



Working Report 2007-56

GPS Operations at Olkiluoto, Kivetty and Romuvaara in 2006

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May 2007

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GPS Operations at Olkiluoto, Kivetty and Romuvaara in 2006

ABSTRACT

The GPS based deformation studies have been made at the investigation areas of Posiva since 1995, when the network of ten GPS pillars was established at Olkiluoto. The network of seven GPS pillars was built at Kivetty and Romuvaara during the year 1996. One pillar in each investigation area belongs to the Finnish permanent GPS network, FinnRef[®].

22 GPS measurement campaigns have been carried out at Olkiluoto since 1995, and 15 campaigns at Kivetty and Romuvaara. According to the time series of the GPS results 1/3 of the baselines at Olkiluoto have statistically significant change rates. However, the observed movements are smaller than ± 0.22 mm/a. The networks of Kivetty and Romuvaara are quite stable except one pillar at Romuvaara.

There are five pillars, which have statistically significant horizontal velocities at Olkiluoto. These local velocity components are small but taking into account the standard deviations the largest velocity components seems to be reliably determined (maximum velocity is -0.23 mm/a ± 0.023 mm/a).

The uniform scale for the GPS measurements made in different years is the basic condition for reliable results in the deformation analyses. At Olkiluoto a baseline for electronic distance measurements (EDM) was built in 2002. The baseline has been measured using EDM instruments simultaneously with the GPS observations. The comparison between the GPS and EDM results can solve a possible scale error of the GPS.

The GPS network at Olkiluoto was extended in 2003. The new pillars were built close to Kuivalahti village and on a small island of Iso Pyrekari. According to the geological evidence it is expected that a fracture zone is located between the new stations, thus enabling the determination of possible deformations along the fracture zone. The new pillars have been observed since 2003, but the time series are still too short for reliable deformation studies.

The local crustal deformations have been studied in GeoSatakunta project, too. This GPS network is located in Cities of Pori and Rauma and their neighbour municipalities. Two new pillars have been established near Olkiluoto investigation area in October 2005. The repeated measurements at these pillars connect the Olkiluoto investigations and GeoSatakunta studies.

Including the new pillars the local GPS network at Olkiluoto consists of 14 stations. The whole network will be measured twice a year. The EDM measurements will be done simultaneously with the GPS observations. Even if the studies are concentrated at Olkiluoto, the GPS observations at Kivetty and Romuvaara investigation areas will be made once per year. Because the stability of these networks has been confirmed by GPS observations in previous years, we may regard the observations at Kivetty and Romuvaara as a reference for the stability of our GPS determinations.

Keywords: Deformation studies, GPS measurements, crustal movements.

Olkiluodon, Kivetyyn ja Romuvaaran tutkimusalueilla vuonna 2006 tehtyjen GPS-mittausten tulokset

TIIVISTELMÄ

GPS-satelliittipaikannukseen perustuvaa deformaatiotutkimusta on tehty Posivan tutkimusalueilla vuodesta 1995 lähtien, jolloin Olkiluotoon perustettiin kymmenen pilaria käsittävä paikallisverkko. Romuvaaralle ja Kivettyyn rakennettiin seuraavana vuonna seitsemän pilarin GPS-verkot. Kaikista tutkimusalueista yksi pilari kuuluu Suomen pysyvään GPS-verkkoon (FinnRef[®]), jossa rekisteröintiä tehdään jatkuvasti.

Olkiluodon verkko on mitattu 22 kertaa vuodesta 1995 lähtien. Romuvaaralla ja Kivetyssä mittauksia on kertynyt 15. Mittauksista lasketut pilarien väliset etäisyydet muodostavat aikasarjan, jonka mukaan kolmanneksella Olkiluodon verkon pilaripareilla on tilastollisesti merkittävä etäisyyden muutosnopeus. Kaikki havaitut liikkeet ovat kuitenkin alle ± 0.22 mm/a. Mittaustulosten mukaan liikkeet Kivetyyn ja Romuvaaran verkoissa ovat erittäin pieniä yhtä Romuvaaran pilaria lukuunottamatta.

Viidellä Olkiluodon asemalla on havaittu tilastollisesti merkittävä vaakaliike. Paikalliset liikenopeedet ovat pieniä, mutta niitä voidaan keskivirheiden perusteella pitää luotettavina (maksimi liikenopeedus -0.23 mm/a ± 0.023 mm/a).

Olkiluodon tutkimusalueelle rakennettiin v. 2002 perusviiva, jonka pituus on mitattu elektronisilla etäisyydenmittauslaitteilla (EDM) GPS-mittauskampanjoiden yhteydessä. Perusviivalla tehtävien EDM-mittausten tarkoituksena on varmistaa GPS:n avulla tehtyjen mittausten mittakaavan yhdenmukaisuus vuodesta toiseen.

Olkiluodon tutkimusalueelle rakennettiin v. 2003 kaksi uutta GPS-mittauspilaria ja uuden ydinvoimalan rakennustyömaan alle jäävän aseman tilalle rakennettiin uusi GPS-havaintopilari. Uudet pilarit sijaitsevat Eurajoensalmen ruhjevyöhykkeellä ja niiden sijaintien muutoksien avulla voidaan seurata mahdollisia ruhjevyöhykkeen liikkeitä. Uudet pilarit on mitattu syksystä 2003 lähtien, mutta aikasarja on vielä liian lyhyt luotettavien deformaatioanalyysien tekemiseen.

Kallioperän deformaatioita on tutkittu myös GeoSatakunta-projektissa, jonka GPS-verkko kattaa Porin ja Rauman kaupunkien ja niiden lähikuntien alueen. Verkon kaksi pilaria sijaitsevat lähellä Olkiluotoa. Näillä syksyllä 2005 perustetuilla pilareilla tehtävät mittaukset yhdistävät Posivan ja GeoSatakunnan tutkimukset yhdeksi kokonaisuudeksi.

Uusien pilarien rakentamisen jälkeen Olkiluodon tutkimusalueella on 14 GPS-pilaria, joiden sijainti mitataan kahdesti vuodessa. Samanaikaisesti GPS-mittausten kanssa tehdään EDM-mittaukset perusviivalla. Vaikka tutkimukset ovat keskittyneet Olkiluotoon, Kivetyyn ja Romuvaaran GPS-verkot mitataan edelleen kerran vuodessa. Aikaisempien GPS-mittausten perusteella voidaan Kivetyyn ja Romuvaaran paikallisverkkoja pitää erittäin stabiileina. Nyt näitä pisteverkkoja voidaan käyttää GPS-mittausten ja laskennan testikenttinä.

Avainsanat: Deformaatiotutkimus, GPS-mittaukset, maankuoren liikkeet.

TABLE OF CONTENTS

ABSTRACT

TIIVISTELMÄ

1. INTRODUCTION	3
2. OPERATIONS AT THE PERMANENT GPS STATIONS IN 2006.....	5
3. GPS OPERATIONS AT THE LOCAL NETWORKS	11
3.1 The local networks	11
3.1.1 Olkiluoto network	11
3.1.2 Kivetty and Romuvaara networks	13
3.2 The measurement campaigns in 2006.....	14
3.2.1 The measurements at Olkiluoto	14
3.2.2 The measurements at Kivetty and Romuvaara.....	16
4. DATA ANALYSIS OF THE LOCAL NETWORKS	17
4.1 GPS computation.....	17
4.2 Change rates of the baselines	17
4.3 Change rates of the baselines from the pillar GPS13 at Olkiluoto.....	21
4.4 Horizontal velocities of the GPS stations at Olkiluoto	21
4.5 Computation and results of the new stations at Olkiluoto	23
5. EDM BASELINE AT OLKILUOTO	25
5.1 Background.....	25
5.2 Electronic distance measurements	25
5.3 Computation.....	27
5.4 Results	27
6. CONTROL MARKERS	29
6.1 Control markers at Olkiluoto	29
6.2 Control measurements of the pillar GPS4 at Romuvaara.....	29
7. FUTURE PLANS	31
8. SUMMARY	33
ACKNOWLEDGEMENTS.....	35
REFERENCES	37
APPENDICES.....	39
Appendix Ia. Results of 22 measurements at Olkiluoto. Deviations of the vector lengths from their mean in millimeters. Unscaled observations.....	40
Appendix Ib. Results of 22 measurements at Olkiluoto. Deviations of the vector lengths from their mean in millimeters. Scaled observations.....	42
Appendix II. Results of the first measurements at Olkiluoto in 2006.....	44
Appendix III. Results of the second measurements at Olkiluoto in 2006.....	76

Appendix IV. Results of the first measurements at the pillars located outside Olkiluoto in 2006.	108
Appendix V. Results of the second measurements at the pillars located outside Olkiluoto in 2006.	123
Appendix VIa. Results of 15 measurements at Kivetty. Deviations of the vector lengths from their mean in millimeters. Unscaled observations.	141
Appendix VIb. Results of 15 measurements at Kivetty. Deviations of the vector lengths from their mean in millimeters. Scaled observations.	142
Appendix VII. Results of the measurements at Kivetty in 2006.	143
Appendix VIIIa. Results of 15 measurements at Romuvaara. Deviations of the vector lengths from their mean in millimeters. Unscaled observations.	160
Appendix VIIIb. Results of 15 measurements at Romuvaara. Deviations of the vector lengths from their mean in millimeters. Scaled observations.	161
Appendix IX. Results of the measurements at Romuvaara in 2006.	162

1. INTRODUCTION

The Finnish Geodetic Institute (FGI) has studied crustal deformations in co-operation with the Posiva Ltd. (previously Teollisuuden Voima, TVO). The studies have been made at the investigation areas, which were selected as candidates for the final disposal sites of spent nuclear fuel. The studies started in 1994, when a network of ten pillars for GPS observations was established at Olkiluoto. In 1995 the GPS networks of seven pillars were built at Kivetty and at Romuvaara. One pillar at each investigation area belongs to the Finnish permanent GPS network FinnRef[®] and are used for continuous GPS observations.

The measurements started at Olkiluoto in 1995, while the first observations were carried out at Romuvaara and at Kivetty in 1996. The baselines between GPS pillars (0.5-3.5 km) have been observed twice a year except the year 2000 because of high ionospheric activity. The studies are now concentrated at Olkiluoto, because the Government and the Parliament have ratified the decision, which enables to establish the final disposal site close to Olkiluoto nuclear power stations. After the decision, since 2002, observations were carried out at Kivetty and at Romuvaara once per year only. We have not finished the studies at these investigation areas, because those areas are the reference networks for Olkiluoto. The time series of the GPS observations provide the relative movements of the GPS pillars, which are then used to determine the local deformations.

Every GPS pillar has two control markers. We determine regularly the distances and angles between the pillars and their control markers in order to check the stability of the concrete pillars. The measurements have been made using tacheometer in 2001 and 2004.

According to the GPS analysis the lengths of all vectors deviate in some sessions systematically from the mean of all observations. The scale difference is mainly caused by errors in the ionosphere modelling. Because of this scaling problem we have established a 511 m long baseline for electronic distance measurement (EDM) between the pillars GPS7 and GPS8 at Olkiluoto. The distance has been measured with Kern ME5000 mekometer, which is the most accurate EDM instrument. The owner of the mekometer is the Institute of Geodesy, Department of Surveying, Helsinki University of Technology. The Mekometer has been calibrated at the Nummela Standard Baseline every year to ensure the quality of the results. The electronic distance measurements have been performed during the GPS observations since 2002. The EDM observations can be used to reduce the GPS results to the traceable scale.

The pillar GPS10 was destroyed when Teollisuuden Voima Oy started to build a new nuclear power station at Olkiluoto in the end of year 2003. The pillar GPS10 was replaced with a new one, locating about 300 m to the west from the original pillar.

In 2003 Posiva decided to expand the Olkiluoto GPS network to the north. The purpose is to monitor possible crustal movements at an old fracture zone, which is passing from NW to SE along Eurajoensalmi. Two new pillars were established in August 2003 at

Kuivalahti and at Iso Pyrekari. The distances to the permanent GPS station are about 8.5 and 4.8 km, respectively.

Local crustal deformations have been studied also in the GeoSatakunta project. The GeoSatakunta GPS network is located in the Cities of Pori and Rauma and their neighbour municipalities. Two new pillars have been established near Olkiluoto investigation area in October 2005. They are located at Hankkila and at Taipalmaa. The distances from the Olkiluoto permanent GPS station are about 7.9 and 5.7 km. Measurements at these pillars connect the Olkiluoto and GeoSatakunta networks.

GPS measurements are suitable to determine horizontal deformations, but the accuracy of height determination is not adequate. The FGI started to determine possible vertical deformations at Olkiluoto with precise levelling in 2003. Levelling campaigns will be performed every second year and they will be reported in a separate working report (Lehmuskoski 2004 and 2006).

2. OPERATIONS AT THE PERMANENT GPS STATIONS IN 2006

Permanent GPS stations at Olkiluoto, Romuvaara, and Kivetty collect continuously GPS data with 30 s observing interval. The GPS data of Olkiluoto is transferred to the FGI hourly using ADSL connection. At Romuvaara we have used wireless WiMAX connection since December 19, 2006. This allows hourly data transfer from the station. Before that we used an old dial up modem with daily download. At Kivetty we are using a modem and daily download.

Occasionally there are one-day breaks in data caused by the errors in data transfer. Longer breaks are mostly caused by the thunderstorms that damage the receiver, modem or telephone line. In 2006 there were no problems with data flow from Olkiluoto station. Both Kivetty and Romuvaara stations have longer gaps in data sets (see Table 2-1). We replaced both modems and over voltage protectors several times in Kivetty and Romuvaara. In July 22 we replaced all the equipments except GPS antenna in Romuvaara, but could not get a connection. These problems lead us to look for more reliable connection method. In December 19 we replaced the telephone connection of Romuvaara with wireless WiMAX connection (Table 2-2).

The GPS data are processed with Bernese 4.2 Software as described in Ollikainen *et al.* 2004. The data are used in 24-hour sessions together with the IGS final orbits. Finally the daily solutions are combined into weekly solution. The main processing parameters and models are summarized in Table 2-3.

Table 2-1. Breaks longer than 3 days at GPS stations in 2006.

OLKI	KIVE	ROMU
	May 12 – May 18 May 30 – Jun 3 Aug 4 – Aug 7 Aug 16 – Aug 23	May 15 – Jun 12 Jul 6 – Jul 20 Jul 24 – Jul 31

Table 2-2. Receivers and connection type at the GPS stations in 2006.

Site	Date	Receiver	S/N	Connection type	Data transfer
OLKI		Z-XII3	168	ADSL	hourly
KIVE	Jun 4	Z-XII3	174	modem	Daily
	Jul 22	uZ	907		
ROMU		Z-XII3	108	modem WiMAX	daily hourly
	Dec 19	Z-XII3	175		

Table 2-3. *The main parameters and models used in GPS processing.*

Software	Bernese 4.2.
Adjustment method	Weighted least squares adjustment.
Pre-processing	Phase pre-processing is done baseline-by-baseline using triple differences. Cycle slips and outliers are fixed if possible. Otherwise a new ambiguity parameter is introduced.
Basic Observable	Carrier phase, code is used only for receiver clock synchronization, elevation cut-off angle is 15 degrees and sampling rate 30 s.
Modelled observable	Double difference, ionosphere-free linear combination.
Rejection criteria	Only full 24 h data is accepted.
Antenna phase centre calibration	Elevation dependent phase centre corrections are applied. IGS_01 model that gives corrections relative to AOAD/M_T antenna is used.
Troposphere	Saastamoinen a priori model, mapping function $1/\cos z$, zenith delays in two hours intervals are estimated for all stations.
Ionosphere	No ionosphere modelling. Epoch-wise elimination during QIF ambiguity resolution. Ionosphere free linear combination of L1 and L2 is used (eliminates the 1 st order) in the final solution.
Orbits and ERP's	IGS final orbit products.
Datum definition	The IGS orbits define the datum. Only METS station is fixed.
Station coordinates	METS constrained to the ITRF coordinates. No constraints for other coordinates.
Satellite clock bias	Satellite clock biases are not estimated. Forming double differences eliminates them.
Receiver clock bias	Receiver clock corrections are estimated using code measurements of individual receivers. Forming double differences eliminates them.
Ambiguities	Ambiguity resolution is performed using QIF strategy (L1&L2) baseline by baseline. The resolved ambiguities are introduced to final adjustment.
Tidal displacement	Solid Earth tides are applied according to IERS Convention96. Ocean loading is not applied. Atmosphere loading is not applied.

In figures 2-1, 2-2 and 2-3 we show nearly 11 years of time series of Olkiluoto, Kivetty and Romuvaara relative to Metsähovi. There exist some erroneous values especially in the height component. The snow accumulating on the antenna radome leading to bad ambiguity resolution or/and bad troposphere estimation explains this behavior. Trends are estimated from the coordinate time series with iterative least square fitting.

Time series have an obvious annual periodicity, which can be seen on the periodograms on the left columns of the Figures 2-1, 2-2, and 2-3. This behaviour was discussed more detailed in Ollikainen *et al.* 2004. The velocity components for Olkiluoto, Kivetty and Romuvaara are summarized in the Table 2-4.

Table 2-4. *The relative movements relative to Metsähovi IGS station.*

Station	North component (mm/a)	East component (mm/a)	Height component (mm/a)	Distance rates (mm/a)
Olkiluoto	-0.42 ± 0.02	-0.44 ± 0.02	$+2.28 \pm 0.05$	$+0.05 \pm 0.03$
Kivetty	$+0.20 \pm 0.03$	-0.60 ± 0.02	$+1.30 \pm 0.07$	$+0.03 \pm 0.03$
Romuvaara	$+0.86 \pm 0.04$	-0.90 ± 0.03	-0.76 ± 0.09	$+0.32 \pm 0.04$

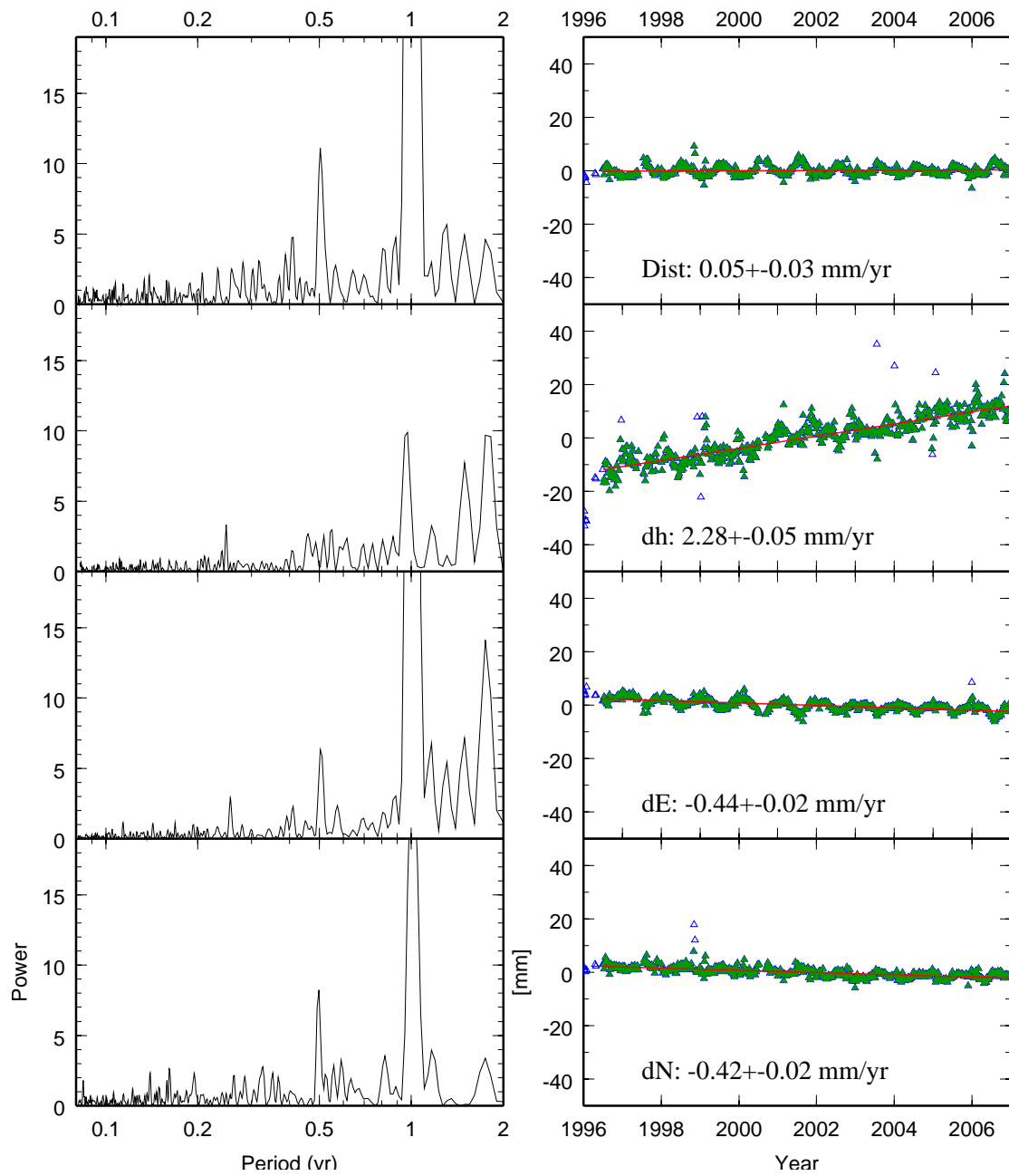


Figure 2-1. Time series of Metsähovi-Olkiluoto vector components. Right: Series of baseline length, height, East and North components. Left: Periodograms of the time series.

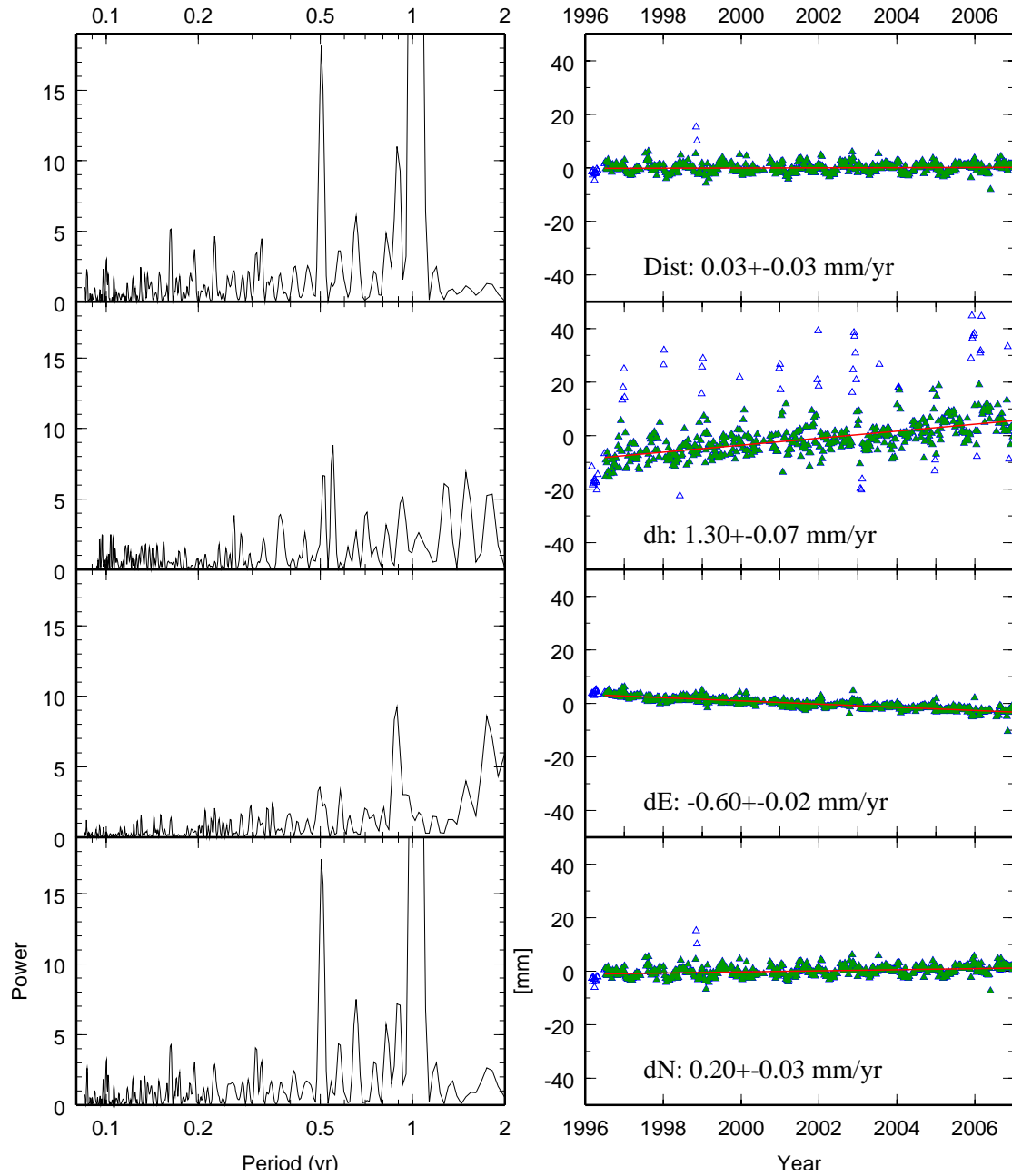


Figure 2-2. Time series of Metsähovi-Kivetty vector components. Right: Series of baseline length, height, East and North components. Left: Periodograms of the time series.

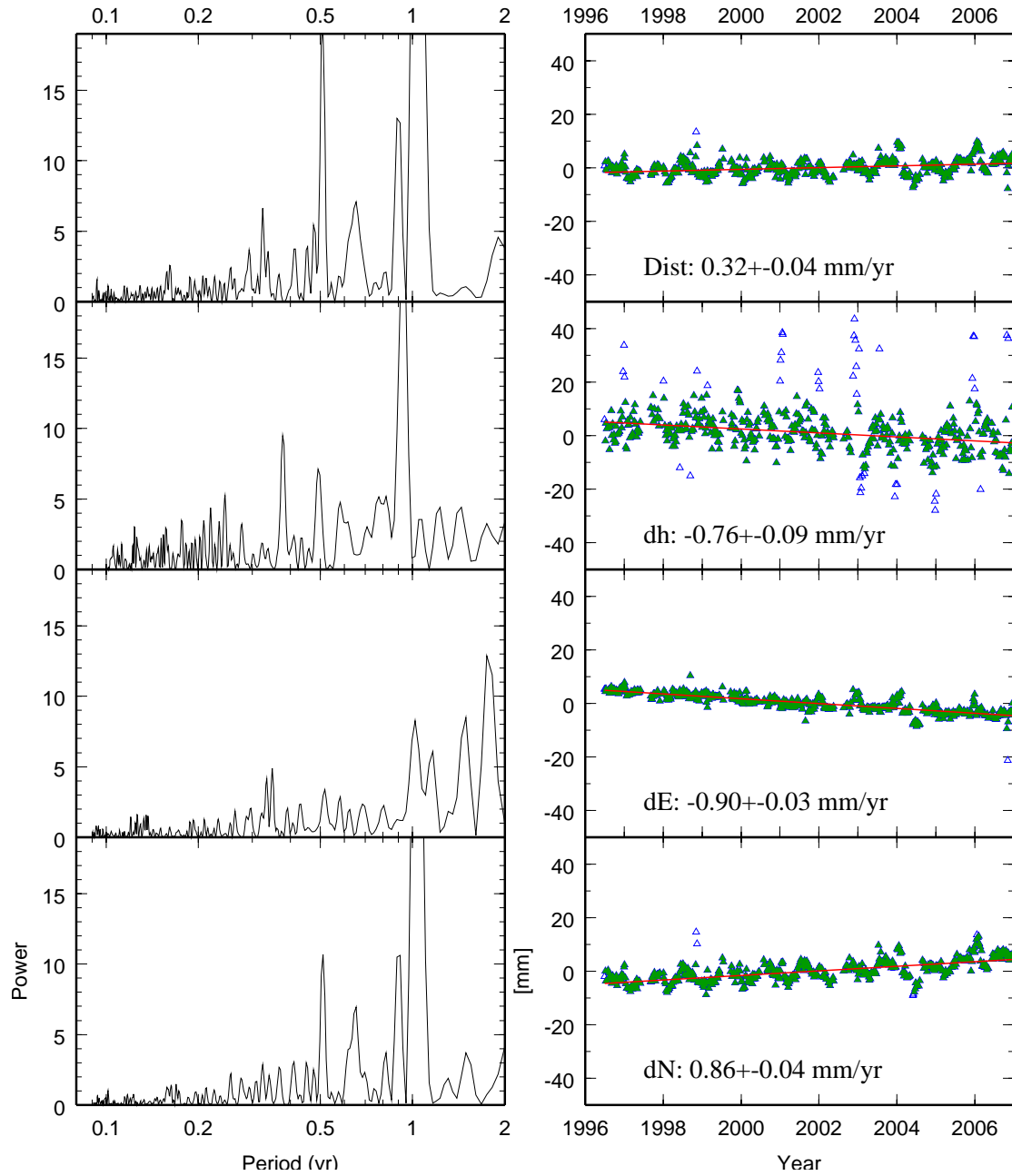


Figure 2-3. Time series of Metsähovi-Romuvaara vector components. Right: Series of baseline length, height, East and North components. Left: Periodograms of the time series.

3. GPS OPERATIONS AT THE LOCAL NETWORKS

3.1 The local networks

3.1.1 Olkiluoto network

The Olkiluoto GPS monitoring network was established in 1994 (Chen and Kakkuri, 1995). The original network (Figure 3-2) includes ten reinforced concrete pillars (GPS1-GPS10). The pillars stand on solid bedrock and according to geological studies they are located on different geological blocks. The distances between pillars are from 0.5 to 3.5 km. The station GPS1 belongs to the Finnish permanent GPS network, FinnRef[®] (Koivula *et al.* 1997), in which the abbreviation OLKI is used for the station.

In 2003 Posiva decided to expand the Olkiluoto GPS network to the north for monitoring possible crustal movements at an old fracture zone, which is passing from NW to SE along Eurajoensalmi. Two new pillars were established in August 2003. They are located at Kuivalahti (GPS11) and at Iso Pyrekari (GPS12) 8.5 and 4.8 km away from the Olkiluoto GPS station.



Figure 3-1. Two new observation pillars have been established near Olkiluoto in October 2005. Left: GPS14 is located under electric line constructions at Hankkila. Right: GPS15 is located on naturally open hill at Taipalmaa village. (Photographs J. Ahola 2006.)

The local crustal deformations have been studied in GeoSatakunta project, too (Ahola and Poutanen 2006). That GPS network is located in Cities of Pori and Rauma and their neighbour municipalities. Two new pillars, GPS14 and GPS15, have been established near Olkiluoto investigation area in October 2005. They are located to the east and to the south from Olkiluoto at Hankkila and at Taipalmaa villages (Figure 3-2). The

distances from the permanent GPS station of Olkiluoto are about 7.9 and 5.7 km. The construction of the pillars is same as the pillars established in 2003 (Figure 3-1). The repeated measurement campaigns at the new pillars connect the Olkiluoto investigations and GeoSatakunta studies.

The pillar GPS10 was destroyed in the end of year 2003 when Teollisuuden Voima Oy started to build a new nuclear power station at Olkiluoto. A new pillar GPS13 was established about 300 m west from the pillar GPS10 in August 2003. Previously the name GPS10B was used for the pillar (Ollikainen *et al.* 2004), but according to the recommendation by Posiva it was renamed in 2005.

The construction work and different pillar types were described in Ollikainen *et al.* 2004.

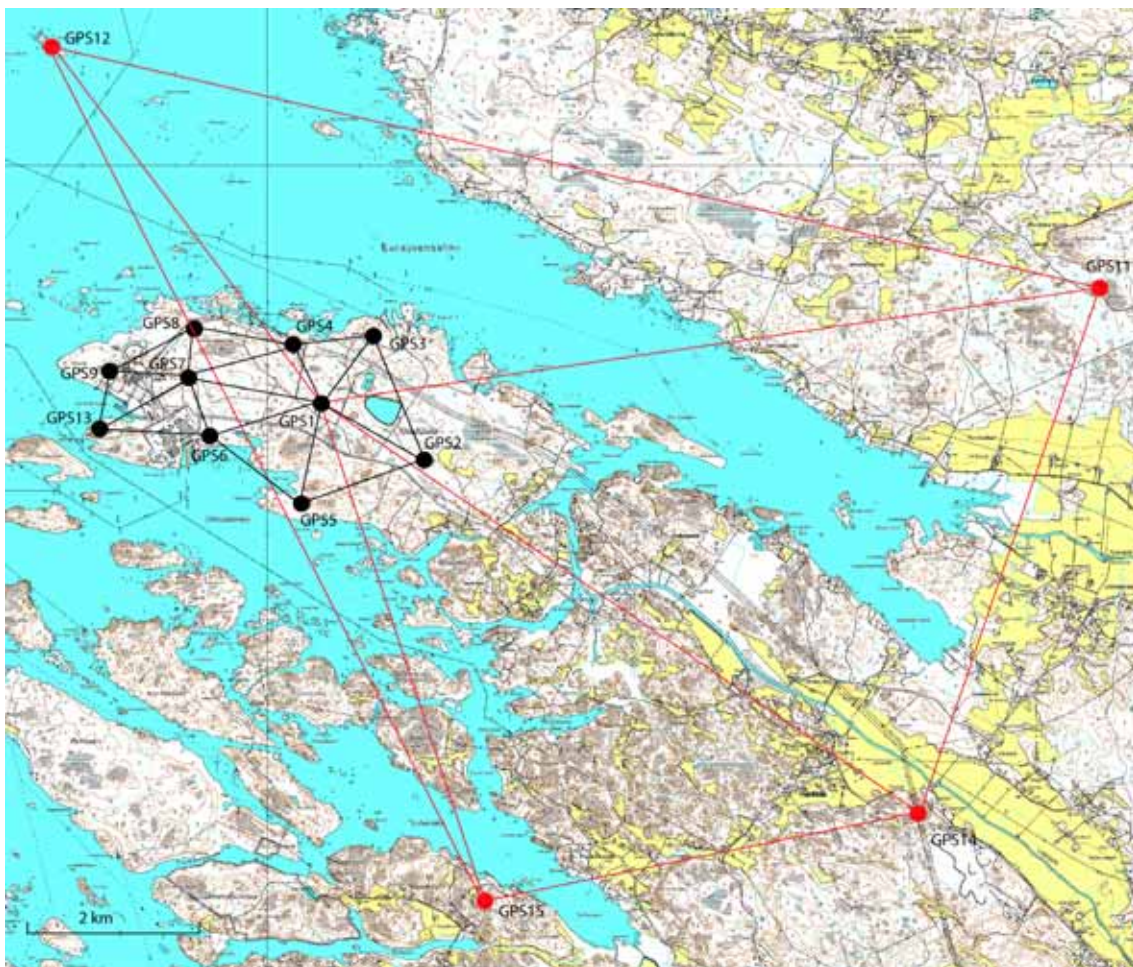


Figure 3-2. The local GPS monitoring network at the investigation area of Olkiluoto. Black: Original network has been established in 1994 (GPS13 in 2003). Red: Pillars have been established in 2003 and 2005.

3.1.2 Kivetty and Romuvaara networks

The networks at Kivetty and Romuvaara were established in 1995 (Chen and Kakkuri, 1996). There are seven pillars at both Kivetty (Figure 3-3) and Romuvaara (Figure 3-4). They were built using the same principles than at Olkiluoto. One of the stations (GPS1) at both of the investigation areas belongs to the Finnish permanent GPS network, FinnRef[®].

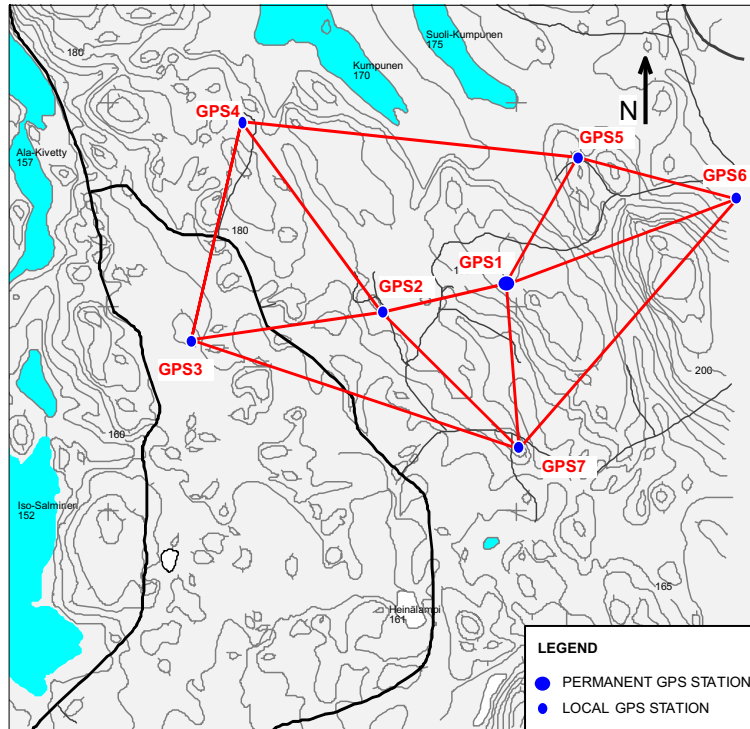


Figure 3-3. The local GPS network at Kivetty.

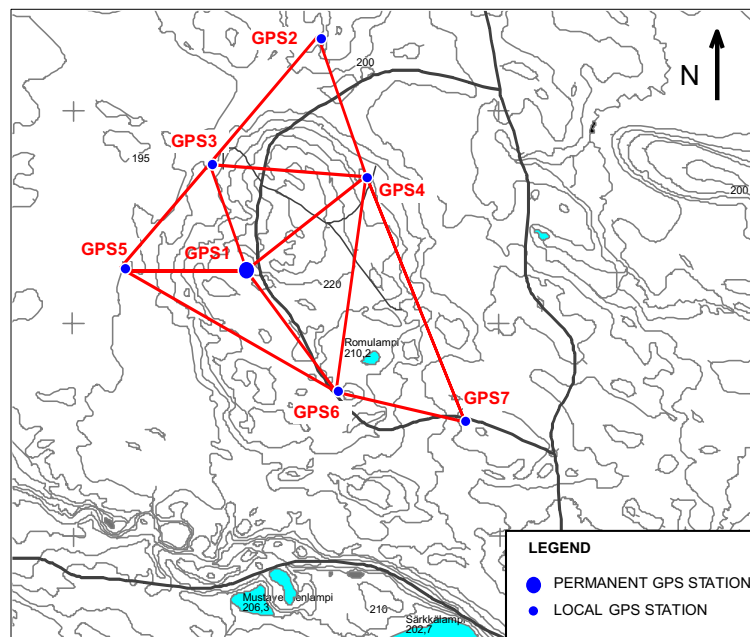


Figure 3-4. The local GPS network at Romuvaara.

3.2 The measurement campaigns in 2006

3.2.1 The measurements at Olkiluoto

The local GPS monitoring network at Olkiluoto has been observed twice a year since 1995 with the exception of year 2000 (Chen and Kakkuri, 1996, 1997 and 1998, Ollikainen and Kakkuri, 1999 and 2000, Ollikainen *et al.* 2001, 2002 and 2004, Ahola *et al.* 2005 and 2006).

As in the previous years two GPS measurement campaigns were carried out at Olkiluoto in 2006. The first measurements were performed on April 4-10 (Table 3-1) and the second one on October 11-16 (Figure 3-5).

The session I includes observations at the pillars GPS1, GPS4, GPS5, GPS6, GPS7, GPS8, GPS9 and GPS13 in both campaigns. The GPS equipments were moved from the pillars GPS4 and GPS7 to the pillars GPS2 and GPS3 for the session II.



Figure 3-5. The GPS measurement at Olkiluoto (GPS6). (Photograph T. Ahola 2006.)

Table 3-1. Observation sessions for the GPS measurements at Olkiluoto in 2006.

Campaign	Session	Observation day		Observation windows (UT)	
		Calendar day	GPS day		
I / 2006	I	7 April	097	8.00-24.00	
		8 April	098	0.00-12.00	
	II	9 April	099	8.00-24.00	
		10 April	100	0.00-11.00	
	III	4 April	094	14.00-24.00	
		5 April	095	0.00-24.00	
		6 April	096	0.00-11.00	
	II / 2006	I	11 October	284	8.00-24.00
			12 October	285	0.00-11.00
II		13 October	286	8.00-24.00	
		14 October	287	0.00-10.00	
III		14 October	287	13.00-24.00	
		15 October	288	0.00-24.00	
		16 October	289	0.00-11.00	

The session III includes the observations at the permanent station GPS1 and pillars GPS11, GPS12, GPS14 and GPS15. It was not possible to make observations at Iso Pyrekari island (GPS12) in spring 2006. During the campaign the ice condition made it impossible to reach Iso Pyrekari by boat. Substitutive measurements were not carried out later because the pillar is located at a nature reserve, which is not allowed to be accessed after the bird nesting on Mid April.

The observations were made using Ashtech Z-12 and Ashtech μ Z GPS receivers equipped with Dorne Margolin-type choke ring antennas (Table 3-2). Same antennas were used at the stations as in previous campaigns.

Table 3-2. The GPS equipments used at Olkiluoto in 2006.

Station	I / 2006 Receiver S/N	II / 2006 Receiver S/N	Antenna S/N
GPS1*	LP00168	LP00168	321
GPS2	03436	03398	11761
GPS3	03398	04293	11959
GPS4	03436	03398	11761
GPS5	LP01087	LP00174	11988
GPS6	LP00164U	LP00164U	11772
GPS7	03398	04293	11959
GPS8	04293	LP01087	11963
GPS9	04300	04098	11770
GPS11	04108	LP00164U	11754
GPS12	-	ZR20001907	11194
GPS13	04108	ZR20000701	11754
GPS14	LP00164U	LP00174	11772
GPS15	LP01087	ZR20000701	11988

*Permanent station

3.2.2 The measurements at Kivetty and Romuvaara

The observations of the local GPS monitoring networks at Kivetty and Romuvaara were started in 1996. Until 2001 the networks were measured twice a year. Posiva concentrates now all studies on Olkiluoto, because the Government and Parliament have ratified the decision that makes possible to establish the final disposal of nuclear waste near Olkiluoto nuclear power stations. However, Posiva and FGI decided to continue measurements also at Kivetty and Romuvaara, because those form good reference networks for Olkiluoto studies. In both networks one measurement campaign a year will be done for reference studies. The observation dates in 2006 are shown in Table 3-3. The length of the observation sessions was 24 hours.

The observations were made using Ashtech Z-12 receivers equipped with Dorne Margolin-type choke ring antennas (Table 3-4). Same antennas were used as in previous campaigns.

Table 3-3. Observation sessions for the GPS measurements at Kivetty and Romuvaara in 2006.

Year	Network	Observation day		Observation windows (UT)
		Calendar day	GPS day	
2006	Romuvaara	22 Sept	265	10.00-24.00
		23 Sept	266	0.00-11.00
	Kivetty	24 Sept	267	11.00-24.00
		25 Sept	268	0.00-11.30

Table 3-4. The GPS equipments used at Kivetty and Romuvaara in 2006.

Station	Romuvaara		Kivetty	
	Receiver S/N	Antenna S/N	Receiver S/N	Antenna S/N
GPS1*	03175	11987	04108	11203
GPS2	04293	11959	04293	11963
GPS3	04098	11754	04098	11959
GPS4	LP00164U	11770	LP00164U	11988
GPS5	LP00174	11988	LP00174	11772
GPS6	LP01087	11963	LP01087	11754
GPS7	03398	11772	03398	11770

*Permanent station

4. DATA ANALYSIS OF THE LOCAL NETWORKS

4.1 GPS computation

The GPS computation has been made using Bernese software version 5.0 (Hugentobler *et al.* 2004). The observations were processed using the same principles as in the previous computations:

- Observations were processed using independent L1 and L2 observations, rather than any linear-combinations, in order to obtain lower measurement noises and smaller effects of multipath errors.
- The ionospheric refraction was modelled and L1 and L2 observations were corrected with the estimated ionospheric models in order to remove the absolute scale errors resulting from the ionospheric refraction.
- A global standard atmospheric model, which approximately represents the atmospheric conditions at the observation time, was used to correct the tropospheric refraction in order to remove the scale errors. Local tropospheric parameters were solved in the final solution in order to obtain an unbiased estimation of the height component.

The results of the GPS computation of campaigns in 2006 are given in Appendices I-III and VI-IX.

4.2 Change rates of the baselines

The local networks at each investigation area were measured several times since 1995: we have had 22 campaigns at Olkiluoto and 15 campaigns at Kivetty and Romuvaara. The time series enable to determine the change rates for the baselines. The change rates were computed as in previous campaigns (Ollikainen *et al.* 2004).

The accuracy of the GPS determinations depends on how well affecting in scale factors have been eliminated. In some cases the estimation of ionosphere model can be difficult, or even impossible. The errors in the ionosphere modelling affect to the resulting baseline lengths, like a scale error, which was explained in Ollikainen and Kakkuri, 1999. Because of a possible scale bias the observations were scaled with a scale factor, which is computed comparing the results to the mean of all observations. The determination of the scale factor was explained in detail in Ollikainen *et al.* 2004.

The results are given in Tables 4-1, 4-2 and 4-3.

Table 4-1. Change rates of 36 baselines at Olkiluoto. The change rates and estimated errors are obtained from least squares solutions from the results of 22 measurements performed in 1995-2006. The change rates were computed using both unscaled and scaled vector lengths. Baselines with statistically significant change rates are highlighted.

Baseline	No scale correction				Scale correction added			
	Change rate (mm/a)	St. dev. (mm/a)	Length of the baseline at zero epoch (1995.0)	St. dev. (mm)	Change rate (mm/a)	St. dev. (mm/a)	Length of the baseline at zero epoch (1995.0)	St. dev. (mm)
GPS1-GPS2	-0.18	±0.04	1355862.92	±0.29	-0.20	±0.03	1355863.06	±0.25
GPS1-GPS3	-0.01	0.05	1006191.89	0.33	-0.03	0.04	1006192.01	0.30
GPS1-GPS4	0.16	0.04	643447.00	0.31	0.15	0.05	643447.06	0.32
GPS1-GPS5	0.02	0.06	1131621.33	0.40	0.00	0.05	1131621.44	0.33
GPS1-GPS6	0.08	0.03	1264824.68	0.21	0.05	0.03	1264824.82	0.23
GPS1-GPS7	0.11	0.02	1482992.56	0.18	0.08	0.03	1482992.73	0.24
GPS1-GPS8	0.22	0.03	1594500.60	0.21	0.19	0.04	1594500.77	0.26
GPS1-GPS9	0.11	0.03	2343595.23	0.20	0.07	0.04	2343595.49	0.27
GPS2-GPS3	-0.05	0.06	1609847.55	0.40	-0.08	0.05	1609847.72	0.34
GPS2-GPS4	0.08	0.04	1856923.52	0.26	0.04	0.03	1856923.73	0.23
GPS2-GPS5	-0.12	0.05	1477355.75	0.32	-0.15	0.04	1477355.93	0.27
GPS2-GPS6	-0.09	0.03	2436724.45	0.23	-0.14	0.04	2436724.74	0.25
GPS2-GPS7	-0.06	0.03	2811673.60	0.23	-0.12	0.04	2811673.93	0.25
GPS2-GPS8	0.05	0.04	2949496.32	0.30	-0.01	0.04	2949496.64	0.28
GPS2-GPS9	-0.06	0.04	3649885.56	0.30	-0.13	0.04	3649885.97	0.27
GPS3-GPS4	0.13	0.05	756323.92	0.36	0.12	0.05	756324.00	0.33
GPS3-GPS5	0.03	0.09	2094204.04	0.61	-0.01	0.07	2094204.27	0.49
GPS3-GPS6	0.03	0.05	2126842.91	0.37	-0.01	0.04	2126843.15	0.30
GPS3-GPS7	0.00	0.03	2073048.64	0.25	-0.04	0.03	2073048.86	0.24
GPS3-GPS8	0.14	0.05	1924578.51	0.33	0.11	0.05	1924578.74	0.32
GPS3-GPS9	0.00	0.04	2914435.28	0.28	-0.05	0.03	2914435.60	0.24
GPS4-GPS5	0.11	0.06	1734652.12	0.43	0.08	0.05	1734652.31	0.36
GPS4-GPS6	-0.04	0.04	1418664.26	0.26	-0.07	0.04	1418664.40	0.26
GPS4-GPS7	-0.14	0.03	1317485.74	0.19	-0.16	0.03	1317485.90	0.25
GPS4-GPS8	-0.02	0.04	1216240.03	0.27	-0.04	0.04	1216240.17	0.29
GPS4-GPS9	-0.14	0.03	2165877.34	0.24	-0.18	0.04	2165877.60	0.29
GPS5-GPS6	0.06	0.03	1284565.74	0.19	0.04	0.03	1284565.89	0.21
GPS5-GPS7	0.14	0.04	1894752.53	0.29	0.10	0.03	1894752.76	0.23
GPS5-GPS8	0.17	0.05	2256070.34	0.34	0.13	0.03	2256070.60	0.22
GPS5-GPS9	0.13	0.04	2571611.20	0.30	0.08	0.03	2571611.48	0.20
GPS6-GPS7	0.08	0.04	683009.63	0.26	0.07	0.03	683009.68	0.24
GPS6-GPS8	0.08	0.04	1157814.96	0.29	0.06	0.03	1157815.10	0.24
GPS6-GPS9	0.06	0.04	1290279.53	0.28	0.03	0.03	1290279.69	0.22
GPS7-GPS8	-0.06	0.03	511257.23	0.21	-0.07	0.03	511257.29	0.21
GPS7-GPS9	0.01	0.02	868575.47	0.16	-0.01	0.02	868575.56	0.14
GPS8-GPS9	-0.14	0.03	1057915.51	0.24	-0.15	0.03	1057915.62	0.24
RMS:		±0.05		±0.30		±0.04		±0.27

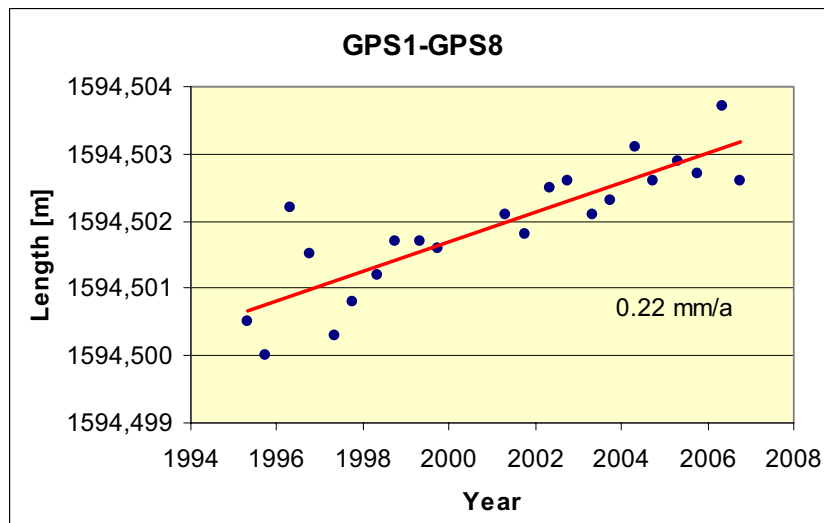


Figure 4-1. The most significant change rate ($0.22 \text{ mm/a} \pm 0.03 \text{ mm/a}$) at Olkiluoto is between the pillars GPS1 and GPS8.

Table 4-2. Change rates of 21 baselines for the local GPS network at Kivetty. The change rates and estimated errors are obtained from least squares solutions of 15 measurements performed in 1996-2006. The change rates were computed using both unscaled and scaled vector lengths. Baselines with statistically significant change rates are highlighted.

Baseline	No scale correction				Scale correction added			
	Change rate (mm/a)	St. dev. (mm/a)	Length of the baseline at zero epoch (1996.0)	St. dev. (mm)	Change rate (mm/a)	St. dev. (mm/a)	Length of the baseline at zero epoch (1996.0)	St. dev. (mm)
GPS1-GPS2	0.04	± 0.04	659084.11	± 0.26	0.02	± 0.04	659084.18	± 0.24
GPS1-GPS3	-0.03	0.04	1613486.09	0.22	-0.07	0.03	1613486.27	0.18
GPS1-GPS4	0.05	0.05	1591096.27	0.26	0.01	0.04	1591096.45	0.22
GPS1-GPS5	-0.04	0.04	672046.81	0.22	-0.06	0.04	672046.88	0.21
GPS1-GPS6	0.15	0.03	1180588.09	0.16	0.12	0.04	1180588.24	0.20
GPS1-GPS7	0.00	0.05	735563.49	0.31	-0.02	0.05	735563.59	0.26
GPS2-GPS3	-0.06	0.05	955938.69	0.28	-0.08	0.05	955938.82	0.29
GPS2-GPS4	0.07	0.06	1198884.00	0.36	0.04	0.06	1198884.13	0.33
GPS2-GPS5	-0.04	0.05	1167284.05	0.31	-0.07	0.05	1167284.20	0.27
GPS2-GPS6	0.14	0.06	1829810.44	0.32	0.09	0.05	1829810.68	0.30
GPS2-GPS7	0.04	0.05	901317.62	0.27	0.02	0.04	901317.72	0.21
GPS3-GPS4	0.13	0.09	1102331.50	0.52	0.11	0.08	1102331.63	0.48
GPS3-GPS5	-0.08	0.06	2031115.39	0.34	-0.13	0.05	2031115.65	0.27
GPS3-GPS6	0.08	0.05	2770064.65	0.30	0.01	0.05	2770064.98	0.29
GPS3-GPS7	0.02	0.05	1693397.79	0.31	-0.02	0.04	1693397.97	0.26
GPS4-GPS5	-0.07	0.04	1608741.90	0.22	-0.11	0.03	1608742.07	0.20
GPS4-GPS6	0.03	0.05	2462388.46	0.26	-0.03	0.05	2462388.77	0.31
GPS4-GPS7	0.10	0.08	2089326.23	0.45	0.05	0.06	2089326.48	0.32
GPS5-GPS6	0.13	0.04	854744.91	0.21	0.11	0.04	854745.02	0.25
GPS5-GPS7	-0.06	0.06	1379384.81	0.37	-0.10	0.05	1379384.98	0.27
GPS6-GPS7	0.11	0.05	1604962.55	0.31	0.07	0.04	1604962.73	0.24
RMS:		± 0.05		± 0.31		± 0.05		± 0.27

One third of the baselines at Olkiluoto have statistically significant change rates at the confidence level of 95% (Table 4-1). However, all rates are smaller than ± 0.22 mm/a. The rates have diminished year after year when the time series has grown longer and the determination of the change rates has become more reliable. The scaled change rates indicate that the pillar GPS2 is moving, which is not clear according to the unscaled change rates. The most significant change rate is between the pillars GPS1 and GPS8 (Figure 4-1).

The GPS network at Kivetty is quite stable. There are just a few baselines, which have statistically significant change rate and these movements are smaller than ± 0.15 mm/a (Table 4-2).

The investigation area at Romuvaara is also quite stable. There are only three baselines with statistically significant change rates (Table 4-3). Two of these vectors are connected to the pillar GPS4. According to the results the pillar GPS4 is moving to the east. A probable explanation for the movement is the instability of pillar GPS4. We will measure the distances and angles between the pillar and control markers during the next years to ensure the reason of the movement.

Table 4-3. Change rates of 21 baselines for the local GPS network at Romuvaara. The change rates and the estimated errors are obtained from least squares solutions of 15 measurements performed in 1996-2006. The change rates were computed using both unscaled and scaled vector lengths. Baselines with statistically significant change rates are highlighted.

Baseline	No scale correction				Scale correction added			
	Change rate (mm/a)	St. dev. (mm/a)	Length of the baseline at zero epoch (1996.0)	St. dev. (mm)	Change Rate (mm/a)	St. dev. (mm/a)	Length of the baseline at zero epoch (1996.0)	St. dev. (mm)
GPS1-GPS2	0.00	± 0.09	1176417.69	± 0.53	-0.05	± 0.05	1176417.91	± 0.27
GPS1-GPS3	-0.05	0.05	541205.23	0.30	-0.07	0.04	541205.34	0.25
GPS1-GPS4	0.22	0.08	731895.96	0.49	0.18	0.07	731896.10	0.40
GPS1-GPS5	0.00	0.03	614734.42	0.17	-0.03	0.04	614734.56	0.22
GPS1-GPS6	-0.05	0.06	678196.47	0.35	-0.08	0.04	678196.60	0.23
GPS1-GPS7	0.02	0.06	1222388.65	0.35	-0.03	0.03	1222388.88	0.18
GPS2-GPS3	0.04	0.06	783976.18	0.35	0.01	0.04	783976.33	0.24
GPS2-GPS4	0.09	0.09	692374.68	0.50	0.06	0.06	692374.80	0.33
GPS2-GPS5	0.06	0.08	1397223.33	0.45	0.00	0.04	1397223.59	0.20
GPS2-GPS6	-0.06	0.14	1686681.96	0.81	-0.12	0.06	1686682.28	0.37
GPS2-GPS7	-0.01	0.15	1940414.15	0.87	-0.09	0.06	1940414.52	0.33
GPS3-GPS4	0.29	0.10	717506.46	0.55	0.26	0.08	717506.57	0.47
GPS3-GPS5	0.02	0.05	616536.05	0.27	0.00	0.04	616536.17	0.23
GPS3-GPS6	-0.11	0.09	1204805.32	0.50	-0.15	0.04	1204805.56	0.26
GPS3-GPS7	-0.03	0.09	1679302.25	0.51	-0.10	0.04	1679302.57	0.21
GPS4-GPS5	0.32	0.10	1225010.73	0.57	0.27	0.08	1225010.97	0.46
GPS4-GPS6	-0.01	0.08	1045309.66	0.48	-0.05	0.04	1045309.85	0.23
GPS4-GPS7	-0.09	0.09	1248362.92	0.49	-0.14	0.05	1248363.18	0.32
GPS5-GPS6	-0.07	0.05	1188022.48	0.30	-0.12	0.05	1188022.71	0.28
GPS5-GPS7	-0.01	0.06	1795939.97	0.33	-0.08	0.06	1795940.32	0.34
GPS6-GPS7	0.05	0.04	636487.67	0.20	0.03	0.04	636487.79	0.21
RMS:		± 0.08		± 0.48		± 0.05		± 0.30

4.3 Change rates of the baselines from the pillar GPS13 at Olkiluoto

The pillar GPS13 (earlier GPS10B) was established at in 2003 (Ollikainen *et al.* 2004). We have observed it twice a year during sessions I and II since autumn 2003 (Tables 3-1 and 3-2) and have made the computation together with other pillars (GPS1-GPS9). However, seven measurements are not enough for reliable deformation studies. That is why we have studied the baselines from the pillar GPS13 separately.

The determination of the change rates has been made using same principles as in the previous chapter, but it is not possible to determine scale corrections using only seven observations. The results are given in the Table 4-4. The most of the standard deviations are higher than the change rates.

Table 4-4. Change rates of 9 baselines from the pillar GPS13 at Olkiluoto. The change rates and the estimated errors are obtained from least squares solutions of only seven measurements performed in 2003-2006.

Baseline	No scale correction			
	Change rate (mm/a)	St. dev. (mm/a)	Length of the baseline at zero epoch (2003.0)	St. dev. (mm)
GPS1-GPS13	0.07	±0.06	2407027.74	±0.13
GPS2-GPS13	0.13	0.26	3597907.72	0.54
GPS3-GPS13	0.14	0.28	3159423.31	0.57
GPS4-GPS13	-0.10	0.05	2406325.59	0.10
GPS5-GPS13	-0.02	0.16	2326729.59	0.33
GPS6-GPS13	0.12	0.13	1166023.89	0.27
GPS7-GPS13	0.08	0.15	1126412.92	0.31
GPS8-GPS13	-0.09	0.23	1520689.03	0.48
GPS9-GPS13	0.08	0.07	665040.41	0.15
RMS:		±0.18		±0.36

4.4 Horizontal velocities of the GPS stations at Olkiluoto

The analysis of the change rates is based on the vectors lengths, which have been computed using 3-dimensional coordinates of each measurement campaigns. The change rates represent only deformations between pillar pairs. If we want to know how the different GPS stations are moving relative to each other, we have to study the plane coordinates of the campaigns and confirm that all coordinates are located in a common coordinate system.

At first we selected the coordinates of the stations obtained in autumn 2006 as a reference session. All other coordinate sets were transformed to this session using 7-parameter *Helmert* transformation. The transformation parameters of the coordinate differences of the origins and the rotation angles around the coordinate axes were solved by the least squares method from the coordinates obtained in different sessions. The scale factor was not solved. This means that the results represent the same situation as the change rates in Table 4-1, which were obtained with unscaled observations.

Because the horizontal movements are the main interest, the 3-dimensional Cartesian coordinates in common coordinate system were transformed into ellipsoidal coordinates, which were projected to plane coordinates using Gauss-Krüger projection. The conversion from ellipsoidal coordinates to plane coordinates was done using the GRS80 ellipsoidal parameters. In order to minimize the projection errors the 21° central meridian was used in the projections.

The components of the station velocities according to the permanent station (GPS1) were computed by linear regression from the plane coordinates obtained from the different sessions. The linear regressions were made separately for the N- and E-coordinates of the pillars. The results are given in Table 4-5 and illustrated in Figure 4-2.

According to deformation analysis there are five stations, which have statistically significant velocities at Olkiluoto. The pillars GPS2, GPS4 and GPS8 are mainly moving to the west with respect to the permanent GPS station (GPS1). The pillar GPS7 and GPS9 have the velocity to the north-west. The local velocity components are small but taking into account the standard deviations, the largest velocity components seems to be reliable (max. velocity $-0.23 \text{ mm/a} \pm 0.023 \text{ mm/a}$).

Table 4-5. The horizontal velocities of the GPS stations in mm/a with respect to the permanent GPS station (GPS1) at Olkiluoto. The velocities and the estimated errors are obtained from least squares solutions of 22 measurements performed in 1995-2006. The stations with statistically significant velocities are highlighted.

Station	North component		East component	
	Velocity [mm/a]	St.dev. [mm/a]	Velocity [mm/a]	St.dev. [mm/a]
GPS1	0.000	0.000	0.000	0.000
GPS2	0.049	0.029	-0.174	0.037
GPS3	0.044	0.047	-0.080	0.036
GPS4	0.108	0.042	-0.228	0.023
GPS5	-0.017	0.056	-0.018	0.037
GPS6	0.002	0.039	-0.088	0.034
GPS7	0.108	0.019	-0.087	0.025
GPS8	0.075	0.023	-0.217	0.037
GPS9	0.113	0.019	-0.098	0.028
RMS:		± 0.034		± 0.031

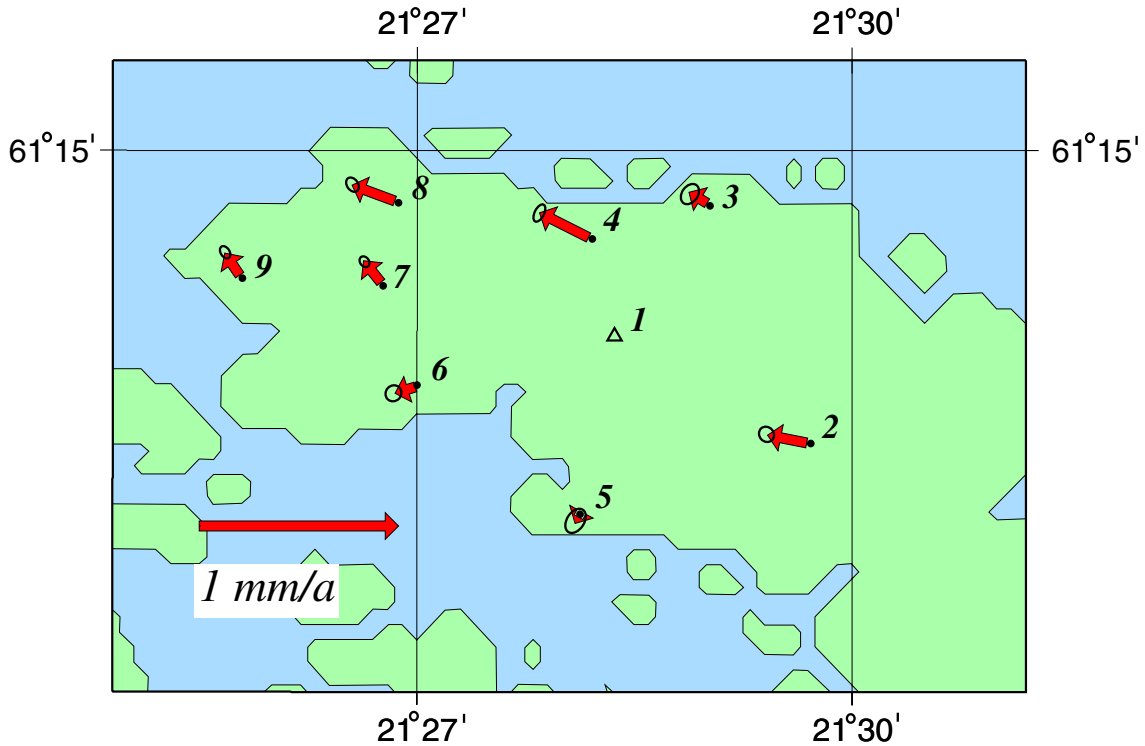


Figure 4-2. The horizontal velocities of the GPS stations at Olkiluoto relative to the permanent GPS station (1).

4.5 Computation and results of the new stations at Olkiluoto

The pillars GPS11 at Kuivalahti and GPS12 at Iso Pyrekari were established at in 2003 (Ollikainen *et al.* 2004) and the pillars GPS14 at Hankkila and GPS15 at Taipalma were established in 2005 (Figure 3-1). The stations GPS11 and GPS12 were measured twice a year since autumn 2003. However, the stations GPS14 and GPS15 have just been observed in 2006. The station GPS12 has been observed just once in 2005 and 2006, because it was impossible to reach Iso Pyrekari by boat during bad ice conditions.

Previously the measurements have been computed using the same principles as in the computation of the original network (Ahola *et al.* 2005). We decided to change a computation strategy and compute all measurement again, because we have also other deformation measurements at Satakunta (Ahola and Poutanen 2006). We will combine the observations at the same pillars in both campaigns, what is why we have to use the same computation strategy.

The observations have been processed using Bernese software version 5.0. The main difference between earlier computations and a new strategy is the ionosphere modelling. The new computation has been made without ionosphere models. The ambiguities have been solved baseline by baseline using QIF method. Previously resolved ambiguities are introduced to the final solution using ionosphere free L3 linear combination.

The results of the measurement in 2006 are given in Appendixes IV-V.

The pillar GPS11 has been measured seven times, while the pillar GPS12 only five times (not in spring 2005 and 2006). The lengths of the observed vectors are between 4.8 and 11.6 km. The time series is still too short for reliable deformation studies. However, the change rates of the vectors are given in Table 4-6. The standard deviations are almost same size as the change rates.

The pillars GPS14 and GPS15 have been measured just twice, which is not enough to make any deformation analysis. The observed distances between the new stations and the permanent GPS station in 2006 are given in Table 4-7.

Table 4-6. Change rates of the baselines from the pillars GPS11 and GPS12 at Olkiluoto. The change rates and the estimated errors are obtained from least squares solutions of only seven or five (GPS12) measurements performed in 2003-2006.

Baseline	No scale correction			
	Change rate (mm/a)	St. dev. (mm/a)	Length of the baseline at zero epoch 2003.0 (mm)	St. dev. (mm)
GPS1-GPS11	-1.15	0.54	8478269.20	±1.11
GPS1-GPS12	-0.25	0.21	4817826.31	0.41
GPS11-GPS12	-0.21	0.28	11574239.10	0.54
RMS:		±0.37		±0.75

Table 4-7. The observed distances between the new stations and permanent GPS station in 2006.

Baseline	Length of the baseline 1/2006 (mm)	Length of the baseline 2/2006 (mm)	Difference (mm)
GPS1-GPS11	8478263.4	8478266.6	+3.4
GPS1-GPS12	-	4817825.7	-
GPS1-GPS14	7852377.7	7852377.9	+0.2
GPS1-GPS15	5704060.8	5704060.9	+0.1
GPS11-GPS12	-	11574239.0	-
GPS11-GPS14	6005975.3	6005975.3	0.0
GPS11-GPS15	9358363.3	9358365.7	+2.4
GPS12-GPS14	-	12512520.9	-
GPS12-GPS15	-	10387700.4	-
GPS14-GPS15	4762657.3	4762658.3	+1.0

5. EDM BASELINE AT OLKILUOTO

5.1 Background

We have noticed that GPS solutions may be significantly biased by scale errors (Ollikainen and Kakkuri, 1999). This systematic scale error is mainly caused by errors in ionosphere modelling. The scale error has varied from -0.8 to +0.6 ppm at Olkiluoto (Appendix Ia). However in 2002 measurements at Romuvaara it was as large as +2.1 ppm (Appendix VIIa).

The FGI and Posiva have established a baseline for electronic distance measurements (EDM), because of this scaling problem of GPS observations. The baseline was established between pillars GPS7 and GPS8 in 2002.

Accuracy of high precision EDM is about $\pm(0.2 \text{ mm} + 0.2 \text{ ppm})$ (1σ). The estimated accuracy for GPS is about $\pm 0.8 \text{ mm}$ (1σ) obtained at the microneetworks of Posiva (Appendix Ia). According to these figures EDM is more accurate than GPS when the baselines are as short as at Olkiluoto. We measure the EDM baseline simultaneously with the GPS measurement. The scale factor problem is expected to be solved by deriving the uniform scale for the GPS observations using the EDM results.

5.2 Electronic distance measurements

A Kern ME5000 mekometer is the most accurate EDM instrument, which is suitable for fieldwork. The mekometer of the Laboratory of Geoinformation and Positioning Technology, Department of Surveying, Helsinki University of Technology was used in the baseline measurements. We have calibrated the mekometer at the Nummela Standard Baseline at least once a year and the results are given in Certificates of Calibration of the National Standards Laboratory of the Finnish Geodetic Institute (Table 5-1).

Table 5-1. Mekometer calibrations at Nummela Standard Baseline in 2006.

Year	Date	Certificate of Calibration
2006	August 22-29 and October 23-26	23 / 2006

The EDM baseline at Olkiluoto has been measured twice a year during the both GPS measurement campaigns since 2002 except in spring 2006, when it was impossible to perform EDM measurements. A soil depot near the station GPS7 blocked visibility between the observation pillars, but the soil was moved before the next measurements campaign. The measurements in 2006 were performed on October 15-16. We observed three times ten single distances from both observation pillars during the campaigns as in the previous years (Figure 5-1).

The weather observations were made with calibrated instruments at the mekometer site and at the reflector site. Dry and wet temperatures have been observed with psychrometers and air pressure with aneroids (Table 5-2).



Figure 5-1. The mekometer Kern ME5000 at the pillar GPS8 during baseline observation on October 2006. (Photograph T. Ahola 2006.)

Table 5-2. The equipments at the mekometer and at the reflector sites.

	Equipment at the mekometer site	Equipment at the reflector site
Kern Mekometer ME5000	S/N 357094	-
Kern prism reflector	-	S/N 374414
Thies Clima psychrometer	S/N 6530 / 6540	S/N 6544 / 6527
Thommen Hoehenmesser aneroid	S/N 164610	S/N 126533

5.3 Computation

The results of mekometer measurements depend on weather conditions. Therefore, a computation strategy is to compute first velocity corrections according to weather conditions for observed distances. The result is a mean of corrected distances with standard error. The computation and used formulas were given in Ollikainen *et al.* 2004.

5.4 Results

The results of electronic distance measurements at the baseline GPS7-GPS8 are the means of observed distances after the first velocity corrections. These values with standard errors (1σ) are given in the Table 5-3. In addition to the standard deviation, the standard uncertainty includes errors of centring and adjusting of the instruments (± 0.1 mm), the calibration of the instruments (± 0.1 mm) and determination of the refraction correction (± 0.1 mm).

Table 5-3. The space distances between the pillars GPS7-GPS8 measured by the GPS and the Kern Mekometer ME5000. The mean of the GPS observations includes 22 measurement campaigns since 1995.

Measurement	Distance (mm)	Standard deviation (mm)	Total standard uncertainty (mm)	Certificate of Calibration
Mean of GPS obs.	511256.9	± 0.5	-	-
Apr 28 2002	511256.4	± 0.3	± 0.3	5 / 2002
Oct 12-13 2002	511255.7	± 0.1	± 0.2	9 / 2002
Apr 26-27 2003	511256.1	± 0.1	± 0.2	5 / 2003
Oct 11-12 2003	511256.6	± 0.1	± 0.2	19 / 2003
Apr 4-5 2004	511256.5	± 0.1	± 0.3	19 / 2004
Oct 9-10 2004	511255.9	± 0.1	± 0.2	20 / 2004
Apr 10-11 2005	511256.1	± 0.3	± 0.3	20 / 2005
Oct 5-6 2005	511256.1	± 0.2	± 0.3	32 / 2005
Oct 15-16 2006	511255.5	± 0.2	± 0.3	16 / 2006

The electronic distance measurements are traceable to the definition of the metre through the Nummela Standard Baseline, which has been measured with the Väisälä light interference method. The latest interference measurements were performed in 2005 (Jokela and Häkli, 2006). Latest mekometer calibrations in Nummela have been performed in 2006. Procedures meet the requirements of the standards ISO 9001 and ISO 17025. The results are given also in Certificates of Calibration of the National Standards Laboratory of the Finnish Geodetic Institute. Since 2003 the results are given with extended uncertainty (2σ), which is two times total standard uncertainty.

The comparison of the EDM and GPS results is given in Figure 5-2. Each EDM distance is shorter than the GPS result from same campaign. According to the five years period GPS gives on an average 0.69 mm longer distances between pillars GPS7 and GPS8 than EDM. That is over 1 ppm scale difference.

The scale difference between GPS and Mekometer measurements is obvious, but we do not yet know, what is the reason for this behaviour. At first we thought that the different phase centre offsets of the GPS antennas can be an explanation. In fact that is why we

use the same antennas at the pillars in every GPS campaign. We tested the effect of the phase centre offsets to the GPS results in autumn 2005. However, we have shown in Ahola *et al.* 2006, that the reason of the scale difference must be elsewhere.

According to nine measurements the shapes of the time series, which are computed with different methods, are quite similar. This is very interesting, because it should mean that the obtained deformation is real, even if the distance changes back and forth. However, it is too early to make any specific conclusion. We need more studies and observations at the baseline and it is obvious that we will continue the electronic distance measurements simultaneously with GPS measurements.

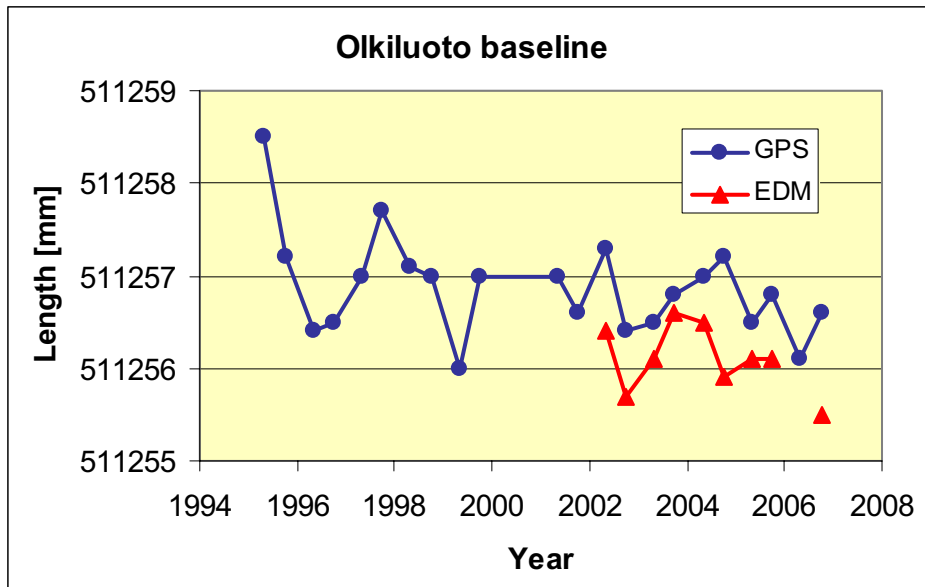


Figure 5-2. The GPS and the EDM results from the baseline GPS7-GPS8.

6. CONTROL MARKERS

6.1 Control markers at Olkiluoto

Each GPS pillar has two control markers. The benchmarks are founded in solid bedrock near the station. Because the benchmarks are used to determine the possible horizontal displacements of the pillars, the ideal location is such that the lines between the concrete pillar and the markers intersect in 90 degrees angle. The distances between pillars and control markers are from 4.5 m to 12.5 m.

The Olkiluoto GPS network was extended in 2003, when three new GPS pillars were built. In autumn 2004 we established control markers for pillars GPS11 and GPS13 (Ahola *et al.* 2005).

The distances and angles between pillars and control markers at Olkiluoto were observed in 2001 and 2004. The small differences between the campaigns in 2001 and 2004 prove that the concrete pillars have been stable during the measurement period (Ahola *et al.* 2005).

We established and measured the control markers for the pillar GPS12 at Iso Pyrekari in 2005. The height of the pillar is only 0.5 m and because of that, it should be very stable. However, we founded two benchmarks in solid bedrock near the pillar, because pack ice can cause damage for the concrete pillar during hard winter.

We will continue the measurements at the reserve markers in three years intervals. The next measurement will be carried out at Olkiluoto in 2007.

6.2 Control measurements of the pillar GPS4 at Romuvaara

According to deformation results the pillar GPS4 is moving to the east at Romuvaara (Table 4-3). A probable explanation for the movement is the instability of pillar GPS4.

We have measured the distances and angles between the pillar and control markers to ensure the reason of the movement. The observations have been made during the GPS campaigns in 2005 and 2006 (Figure 6-1). The distances between the concrete pillar and control markers were measured using the Distomat Wild DI2002 EDM instrument, S/N 180206. The horizontal and vertical angles were observed with the theodolite Theomat Wild T2002, S/N 346317.

The angles, distances and height differences in the triangle between the pillar GPS4 and the two control benchmarks (A and B) are presented in Table 6-1. The standard errors of unit weight (observed horizontal angle) from least-squares adjustments of six observation sets were 1.6 mgon in 2005 and 1.3 mgon in 2006. The standard uncertainty of 3D-position in the local topocentric system is about 0.3–0.4 mm in both measurements.

From the two measurements we cannot yet make conclusions of possible movements. We will measure the distances and angles between the pillar and control markers during the next years to ensure the reason of the movement.

Table 6-1. The horizontal angles and distances and height differences from tacheometer measurement between the control markers (A,B) and the pillar GPS4 at Romuvaara.

	September 14, 2005	September 21, 2006	Difference
Horizontal angle GPS4–A–B	31.1078 gon	31.1092 gon	+1.4 mgon
Horizontal angle A–B–GPS4	70.7799 gon	70.7711 gon	–8.8 mgon
Horizontal angle B–GPS4–A	98.1123 gon	98.1197 gon	+7.4 mgon
Horizontal distance A–B	10.8597 m	10.8605 m	+0.8 mm
Horizontal distance A–GPS	9.7400 m	9.7401 m	+0.1 mm
Horizontal distance B–GPS	5.1001 m	5.1007 m	+0.6 mm
Height difference from A to B	–0.0139 m	–0.0148 m	–0.7 mm
Height difference from A to GPS	+2.6659 m	+2.6652 m	–0.7 mm
Height difference from B to GPS	+2.6798 m	+2.6801 m	+0.3 mm



Figure 6-1. The distances between pillars and control markers were measured using the Distomat Wild DI2002 EDM instrument. The horizontal and vertical angles were observed with the theodolite Theomat Wild T2002. (Photograph J. Puupponen 2006.)

7. FUTURE PLANS

According to our quality manual (Ahola 2007) and the consultations between Posiva and the FGI we will continue geodetic observations at Olkiluoto, Kivetty and Romuvaara annually. The studies of each year will be reported in Posiva working report series.

The permanent GPS stations continue observations at the investigation areas. The Olkiluoto local GPS network will be measured twice a year. Even if the studies are concentrated at Olkiluoto, one measurement campaign will be carried out at Kivetty and Romuvaara annually. The observations at Kivetty and Romuvaara are important reference investigations for the studies at Olkiluoto.

The EDM baseline GPS7-GPS8 at Olkiluoto will be measured with the mekometer during every GPS campaign to improve the reliability of the GPS results. The mekometer will be calibrated at the Nummela Standard Baseline at least once a year to ensure the quality of the results.

Every GPS station has two control markers. We will determine the distances and the angles between the stations and the control markers in order to check the stability of the concrete pillars at Olkiluoto in three years interval. Next measurements will be carried out in 2007.

The heights of Olkiluoto GPS network have been measured with precise levelling in 2003 and 2005 (Lehmuskoski 2004 and 2006). The levelling is the most accurate method to observe the possible vertical deformations at the investigation area. The levelling campaigns will be performed every second year and results will be published in a separate working report of Posiva. We established two levelling networks at Olkiluoto in 2006 for specific deformation studies. The networks are located above the excavation area of the ONKALO and the repository for low- and medium-level waste (the VLJ repository).

8. SUMMARY

22 GPS observation campaigns have been carried out at Olkiluoto since 1995 and 15 campaigns at Kivetty and Romuvaara since 1996. Two measurements were performed at Olkiluoto in 2006. The networks of Kivetty and Romuvaara were observed once during 2006.

The computation was made with Bernese version 5.0. According to the GPS deformation analysis one third of the baselines at Olkiluoto have statistically significant change rates at the confidence level of 95%. However, all of these change rates are smaller than ± 0.22 mm/a. The change rates have diminished year after year when the time series has grown longer and the determination of the change rates has become more reliable.

There are five stations at Olkiluoto, which have statistically significant horizontal velocities. The local velocity components are small, but taking into account the standard deviations, the largest velocity components seem to be reliable (max. velocity -0.23 mm/a ± 0.023 mm/a).

The GPS networks at Kivetty and Romuvaara are quite stable. At Romuvaara the station GPS4 is moving to the east. A probable explanation for the movement is the instability of the pillar GPS4. We have measured the angles and distances between the pillar and the control markers to ensure the reason of the movement, but from the two measurements we cannot yet make conclusions of possible movements.

Electronic distance measurements were performed at Olkiluoto at the baseline GPS7-GPS8 using the mekometer since 2002. The measurements have been made simultaneously with GPS campaigns to improve the reliability of the GPS results. According to five years period GPS gives us on an average 0.69 mm longer distances between pillars GPS7 and GPS8 than EDM. That is over 1 ppm scale difference. The similarity of the GPS and EDM time series is very interesting, but it is too early to make specific conclusion. The results are promising, but more studies are needed before we can use the EDM results to scale the GPS observations.

ACKNOWLEDGEMENTS

The *Laboratory of Geoinformation and Positioning Technology, Department of Surveying, Helsinki University of Technology* is acknowledged for giving us access to their accurate electronic distance measurement device Kern Mekometer ME5000.

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APPENDICES

Appendix Ia. Results of 22 measurements at Olkiluoto. Deviations of the vector lengths from their mean in millimeters. Unscaled observations.

Vector	Mean length [mm]	Time [a]																				RMS		
		95.3	95.8	96.3	96.8	97.3	97.8	98.3	98.8	99.3	99.8	1.3	1.8	2.3	2.8	3.3	3.8	4.3	4.8	5.3	5.8		6.3	6.8
GPS1-GPS2	1355861.9	2.0	2.1	0.1	0.9	0.2	0.6	-0.4	1.1	-0.4	0.3	-1.0	-0.4	0.8	-0.2	-1.2	-0.3	-1.2	0.1	-1.4	-0.4	-1.4	0.1	±0.9
GPS1-GPS3	1006191.8	-0.6	1.7	-0.1	-0.5	-0.5	-0.4	0.6	-0.3	-0.3	0.3	0.5	1.3	0.8	-1.9	-0.2	0.4	-0.4	0.9	-0.6	-0.3	-0.6	0.4	0.8
GPS1-GPS4	643447.9	-1.5	-1.8	-0.1	-0.2	-0.4	-0.2	0.4	-1.3	-1.0	0.0	0.4	0.2	0.0	2.3	0.8	0.7	0.9	-0.1	0.5	0.3	1.1	-0.1	0.9
GPS1-GPS5	1131621.4	-1.3	2.2	-0.6	0.4	0.2	0.1	-1.2	0.1	-1.2	0.5	-0.2	1.3	-0.8	-0.3	0.1	0.4	-0.4	1.4	-0.9	1.3	-0.7	0.3	0.9
GPS1-GPS6	1264825.1	-1.7	-0.9	0.2	0.3	0.0	-0.5	-0.4	0.3	0.5	-0.3	0.4	0.3	0.7	-0.2	0.5	0.3	0.6	0.3	0.2	0.2	0.4	-0.3	0.5
GPS1-GPS7	1482993.2	-1.0	-1.1	-0.1	-0.1	0.5	-0.1	-0.6	-0.5	0.1	-0.7	0.1	-0.3	0.2	0.1	0.1	0.0	0.9	0.3	0.8	0.3	1.2	0.1	0.6
GPS1-GPS8	1594501.9	-1.4	-1.9	0.3	-0.4	-1.6	-1.1	-0.7	-0.2	-0.2	-0.3	0.2	-0.1	0.6	0.7	0.2	0.4	1.2	0.7	1.0	0.8	1.8	0.7	0.9
GPS1-GPS9	2343595.9	-1.3	-0.8	0.9	-0.2	-0.1	-0.1	-0.6	-0.5	-0.2	-0.4	-0.3	-0.6	0.1	0.0	-0.1	0.2	0.5	0.6	0.3	0.7	1.5	0.5	0.6
GPS2-GPS3	1609847.3	-0.2	2.7	-0.4	-0.4	-0.4	-0.4	1.4	0.2	-1.1	-0.8	0.1	0.4	0.9	-0.8	-1.3	0.1	-0.2	2.0	-0.8	-0.4	-0.7	-0.3	0.9
GPS2-GPS4	1856924.0	-0.3	-0.3	-0.8	0.1	-0.5	0.0	-0.3	-0.6	-1.3	-0.1	-0.3	0.1	1.3	1.8	-0.5	0.3	0.0	0.6	-0.5	0.5	0.0	0.3	0.7
GPS2-GPS5	1477355.0	-0.2	1.3	1.2	1.3	1.1	0.8	-0.3	0.7	-1.0	0.0	-0.8	0.1	0.1	-1.7	-0.2	0.2	-0.9	-0.1	-1.1	0.5	-1.3	0.6	0.9
GPS2-GPS6	2436723.9	0.4	0.5	0.4	0.9	0.4	0.1	-0.7	1.2	0.3	-0.3	-0.4	-0.4	1.3	-0.9	-0.3	-0.2	-0.5	-0.2	-0.9	-0.6	-0.6	0.0	0.6
GPS2-GPS7	2811673.2	0.9	0.8	0.0	0.8	0.6	0.5	-0.9	0.6	-0.3	-0.4	-0.9	-0.6	0.8	0.0	-0.9	-0.2	-0.3	0.2	-0.5	-0.1	0.0	0.3	0.6
GPS2-GPS8	2949496.6	0.4	0.2	0.3	0.5	-1.5	-0.6	-1.2	0.7	-0.5	-0.1	-0.7	-0.5	1.3	0.6	-1.0	0.1	-0.1	0.8	-0.3	0.4	0.5	0.7	0.7
GPS2-GPS9	3649885.2	0.5	1.2	1.0	0.7	0.0	0.5	-1.1	0.5	-0.5	-0.1	-1.3	-0.9	0.8	-0.2	-1.0	0.0	-0.7	0.5	-1.0	0.2	0.2	0.7	0.7
GPS3-GPS4	756324.7	-1.0	-0.1	-1.0	-0.9	-0.8	-0.5	-1.0	-0.6	0.3	0.4	0.4	1.8	2.1	-1.6	-0.1	0.4	-0.2	0.8	-0.1	0.9	-0.3	1.4	0.9
GPS3-GPS5	2094204.2	-2.4	3.4	-0.5	-0.2	-0.2	-0.4	-0.2	-0.3	-1.6	0.4	0.4	2.5	0.0	-2.3	-0.1	0.8	-0.5	2.3	-1.3	1.0	-1.1	0.6	1.4
GPS3-GPS6	2126843.1	-1.8	0.8	-0.1	0.2	-0.7	-0.7	-0.5	0.2	0.3	0.5	0.4	1.6	1.4	-1.8	0.1	0.8	-0.4	0.8	-0.8	0.1	-0.8	0.2	0.9
GPS3-GPS7	2073048.6	-0.1	0.5	0.0	0.0	0.4	0.1	-1.2	-0.2	0.4	0.2	0.2	0.5	1.2	-1.6	-0.4	0.0	-0.2	0.2	-0.3	0.1	-0.1	0.5	0.6
GPS3-GPS8	1924579.4	-1.3	-0.9	0.6	0.1	-1.7	-1.4	-2.0	0.0	0.8	0.6	0.1	0.6	1.4	-0.5	-0.1	0.2	0.0	0.2	0.1	0.7	1.0	1.1	0.9
GPS3-GPS9	2914435.3	-0.5	0.5	1.0	-0.1	-0.2	0.0	-1.0	-0.3	0.2	0.5	-0.1	0.3	0.9	-1.5	-0.6	0.1	-0.7	0.4	-0.9	0.5	0.2	0.8	0.6
GPS4-GPS5	1734652.8	-2.2	0.9	-0.8	0.3	-0.2	-0.1	-0.8	-1.0	-2.2	0.6	0.0	1.4	-1.2	2.1	0.7	0.9	0.2	1.0	-0.7	1.1	0.1	-0.2	1.1
GPS4-GPS6	1418664.0	-1.1	0.1	0.7	1.2	-0.1	-0.1	0.1	0.3	-0.4	0.4	-0.1	0.0	-0.7	1.2	0.5	0.7	0.0	-0.3	-0.6	-0.4	-0.3	-1.2	0.6
GPS4-GPS7	1317484.9	0.9	0.8	1.0	0.9	1.2	0.6	-0.2	0.4	0.1	-0.2	-0.2	-1.2	-0.9	-0.1	-0.3	-0.4	0.0	-0.5	-0.2	-0.8	0.2	-0.9	0.7
GPS4-GPS8	1216239.9	0.0	0.3	1.5	0.7	-0.9	-0.9	-0.7	1.0	0.6	0.0	-0.2	-0.8	-0.5	-0.1	-0.3	-0.2	0.1	0.0	0.2	-0.2	0.9	-0.1	0.6
GPS4-GPS9	2165876.5	0.5	1.0	2.1	0.7	0.6	0.5	0.1	0.5	0.0	0.0	-0.5	-1.3	-1.1	-0.4	-0.5	-0.3	-0.5	-0.2	-0.8	-0.4	0.4	-0.5	0.7

GPS5-GPS6	1284566.1	-0.3	0.4	-1.1	-0.4	-0.1	-0.6	-1.1	0.3	0.4	0.0	0.5	0.6	0.1	0.2	0.4	-0.2	0.5	0.5	-0.1	-0.2	0.7	0.1	0.5
GPS5-GPS7	1894753.4	-1.1	0.8	-1.7	-0.3	-0.5	-0.5	-1.7	-0.4	-0.7	0.2	-0.3	1.1	-0.8	1.3	0.2	0.3	0.3	1.1	0.0	0.7	0.7	0.4	0.8
GPS5-GPS8	2256071.4	-0.8	0.8	-1.5	-0.6	-1.8	-0.7	-1.7	-0.1	-1.5	0.5	-0.2	1.3	-0.4	1.2	0.0	0.6	0.4	1.7	-0.2	1.1	0.5	0.7	1.0
GPS5-GPS9	2571612.0	-0.9	1.1	-0.9	-0.4	-1.0	-0.3	-2.0	-0.4	-0.6	0.4	-0.7	0.5	-0.3	1.2	0.0	0.5	0.2	1.3	-0.2	0.6	1.2	0.6	0.8
GPS6-GPS7	683010.1	-1.1	0.4	-0.6	0.3	-0.9	-0.2	-0.4	-0.3	-0.7	0.5	-0.7	0.9	-0.6	1.6	0.1	1.0	-0.1	0.6	0.1	0.8	-0.1	0.2	0.7
GPS6-GPS8	1157815.5	-0.4	0.1	-0.8	-0.1	-1.6	0.2	-0.3	-0.1	-1.5	0.7	-0.6	0.8	-0.1	1.2	-0.2	1.2	0.1	1.0	-0.2	0.9	-0.7	0.2	0.7
GPS6-GPS9	1290279.9	-0.5	0.9	0.3	0.0	-0.8	0.3	-0.9	-0.7	-1.0	0.4	-1.2	-0.1	-0.5	1.0	-0.4	0.7	-0.3	0.8	-0.1	0.8	0.5	0.6	0.7
GPS7-GPS8	511256.9	1.6	0.3	-0.5	-0.4	0.1	0.8	0.2	0.1	-0.9	0.1	0.1	-0.3	0.4	-0.5	-0.4	-0.1	0.1	0.3	-0.4	-0.1	-0.8	-0.2	0.5
GPS7-GPS9	868575.5	-0.4	0.3	1.0	-0.1	-0.6	0.0	0.1	-0.1	-0.2	0.3	-0.3	-0.2	-0.1	-0.1	-0.2	0.2	-0.5	0.4	-0.5	0.4	0.3	0.4	0.4
GPS8-GPS9	1057914.7	1.3	0.8	0.3	-0.3	1.3	1.5	1.0	-0.1	-0.8	0.0	-0.2	-0.4	-0.6	-0.7	-0.5	-0.3	-0.6	0.1	-1.0	0.0	-0.9	-0.2	0.7
Mean:		0.8	0.5	0.0	0.1	-0.3	-0.1	-0.6	0.0	-0.5	0.1	-0.2	0.3	0.2	0.0	-0.2	0.3	-0.1	0.6	-0.4	0.3	0.1	0.2	
St.dev.:		±0.1	0.1	0.9	0.5	0.8	0.6	0.8	0.6	0.7	0.4	0.5	0.9	0.8	1.2	0.5	0.4	0.5	0.6	0.6	0.5	0.8	0.5	
RMS:		±1.1	1.2	0.8	0.6	0.8	0.6	0.9	0.6	0.8	0.4	0.5	0.9	0.9	1.2	0.5	0.5	0.5	0.8	0.7	0.6	0.8	0.6	±0.8

Appendix Ib. Results of 22 measurements at Oikiluoto. Deviations of the vector lengths from their mean in millimeters. Scaled observations.

Vector	Mean length [mm]	Time [a]																				RMS		
		95.3	95.8	96.3	96.8	97.3	97.8	98.3	98.8	99.3	99.8	1.3	1.8	2.3	2.8	3.3	3.8	4.3	4.8	5.3	5.8		6.3	6.8
GPS1-GPS2	1355861.8	2.4	1.7	0.1	0.8	0.5	0.6	0.1	1.2	0.2	0.2	-0.8	-0.6	0.6	-0.1	-1.0	-0.5	-1.1	-0.4	-1.0	-0.6	-1.3	-0.1	±0.9
GPS1-GPS3	1006191.8	-0.3	1.4	-0.1	-0.5	-0.3	-0.4	0.9	-0.2	0.1	0.2	0.6	1.1	0.7	-1.9	-0.1	0.2	-0.4	0.5	-0.4	-0.5	-0.6	0.3	0.7
GPS1-GPS4	643447.9	-1.3	-2.0	-0.1	-0.2	-0.3	-0.2	0.6	-1.3	-0.8	-0.1	0.5	0.1	-0.1	2.3	0.9	0.6	0.9	-0.3	0.6	0.2	1.1	-0.2	0.9
GPS1-GPS5	1131621.4	-1.0	1.9	-0.6	0.4	0.4	0.1	-0.9	0.2	-0.8	0.4	-0.1	1.1	-1.0	-0.3	0.2	0.2	-0.4	1.0	-0.6	1.1	-0.7	0.1	0.8
GPS1-GPS6	1264825.1	-1.3	-1.3	0.2	0.3	0.3	-0.5	0.0	0.4	0.9	-0.4	0.5	0.0	0.5	-0.2	0.6	0.0	0.6	-0.2	0.5	-0.1	0.4	-0.5	0.6
GPS1-GPS7	1482993.2	-0.5	-1.5	-0.1	-0.2	0.8	0.0	-0.2	-0.4	0.6	-0.8	0.3	-0.6	0.0	0.1	0.2	-0.3	0.9	-0.2	1.1	0.0	1.2	-0.1	0.6
GPS1-GPS8	1594501.9	-0.9	-2.4	0.3	-0.5	-1.3	-1.0	-0.2	-0.1	0.4	-0.5	0.4	-0.4	0.4	0.7	0.4	0.1	1.2	0.1	1.4	0.5	1.8	0.5	0.9
GPS1-GPS9	2343595.9	-0.6	-1.5	1.0	-0.3	0.4	0.0	0.1	-0.4	0.6	-0.6	-0.1	-1.1	-0.2	-0.1	0.1	-0.3	0.6	-0.3	0.8	0.2	1.5	0.2	0.7
GPS2-GPS3	1609847.3	0.4	2.2	-0.4	-0.5	-0.1	-0.3	1.9	0.3	-0.5	-1.0	0.3	0.1	0.7	-0.8	-1.1	-0.3	-0.2	1.4	-0.4	-0.7	-0.7	-0.5	0.8
GPS2-GPS4	1856924.0	0.3	-0.9	-0.7	0.0	-0.1	0.1	0.2	-0.5	-0.6	-0.3	-0.1	-0.3	1.1	1.8	-0.3	-0.1	0.1	-0.1	-0.1	0.1	0.0	0.1	0.6
GPS2-GPS5	1477355.0	0.3	0.9	1.2	1.2	1.4	0.9	0.1	0.8	-0.5	-0.1	-0.6	-0.2	-0.1	-1.7	-0.1	-0.1	-0.9	-0.6	-0.8	0.2	-1.3	0.4	0.8
GPS2-GPS6	2436723.9	1.2	-0.2	0.5	0.8	0.9	0.2	0.0	1.3	1.2	-0.5	-0.1	-0.9	1.0	-1.0	-0.1	-0.7	-0.4	-1.1	-0.4	-1.1	-0.6	-0.3	0.8
GPS2-GPS7	2811673.2	1.8	0.0	0.1	0.7	1.2	0.6	-0.1	0.8	0.7	-0.7	-0.6	-1.2	0.4	-0.1	-0.6	-0.8	-0.2	-0.8	0.1	-0.7	0.0	-0.1	0.7
GPS2-GPS8	2949496.6	1.3	-0.7	0.4	0.4	-0.9	-0.5	-0.3	0.9	0.5	-0.4	-0.4	-1.1	0.9	0.5	-0.7	-0.5	0.0	-0.3	0.4	-0.2	0.5	0.3	0.6
GPS2-GPS9	3649885.2	1.6	0.1	1.1	0.6	0.8	0.6	0.0	0.7	0.8	-0.5	-0.9	-1.7	0.3	-0.3	-0.7	-0.7	-0.6	-0.9	-0.2	-0.6	0.2	0.2	0.8
GPS3-GPS4	756324.7	-0.8	-0.3	-1.0	-0.9	-0.6	-0.5	-0.8	-0.6	0.6	0.3	0.5	1.6	2.0	-1.6	0.0	0.2	-0.2	0.5	0.1	0.7	-0.3	1.3	0.9
GPS3-GPS5	2094204.2	-1.8	2.8	-0.4	-0.3	0.2	-0.3	0.4	-0.2	-0.9	0.2	0.6	2.0	-0.3	-2.4	0.1	0.4	-0.4	1.5	-0.8	0.5	-1.1	0.3	1.1
GPS3-GPS6	2126843.1	-1.1	0.2	0.0	0.1	-0.3	-0.6	0.1	0.3	1.0	0.3	0.6	1.1	1.1	-1.9	0.3	0.4	-0.3	0.0	-0.3	-0.4	-0.8	-0.1	0.7
GPS3-GPS7	2073048.6	0.5	-0.1	0.1	-0.1	0.8	0.2	-0.6	-0.1	1.1	0.0	0.4	0.1	0.9	-1.7	-0.2	-0.4	-0.1	-0.6	0.2	-0.3	-0.1	0.2	0.6
GPS3-GPS8	1924579.4	-0.7	-1.5	0.7	0.0	-1.3	-1.3	-1.4	0.1	1.5	0.4	0.3	0.2	1.1	-0.6	0.1	-0.2	0.1	-0.5	0.5	0.3	1.0	0.8	0.8
GPS3-GPS9	2914435.3	0.4	-0.4	1.1	-0.2	0.4	0.1	-0.1	-0.1	1.2	0.2	0.2	-0.3	0.5	-1.6	-0.3	-0.5	-0.6	-0.7	-0.2	-0.1	0.2	0.4	0.6
GPS4-GPS5	1734652.8	-1.7	0.4	-0.7	0.2	0.2	0.0	-0.3	-0.9	-1.6	0.4	0.2	1.0	-1.4	2.1	0.9	0.5	0.3	0.4	-0.3	0.7	0.1	-0.4	0.9
GPS4-GPS6	1418664.0	-0.7	-0.3	0.7	1.1	0.2	-0.1	0.5	0.4	0.1	0.3	0.0	-0.3	-0.9	1.2	0.6	0.4	0.0	-0.8	-0.3	-0.7	-0.3	-1.4	0.6
GPS4-GPS7	1317484.9	1.3	0.4	1.0	0.9	1.5	0.6	0.2	0.5	0.6	-0.3	-0.1	-1.5	-1.1	-0.1	-0.2	-0.7	0.0	-1.0	0.1	-1.1	0.2	-1.1	0.8
GPS4-GPS8	1216239.9	0.4	-0.1	1.5	0.7	-0.6	-0.9	-0.3	1.1	1.0	-0.1	-0.1	-1.1	-0.7	-0.1	-0.2	-0.4	0.1	-0.4	0.5	-0.5	0.9	-0.3	0.7
GPS4-GPS9	2165876.5	1.2	0.4	2.2	0.6	1.1	0.6	0.7	0.6	0.8	-0.2	-0.3	-1.8	-1.4	-0.5	-0.3	-0.7	-0.4	-1.0	-0.3	-0.9	0.4	-0.8	0.9

GPS5-GPS6	1284566.1	0.1	0.0	-1.1	-0.4	0.2	-0.6	-0.7	0.4	0.9	-0.1	0.6	0.3	-0.1	0.2	0.5	-0.5	0.5	0.0	0.2	-0.5	0.7	-0.1	0.5
GPS5-GPS7	1894753.4	-0.5	0.2	-1.6	-0.4	-0.1	-0.4	-1.1	-0.3	0.0	0.0	-0.1	0.7	-1.1	1.3	0.4	-0.1	0.4	0.4	0.4	0.3	0.7	0.1	0.6
GPS5-GPS8	2256071.4	-0.1	0.1	-1.4	-0.7	-1.3	-0.6	-1.0	0.0	-0.7	0.3	0.0	0.8	-0.7	1.1	0.2	0.1	0.5	0.9	0.3	0.6	0.5	0.4	0.7
GPS5-GPS9	2571612.0	-0.1	0.3	-0.8	-0.5	-0.5	-0.2	-1.2	-0.3	0.3	0.1	-0.4	-0.1	-0.6	1.1	0.2	0.0	0.3	0.3	0.4	0.0	1.2	0.3	0.6
GPS6-GPS7	683010.1	-0.9	0.2	-0.6	0.3	-0.8	-0.2	-0.2	-0.3	-0.5	0.4	-0.6	0.8	-0.7	1.6	0.2	0.9	-0.1	0.3	0.3	0.7	-0.1	0.1	0.6
GPS6-GPS8	1157815.5	0.1	-0.3	-0.8	-0.1	-1.4	0.2	0.1	0.1	-1.1	0.6	-0.5	0.6	-0.3	1.2	-0.1	1.0	0.1	0.6	0.2	0.6	-0.7	-0.1	0.6
GPS6-GPS9	1290279.9	-0.1	0.5	0.3	0.0	-0.5	0.3	-0.5	-0.6	-0.5	0.3	-1.1	-0.4	-0.7	1.0	-0.3	0.4	-0.3	0.3	0.2	0.5	0.5	0.4	0.5
GPS7-GPS8	511256.9	1.8	0.1	-0.5	-0.4	0.2	0.8	0.3	0.1	-0.7	0.1	0.2	-0.4	0.3	-0.5	-0.4	-0.2	0.1	0.1	-0.3	-0.2	-0.8	-0.3	0.6
GPS7-GPS9	868575.5	-0.1	0.0	1.0	-0.1	-0.4	0.0	0.4	-0.1	0.1	0.2	-0.2	-0.4	-0.2	-0.1	-0.1	0.0	-0.5	0.1	-0.3	0.2	0.3	0.3	0.3
GPS8-GPS9	1057914.7	1.6	0.5	0.3	-0.3	1.5	1.5	1.3	0.0	-0.4	-0.1	-0.1	-0.6	-0.7	-0.7	-0.4	-0.5	-0.6	-0.3	-0.8	-0.2	-0.9	-0.3	0.8
Mean:		0.8	0.5	0.1	0.1	0.1	0.0	-0.1	0.1	0.2	-0.1	0.0	-0.1	0.0	-0.1	0.0	-0.1	0.0	-0.1	0.0	-0.1	-0.1	0.0	
St.dev.:		±0.1	0.1	0.9	0.5	0.8	0.6	0.7	0.6	0.8	0.4	0.5	0.9	0.8	1.2	0.5	0.5	0.5	0.7	0.5	0.6	0.8	0.5	
RMS:		±1.1	1.1	0.9	0.5	0.8	0.6	0.7	0.6	0.8	0.4	0.5	0.9	0.8	1.2	0.5	0.5	0.5	0.6	0.5	0.6	0.8	0.5	±0.7

Appendix II. Results of the first measurements at Olkiluoto in 2006.

```
=====
Program : GPSEST                               Bernese GPS Software Version 5.0
Purpose : Parameter estimation
Campaign: ${P}/OLKI06K                         Default session: 1000 year 2006
Date    : 19-Dec-2006 17:03                   User name      : ja
=====
```

OLKI06K

```
1${P}/OLKI06K                                PROGRAM GPSEST   19-DEC-06 17:03
OLKI06K                                       BERNESE GPS SOFTWARE VERSION 5.0
-----
```

TABLE OF CONTENTS

1. CAMPAIGNS
2. OBSERVATION FILES
3. GENERAL OPTIONS
4. STATIONS
5. SATELLITE ORBITS
6. ATMOSPHERE
7. CLOCK PARAMETERS
8. POLE COORDINATES AND TIME INFORMATION
9. ANTENNA PHASE CENTERS
10. CONSTANTS
11. PARAMETER CHARACTERIZATION LIST
12. TEST OUTPUT
13. RESULTS (PART 1)
14. RESULTS (PART 2)

```
1${P}/OLKI06K                                PROGRAM GPSEST   19-DEC-06 17:03
OLKI06K                                       BERNESE GPS SOFTWARE VERSION 5.0
-----
```

INPUT AND OUTPUT FILENAMES

```
-----
Session table          : ${P}/OLKI06K\STA\SESSIONS.SES
```



```

General constants      : ${X}/GEN\CONST.
Geodetic datum        : ${X}/GEN\DATUM.
Station information    : ${P}/OLKI06K\STA\OLKI06K.STA
Earth rotation parameters : ${P}/OLKI06K\ORB\C04_2006.ERP
Subdaily pole model   : ${X}/GEN\IERS2000.SUB
Nutation model        : ${X}/GEN\IAU2000.NUT
Satellite information  : ${X}/GEN\SATELLIT.
Receiver information   : ${X}/GEN\RECEIVER.
Satellite problems    : ${X}/GEN\SAT_2006.CRX
Phase center eccentricities : ${X}/GEN\PHAS_IGS.REL
SINEX general input file : ${X}/GEN\SINEX.
IONEX control file    : ${X}/GEN\IONEX.
Difference GPS-UTC    : ---
A priori station coordinates: ${P}/OLKI06K\STA\OLKI.CRD
GNSS standard orbits  : ${P}/OLKI06K\ORB\OLKI06K.STD
GNSS orbit partials  : ---
Ionosphere models     : ${P}/OLKI06K\ATM\OLKI06K.ION
Troposphere estimates : ---
Station sigma factors : ---
Station eccentricities : ---
Ocean loading tables  : ---
GNSS clock corrections : ---
Differential code biases : ---
Receiver antenna orientation: ---
Kinematic coordinates : ---
Kinematic velocities  : ---
Standard orbit(s)     : ---
Orbit partials        : ---
Attitude data         : ---
Precise orbit(s)      : ---
LEO orbital elements  : ---
Station coordinates   : ${P}/OLKI06K\STA\TOLKI06K.CRD
GNSS orbital elements : ---
Troposphere estimates : ---
Troposphere SINEX     : ---
Ionosphere models     : ---
IONEX                 : ---
Residuals             : ---
Coordinate covariance matrix: ---
Full covariance matrix : ---
Normal equations      : ---
Bernese ERP file      : ---
IERS ERP file         : ---
GNSS clock corrections : ---
Clock RINEX           : ---
Kinematic coordinates : ---
Differential code biases : ---
Phase center variations (gri: ---
Phase center variations (har: ---
Scratch file          : ${U}/WORK\GPSEST.SCR
Scratch files         : ${U}/WORK\GPSEST.SC1
Program output        : ${P}/OLKI06K\OUT\GPSEST.L28
Error message         : ${U}/WORK\ERROR.MSG

```

1\${P}/OLKI06K
OLKI06K

PROGRAM GPSEST 19-DEC-06 17:03
BERNESE GPS SOFTWARE VERSION 5.0

1. CAMPAIGNS

CAMPAIGN NAME	NUM	STATION NAME	NUM	STATION NAME	NUM	STATION NAME	NUM	STATION NAME	NUM	STATION NAME
\${P}/OLKI06K :	1	GPS1	2	GPS2	3	GPS3	4	GPS4	5	GPS5
	6	GPS6	7	GPS7	8	GPS8	9	GPS9	10	GP13

2. OBSERVATION FILES

\${P}/OLKI06K

MAIN CHARACTERISTICS:

FILE	OBSERVATION FILE HEADER	OBSERVATION FILE	SESS	RECEIVER 1	RECEIVER 2
1	\${P}/OLKI06K/OBS/01020990.PSH	\${P}/OLKI06K/OBS/01020990.PSO	0990	ASHTECH Z-XII3	ASHTECH Z-XII3
2	\${P}/OLKI06K/OBS/01021000.PSH	\${P}/OLKI06K/OBS/01021000.PSO	1000	ASHTECH Z-XII3	ASHTECH Z-XII3
3	\${P}/OLKI06K/OBS/01030990.PSH	\${P}/OLKI06K/OBS/01030990.PSO	0990	ASHTECH Z-XII3	ASHTECH Z-XII3
4	\${P}/OLKI06K/OBS/01031000.PSH	\${P}/OLKI06K/OBS/01031000.PSO	1000	ASHTECH Z-XII3	ASHTECH Z-XII3
5	\${P}/OLKI06K/OBS/01040970.PSH	\${P}/OLKI06K/OBS/01040970.PSO	0970	ASHTECH Z-XII3	ASHTECH Z-XII3
6	\${P}/OLKI06K/OBS/01040980.PSH	\${P}/OLKI06K/OBS/01040980.PSO	0980	ASHTECH Z-XII3	ASHTECH Z-XII3
7	\${P}/OLKI06K/OBS/01050970.PSH	\${P}/OLKI06K/OBS/01050970.PSO	0970	ASHTECH Z-XII3	ASHTECH Z-XII3
8	\${P}/OLKI06K/OBS/01050980.PSH	\${P}/OLKI06K/OBS/01050980.PSO	0980	ASHTECH Z-XII3	ASHTECH Z-XII3
9	\${P}/OLKI06K/OBS/01050990.PSH	\${P}/OLKI06K/OBS/01050990.PSO	0990	ASHTECH Z-XII3	ASHTECH Z-XII3
10	\${P}/OLKI06K/OBS/01051000.PSH	\${P}/OLKI06K/OBS/01051000.PSO	1000	ASHTECH Z-XII3	ASHTECH Z-XII3
11	\${P}/OLKI06K/OBS/01060970.PSH	\${P}/OLKI06K/OBS/01060970.PSO	0970	ASHTECH Z-XII3	ASHTECH Z-XII3
12	\${P}/OLKI06K/OBS/01060980.PSH	\${P}/OLKI06K/OBS/01060980.PSO	0980	ASHTECH Z-XII3	ASHTECH Z-XII3
13	\${P}/OLKI06K/OBS/01060990.PSH	\${P}/OLKI06K/OBS/01060990.PSO	0990	ASHTECH Z-XII3	ASHTECH Z-XII3
14	\${P}/OLKI06K/OBS/01061000.PSH	\${P}/OLKI06K/OBS/01061000.PSO	1000	ASHTECH Z-XII3	ASHTECH Z-XII3
15	\${P}/OLKI06K/OBS/01070970.PSH	\${P}/OLKI06K/OBS/01070970.PSO	0970	ASHTECH Z-XII3	ASHTECH Z-XII3
16	\${P}/OLKI06K/OBS/01070980.PSH	\${P}/OLKI06K/OBS/01070980.PSO	0980	ASHTECH Z-XII3	ASHTECH Z-XII3
17	\${P}/OLKI06K/OBS/01080970.PSH	\${P}/OLKI06K/OBS/01080970.PSO	0970	ASHTECH Z-XII3	ASHTECH Z-XII3
18	\${P}/OLKI06K/OBS/01080980.PSH	\${P}/OLKI06K/OBS/01080980.PSO	0980	ASHTECH Z-XII3	ASHTECH Z-XII3
19	\${P}/OLKI06K/OBS/01080990.PSH	\${P}/OLKI06K/OBS/01080990.PSO	0990	ASHTECH Z-XII3	ASHTECH Z-XII3
20	\${P}/OLKI06K/OBS/01081000.PSH	\${P}/OLKI06K/OBS/01081000.PSO	1000	ASHTECH Z-XII3	ASHTECH Z-XII3

21	#{P}/OLKI06K/OBS/06090970.PSH	#{P}/OLKI06K/OBS/06090970.PSO	0970	ASHTECH Z-XII3	ASHTECH Z-XII3
22	#{P}/OLKI06K/OBS/06090980.PSH	#{P}/OLKI06K/OBS/06090980.PSO	0980	ASHTECH Z-XII3	ASHTECH Z-XII3
23	#{P}/OLKI06K/OBS/06090990.PSH	#{P}/OLKI06K/OBS/06090990.PSO	0990	ASHTECH Z-XII3	ASHTECH Z-XII3
24	#{P}/OLKI06K/OBS/06091000.PSH	#{P}/OLKI06K/OBS/06091000.PSO	1000	ASHTECH Z-XII3	ASHTECH Z-XII3
25	#{P}/OLKI06K/OBS/06130970.PSH	#{P}/OLKI06K/OBS/06130970.PSO	0970	ASHTECH Z-XII3	ASHTECH Z-XII3
26	#{P}/OLKI06K/OBS/06130980.PSH	#{P}/OLKI06K/OBS/06130980.PSO	0980	ASHTECH Z-XII3	ASHTECH Z-XII3
27	#{P}/OLKI06K/OBS/06130990.PSH	#{P}/OLKI06K/OBS/06130990.PSO	0990	ASHTECH Z-XII3	ASHTECH Z-XII3
28	#{P}/OLKI06K/OBS/06131000.PSH	#{P}/OLKI06K/OBS/06131000.PSO	1000	ASHTECH Z-XII3	ASHTECH Z-XII3

FILE	TYP	FREQ.	STATION 1	STATION 2	SESS	FIRST	OBSERV.TIME	#EPO	DT	#EF	#CLK	ARC	#SAT	AMB. I. + S.			#CLUSTERS				RM
														W	12	#AMB	L1	L2	L5		
1	P	L1,L2	GPS1	GPS2	0990	6-04-09	6:53:00	2054	30	0	E E	1	28	N	Y	Y	53	17	17	53	0
2	P	L1,L2	GPS1	GPS2	1000	6-04-10	0:00:30	1520	30	0	E E	1	29	N	Y	Y	44	14	14	44	0
3	P	L1,L2	GPS1	GPS3	0990	6-04-09	7:25:00	1990	30	0	E E	1	29	N	Y	Y	56	20	20	56	0
4	P	L1,L2	GPS1	GPS3	1000	6-04-10	0:00:30	1469	30	0	E E	1	29	N	Y	Y	43	14	14	43	0
5	P	L1,L2	GPS1	GPS4	0970	6-04-07	7:31:30	1977	30	0	E E	1	28	N	Y	Y	60	24	24	60	0
6	P	L1,L2	GPS1	GPS4	0980	6-04-08	0:00:30	1538	30	0	E E	1	29	N	Y	Y	49	18	18	49	0
7	P	L1,L2	GPS1	GPS5	0970	6-04-07	6:15:00	2130	30	0	E E	1	28	N	Y	Y	58	19	19	58	0
8	P	L1,L2	GPS1	GPS5	0980	6-04-08	0:00:30	1331	30	0	E E	1	29	N	Y	Y	42	16	16	42	0
9	P	L1,L2	GPS1	GPS5	0990	6-04-09	9:18:30	1763	30	0	E E	1	28	N	Y	Y	40	10	10	40	0
10	P	L1,L2	GPS1	GPS5	1000	6-04-10	0:00:30	1154	30	0	E E	1	29	N	Y	Y	37	12	12	37	0
11	P	L1,L2	GPS1	GPS6	0970	6-04-07	6:58:30	2043	30	0	E E	1	28	N	Y	Y	60	24	24	60	0
12	P	L1,L2	GPS1	GPS6	0980	6-04-08	0:00:30	1515	30	0	E E	1	29	N	Y	Y	40	11	11	40	0
13	P	L1,L2	GPS1	GPS6	0990	6-04-09	8:49:00	1822	30	0	E E	1	29	N	Y	Y	49	18	18	49	0
14	P	L1,L2	GPS1	GPS6	1000	6-04-10	0:00:30	1375	30	0	E E	1	29	N	Y	Y	40	13	13	40	0
15	P	L1,L2	GPS1	GPS7	0970	6-04-07	8:10:00	1900	30	0	E E	1	28	N	Y	Y	51	19	19	51	0
16	P	L1,L2	GPS1	GPS7	0980	6-04-08	0:00:30	1498	30	0	E E	1	29	N	Y	Y	42	13	13	42	0
17	P	L1,L2	GPS1	GPS8	0970	6-04-07	7:50:00	1940	30	0	E E	1	28	N	Y	Y	69	31	31	69	0
18	P	L1,L2	GPS1	GPS8	0980	6-04-08	0:00:30	1405	30	0	E E	1	29	N	Y	Y	47	18	18	47	0
19	P	L1,L2	GPS1	GPS8	0990	6-04-09	7:53:30	1933	30	0	E E	1	29	N	Y	Y	63	23	23	63	0
20	P	L1,L2	GPS1	GPS8	1000	6-04-10	0:00:30	1414	30	0	E E	1	29	N	Y	Y	42	14	14	42	0
21	P	L1,L2	GPS6	GPS9	0970	6-04-07	8:30:00	1860	30	0	E E	1	29	N	Y	Y	51	18	18	51	0
22	P	L1,L2	GPS6	GPS9	0980	6-04-08	0:00:30	1443	30	0	E E	1	29	N	Y	Y	38	11	11	38	0
23	P	L1,L2	GPS6	GPS9	0990	6-04-09	8:49:00	1822	30	0	E E	1	29	N	Y	Y	48	17	17	48	0
24	P	L1,L2	GPS6	GPS9	1000	6-04-10	0:00:30	1343	30	0	E E	1	29	N	Y	Y	36	10	10	36	0
25	P	L1,L2	GPS6	GP13	0970	6-04-07	8:55:00	1810	30	0	E E	1	28	N	Y	Y	54	22	22	54	0
26	P	L1,L2	GPS6	GP13	0980	6-04-08	0:00:30	1477	30	0	E E	1	29	N	Y	Y	41	13	13	41	0
27	P	L1,L2	GPS6	GP13	0990	6-04-09	8:49:00	1822	30	0	E E	1	29	N	Y	Y	48	17	17	48	0
28	P	L1,L2	GPS6	GP13	1000	6-04-10	0:00:30	1298	30	0	E E	1	29	N	Y	Y	39	14	14	39	0

SATELLITES:

FILE	#SAT	SATELLITES																													
1	28	1	2	3	4	5	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
2	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
3	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
4	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	

5	28	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
6	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
7	28	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
8	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
9	28	1	2	3	4	5	6	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
10	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
11	28	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
12	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
13	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
14	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
15	28	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
16	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
17	28	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
18	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
19	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
20	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
21	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
22	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
23	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
24	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
25	28	1	2	3	4	5	6	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
26	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
27	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
28	29	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

OBSERVATION SELECTION:

SAMPLING RATE : 30 SEC
 ELEVATION CUT-OFF ANGLE : 20 DEGREES
 SATELLITE SYSTEM : GPS
 SPECIAL DATA SELECTION : NO

1\${P}/OLKI06K
 OLKI06K

PROGRAM GPSEST 19-DEC-06 17:03
 BERNESE GPS SOFTWARE VERSION 5.0

3. GENERAL OPTIONS

TIDAL CORRECTION OF STATION COORDINATES : IERS CONVENTIONS 2000

A PRIORI SIGMA OF UNIT WEIGHT:

A PRIORI SIGMA OF UNIT WEIGHT : 0.001 M (SIGMA OF ONE-WAY L1 PHASE OBSERVABLE AT ZENITH)

MODEL FOR ELEVATION-DEPENDENT WEIGHTING : 1/COS(Z)

CORRELATIONS AND SESSIONS:

STRATEGY : CORRELATIONS CORRECTLY MODELLED
 TIME INTERVAL : 0.10000 SEC (TO IDENTIFY EPOCH)

SESS #FILE FILE NUMBERS

0990 7 1 3 9 13 19 23 27
 1000 7 2 4 10 14 20 24 28
 0970 7 5 7 11 15 17 21 25
 0980 7 6 8 12 16 18 22 26

AMBIGUITY RESOLUTION STRATEGY:

AMBIGUITIES PRE-ELIMINATED EVERY 30 SECONDS

SYNCHRONIZATION ERRORS:

STRATEGY : SYNCHRONIZATION ERRORS NOT APPLIED

4. STATIONS

Local geodetic datum: \${X}/GEN/DATUM.

Datum name	Ell. param./ Scale	Shifts to WGS-84	Rotations to WGS-84
WGS - 84	A = 6378137.000 m 1/F= 298.2572236 SC = 0.00000D+00	DX = 0.0000 m DY = 0.0000 m DZ = 0.0000 m	RX = 0.00000 arcsec RY = 0.00000 arcsec RZ = 0.00000 arcsec

A priori station coordinates: \${P}/OLKI06K\STA\OLKI.CRD

A priori station coordinates WGS-84 A priori station coordinates Ellipsoidal in local geodetic datum

num	Station name	obs e/f/h	X (m)	Y (m)	Z (m)	Latitude	Longitude	Height (m)
1	GPS1	Y ESTIM	2863210.1067	1126271.4390	5568267.2990	61 14 22.754183	21 28 21.633926	30.5520
2	GPS2	Y ESTIM	2863312.4876	1127586.4513	5567953.2561	61 14 1.535088	21 29 41.145601	32.8443
3	GPS3	Y ESTIM	2862323.4428	1126533.7706	5568664.0772	61 14 49.568852	21 28 59.767954	27.6613
4	GPS4	Y ESTIM	2862758.9415	1125923.2376	5568566.0154	61 14 42.897724	21 28 10.980705	29.1133
5	GPS5	Y ESTIM	2864192.3764	1126421.6871	5567725.8796	61 13 46.892454	21 28 6.906786	22.2982
6	GPS6	Y ESTIM	2863910.3892	1125229.5963	5568112.5408	61 14 12.686451	21 26 59.459035	25.0654

7	GPS7	Y	ESTIM	2863465.8530	1124819.7828	5568430.2557	61 14 33.586772	21 26 44.784815	32.4126
8	GPS8	Y	ESTIM	2863019.7046	1124739.5538	5568666.6848	61 14 49.853077	21 26 50.715669	25.8084
9	GPS9	Y	ESTIM	2863742.0387	1123996.6145	5568453.4720	61 14 35.187574	21 25 46.644762	31.7025
10	GP13	Y	ESTIM	2864309.0028	1124134.0361	5568134.1930	61 14 13.855835	21 25 41.334054	29.8962

A priori sigma:

Station coordinates a priori sigma
in local geodetic datum

num	Station name	N (m)	E (m)	U (m)
1	GPS1	0.00001	0.00001	0.00001

1\${P}/OLKI06K
OLKI06K

PROGRAM GPSEST 19-DEC-06 17:03
BERNESE GPS SOFTWARE VERSION 5.0

5. SATELLITE ORBITS

ARC CHARACTERISTICS:

ARC	START OF ARC	END OF ARC	SOURCE	#SAT	SATELLITES																		
1	06-04-07 00:00:00	06-04-11 00:00:00	PR2006.100	29	1	2	3	4	5	6	8	9	10	11	13	14	15	16	17	18	19	20	
					21	22	23	24	25	26	27	28	29	30	57								

OSCULATING ELEMENTS: \${P}/OLKI06K\ORB\OLKI06K.STD

REFERENCE SYSTEM: J2000.0
REFERENCE EPOCH : 53832.2604167 MJD (2006 4 7 6 15 0.00)

SAT	S.MAJ.AXIS	ECCENTRIC.	INCLINAT.	NODE	PERIGEE	M. ANOMALY	PER.PASS.TIME
1	26559604.4	0.00621068	56.596203	27.139040	-97.741834	-24.973108	53832.2950026
2	26562008.3	0.00920642	54.434744	-95.183962	115.916164	57.138104	53832.1812738
3	26560357.7	0.00794262	53.089098	-160.272512	38.057584	9.486055	53832.2472786
4	26560527.5	0.00733544	54.408029	-94.051312	8.495855	-169.050069	53832.4945510
5	26559348.0	0.00687075	53.752333	140.257801	-300.615973	176.780983	53832.0155913
6	26559926.8	0.00607857	53.518001	-156.943081	254.341086	-108.590536	53832.4108095
8	26560322.2	0.00946433	55.734305	87.248152	151.624724	-109.070471	53832.4114775
9	26559148.5	0.01770449	55.020122	82.735932	70.318585	-127.255930	53832.4366524

SITE-SPECIFIC TROPOSPHERE PARAMETERS

Mapping function used for delay estimation: $1/\cos(\text{zenith-distance})$
 Troposphere gradient estimation : No

Par	Station name	Reference epoch	sig_n (m)	sig_e (m)	sig_u (m)	abs/rel
1	GPS2	2006 04 07 06 00 00			0.00000	abs
2	GPS2	2006 04 07 08 00 00			0.00000	rel
3	GPS2	2006 04 07 10 00 00			0.00000	rel
4	GPS2	2006 04 07 12 00 00			0.00000	rel
5	GPS2	2006 04 07 14 00 00			0.00000	rel
6	GPS2	2006 04 07 16 00 00			0.00000	rel
7	GPS2	2006 04 07 18 00 00			0.00000	rel
8	GPS2	2006 04 07 20 00 00			0.00000	rel
9	GPS2	2006 04 07 22 00 00			0.00000	rel
10	GPS2	2006 04 08 00 00 00			0.00000	rel
11	GPS2	2006 04 08 02 00 00			0.00000	rel
12	GPS2	2006 04 08 04 00 00			0.00000	rel
13	GPS2	2006 04 08 06 00 00			0.00000	rel
14	GPS2	2006 04 08 08 00 00			0.00000	rel
15	GPS2	2006 04 08 10 00 00			0.00000	rel
16	GPS2	2006 04 08 12 00 00			0.00000	rel
17	GPS2	2006 04 08 14 00 00			0.00000	rel
18	GPS2	2006 04 08 16 00 00			0.00000	rel
19	GPS2	2006 04 08 18 00 00			0.00000	rel
20	GPS2	2006 04 08 20 00 00			0.00000	rel
21	GPS2	2006 04 08 22 00 00			0.00000	rel
22	GPS2	2006 04 09 00 00 00			0.00000	rel
23	GPS2	2006 04 09 02 00 00			0.00000	rel
24	GPS2	2006 04 09 04 00 00			0.00000	rel
25	GPS2	2006 04 09 06 00 00			0.00000	rel
26	GPS2	2006 04 09 08 00 00			0.00000	rel
27	GPS2	2006 04 09 10 00 00			0.00000	rel
28	GPS2	2006 04 09 12 00 00			0.00000	rel
29	GPS2	2006 04 09 14 00 00			0.00000	rel
30	GPS2	2006 04 09 16 00 00			0.00000	rel
31	GPS2	2006 04 09 18 00 00			0.00000	rel
32	GPS2	2006 04 09 20 00 00			0.00000	rel
33	GPS2	2006 04 09 22 00 00			0.00000	rel
34	GPS2	2006 04 10 00 00 00			0.00000	rel
35	GPS2	2006 04 10 02 00 00			0.00000	rel
36	GPS2	2006 04 10 04 00 00			0.00000	rel
37	GPS2	2006 04 10 06 00 00			0.00000	rel
38	GPS2	2006 04 10 08 00 00			0.00000	rel
39	GPS2	2006 04 10 10 00 00			0.00000	rel
40	GPS2	2006 04 10 12 00 00			0.00000	rel
41	GPS2	2006 04 10 14 00 00			0.00000	rel
42	GPS3	2006 04 07 06 00 00			0.00000	abs
43	GPS3	2006 04 07 08 00 00			0.00000	rel
44	GPS3	2006 04 07 10 00 00			0.00000	rel

45	GPS3	2006 04 07 12 00 00	0.00000	rel
46	GPS3	2006 04 07 14 00 00	0.00000	rel
47	GPS3	2006 04 07 16 00 00	0.00000	rel
48	GPS3	2006 04 07 18 00 00	0.00000	rel
49	GPS3	2006 04 07 20 00 00	0.00000	rel
50	GPS3	2006 04 07 22 00 00	0.00000	rel
51	GPS3	2006 04 08 00 00 00	0.00000	rel
52	GPS3	2006 04 08 02 00 00	0.00000	rel
53	GPS3	2006 04 08 04 00 00	0.00000	rel
54	GPS3	2006 04 08 06 00 00	0.00000	rel
55	GPS3	2006 04 08 08 00 00	0.00000	rel
56	GPS3	2006 04 08 10 00 00	0.00000	rel
57	GPS3	2006 04 08 12 00 00	0.00000	rel
58	GPS3	2006 04 08 14 00 00	0.00000	rel
59	GPS3	2006 04 08 16 00 00	0.00000	rel
60	GPS3	2006 04 08 18 00 00	0.00000	rel
61	GPS3	2006 04 08 20 00 00	0.00000	rel
62	GPS3	2006 04 08 22 00 00	0.00000	rel
63	GPS3	2006 04 09 00 00 00	0.00000	rel
64	GPS3	2006 04 09 02 00 00	0.00000	rel
65	GPS3	2006 04 09 04 00 00	0.00000	rel
66	GPS3	2006 04 09 06 00 00	0.00000	rel
67	GPS3	2006 04 09 08 00 00	0.00000	rel
68	GPS3	2006 04 09 10 00 00	0.00000	rel
69	GPS3	2006 04 09 12 00 00	0.00000	rel
70	GPS3	2006 04 09 14 00 00	0.00000	rel
71	GPS3	2006 04 09 16 00 00	0.00000	rel
72	GPS3	2006 04 09 18 00 00	0.00000	rel
73	GPS3	2006 04 09 20 00 00	0.00000	rel
74	GPS3	2006 04 09 22 00 00	0.00000	rel
75	GPS3	2006 04 10 00 00 00	0.00000	rel
76	GPS3	2006 04 10 02 00 00	0.00000	rel
77	GPS3	2006 04 10 04 00 00	0.00000	rel
78	GPS3	2006 04 10 06 00 00	0.00000	rel
79	GPS3	2006 04 10 08 00 00	0.00000	rel
80	GPS3	2006 04 10 10 00 00	0.00000	rel
81	GPS3	2006 04 10 12 00 00	0.00000	rel
82	GPS3	2006 04 10 14 00 00	0.00000	rel
83	GPS4	2006 04 07 06 00 00	0.00000	abs
84	GPS4	2006 04 07 08 00 00	0.00000	rel
85	GPS4	2006 04 07 10 00 00	0.00000	rel
86	GPS4	2006 04 07 12 00 00	0.00000	rel
87	GPS4	2006 04 07 14 00 00	0.00000	rel
88	GPS4	2006 04 07 16 00 00	0.00000	rel
89	GPS4	2006 04 07 18 00 00	0.00000	rel
90	GPS4	2006 04 07 20 00 00	0.00000	rel
91	GPS4	2006 04 07 22 00 00	0.00000	rel
92	GPS4	2006 04 08 00 00 00	0.00000	rel
93	GPS4	2006 04 08 02 00 00	0.00000	rel
94	GPS4	2006 04 08 04 00 00	0.00000	rel
95	GPS4	2006 04 08 06 00 00	0.00000	rel
96	GPS4	2006 04 08 08 00 00	0.00000	rel
97	GPS4	2006 04 08 10 00 00	0.00000	rel

98	GPS4	2006 04 08 12 00 00	0.00000	rel
99	GPS4	2006 04 08 14 00 00	0.00000	rel
100	GPS4	2006 04 08 16 00 00	0.00000	rel
101	GPS4	2006 04 08 18 00 00	0.00000	rel
102	GPS4	2006 04 08 20 00 00	0.00000	rel
103	GPS4	2006 04 08 22 00 00	0.00000	rel
104	GPS4	2006 04 09 00 00 00	0.00000	rel
105	GPS4	2006 04 09 02 00 00	0.00000	rel
106	GPS4	2006 04 09 04 00 00	0.00000	rel
107	GPS4	2006 04 09 06 00 00	0.00000	rel
108	GPS4	2006 04 09 08 00 00	0.00000	rel
109	GPS4	2006 04 09 10 00 00	0.00000	rel
110	GPS4	2006 04 09 12 00 00	0.00000	rel
111	GPS4	2006 04 09 14 00 00	0.00000	rel
112	GPS4	2006 04 09 16 00 00	0.00000	rel
113	GPS4	2006 04 09 18 00 00	0.00000	rel
114	GPS4	2006 04 09 20 00 00	0.00000	rel
115	GPS4	2006 04 09 22 00 00	0.00000	rel
116	GPS4	2006 04 10 00 00 00	0.00000	rel
117	GPS4	2006 04 10 02 00 00	0.00000	rel
118	GPS4	2006 04 10 04 00 00	0.00000	rel
119	GPS4	2006 04 10 06 00 00	0.00000	rel
120	GPS4	2006 04 10 08 00 00	0.00000	rel
121	GPS4	2006 04 10 10 00 00	0.00000	rel
122	GPS4	2006 04 10 12 00 00	0.00000	rel
123	GPS4	2006 04 10 14 00 00	0.00000	rel
124	GPS5	2006 04 07 06 00 00	0.00000	abs
125	GPS5	2006 04 07 08 00 00	0.00000	rel
126	GPS5	2006 04 07 10 00 00	0.00000	rel
127	GPS5	2006 04 07 12 00 00	0.00000	rel
128	GPS5	2006 04 07 14 00 00	0.00000	rel
129	GPS5	2006 04 07 16 00 00	0.00000	rel
130	GPS5	2006 04 07 18 00 00	0.00000	rel
131	GPS5	2006 04 07 20 00 00	0.00000	rel
132	GPS5	2006 04 07 22 00 00	0.00000	rel
133	GPS5	2006 04 08 00 00 00	0.00000	rel
134	GPS5	2006 04 08 02 00 00	0.00000	rel
135	GPS5	2006 04 08 04 00 00	0.00000	rel
136	GPS5	2006 04 08 06 00 00	0.00000	rel
137	GPS5	2006 04 08 08 00 00	0.00000	rel
138	GPS5	2006 04 08 10 00 00	0.00000	rel
139	GPS5	2006 04 08 12 00 00	0.00000	rel
140	GPS5	2006 04 08 14 00 00	0.00000	rel
141	GPS5	2006 04 08 16 00 00	0.00000	rel
142	GPS5	2006 04 08 18 00 00	0.00000	rel
143	GPS5	2006 04 08 20 00 00	0.00000	rel
144	GPS5	2006 04 08 22 00 00	0.00000	rel
145	GPS5	2006 04 09 00 00 00	0.00000	rel
146	GPS5	2006 04 09 02 00 00	0.00000	rel
147	GPS5	2006 04 09 04 00 00	0.00000	rel
148	GPS5	2006 04 09 06 00 00	0.00000	rel
149	GPS5	2006 04 09 08 00 00	0.00000	rel
150	GPS5	2006 04 09 10 00 00	0.00000	rel

151	GPS5	2006 04 09 12 00 00	0.00000	rel
152	GPS5	2006 04 09 14 00 00	0.00000	rel
153	GPS5	2006 04 09 16 00 00	0.00000	rel
154	GPS5	2006 04 09 18 00 00	0.00000	rel
155	GPS5	2006 04 09 20 00 00	0.00000	rel
156	GPS5	2006 04 09 22 00 00	0.00000	rel
157	GPS5	2006 04 10 00 00 00	0.00000	rel
158	GPS5	2006 04 10 02 00 00	0.00000	rel
159	GPS5	2006 04 10 04 00 00	0.00000	rel
160	GPS5	2006 04 10 06 00 00	0.00000	rel
161	GPS5	2006 04 10 08 00 00	0.00000	rel
162	GPS5	2006 04 10 10 00 00	0.00000	rel
163	GPS5	2006 04 10 12 00 00	0.00000	rel
164	GPS5	2006 04 10 14 00 00	0.00000	rel
165	GPS6	2006 04 07 06 00 00	0.00000	abs
166	GPS6	2006 04 07 08 00 00	0.00000	rel
167	GPS6	2006 04 07 10 00 00	0.00000	rel
168	GPS6	2006 04 07 12 00 00	0.00000	rel
169	GPS6	2006 04 07 14 00 00	0.00000	rel
170	GPS6	2006 04 07 16 00 00	0.00000	rel
171	GPS6	2006 04 07 18 00 00	0.00000	rel
172	GPS6	2006 04 07 20 00 00	0.00000	rel
173	GPS6	2006 04 07 22 00 00	0.00000	rel
174	GPS6	2006 04 08 00 00 00	0.00000	rel
175	GPS6	2006 04 08 02 00 00	0.00000	rel
176	GPS6	2006 04 08 04 00 00	0.00000	rel
177	GPS6	2006 04 08 06 00 00	0.00000	rel
178	GPS6	2006 04 08 08 00 00	0.00000	rel
179	GPS6	2006 04 08 10 00 00	0.00000	rel
180	GPS6	2006 04 08 12 00 00	0.00000	rel
181	GPS6	2006 04 08 14 00 00	0.00000	rel
182	GPS6	2006 04 08 16 00 00	0.00000	rel
183	GPS6	2006 04 08 18 00 00	0.00000	rel
184	GPS6	2006 04 08 20 00 00	0.00000	rel
185	GPS6	2006 04 08 22 00 00	0.00000	rel
186	GPS6	2006 04 09 00 00 00	0.00000	rel
187	GPS6	2006 04 09 02 00 00	0.00000	rel
188	GPS6	2006 04 09 04 00 00	0.00000	rel
189	GPS6	2006 04 09 06 00 00	0.00000	rel
190	GPS6	2006 04 09 08 00 00	0.00000	rel
191	GPS6	2006 04 09 10 00 00	0.00000	rel
192	GPS6	2006 04 09 12 00 00	0.00000	rel
193	GPS6	2006 04 09 14 00 00	0.00000	rel
194	GPS6	2006 04 09 16 00 00	0.00000	rel
195	GPS6	2006 04 09 18 00 00	0.00000	rel
196	GPS6	2006 04 09 20 00 00	0.00000	rel
197	GPS6	2006 04 09 22 00 00	0.00000	rel
198	GPS6	2006 04 10 00 00 00	0.00000	rel
199	GPS6	2006 04 10 02 00 00	0.00000	rel
200	GPS6	2006 04 10 04 00 00	0.00000	rel
201	GPS6	2006 04 10 06 00 00	0.00000	rel
202	GPS6	2006 04 10 08 00 00	0.00000	rel
203	GPS6	2006 04 10 10 00 00	0.00000	rel

204	GPS6	2006 04 10 12 00 00	0.00000	rel
205	GPS6	2006 04 10 14 00 00	0.00000	rel
206	GPS7	2006 04 07 06 00 00	0.00000	abs
207	GPS7	2006 04 07 08 00 00	0.00000	rel
208	GPS7	2006 04 07 10 00 00	0.00000	rel
209	GPS7	2006 04 07 12 00 00	0.00000	rel
210	GPS7	2006 04 07 14 00 00	0.00000	rel
211	GPS7	2006 04 07 16 00 00	0.00000	rel
212	GPS7	2006 04 07 18 00 00	0.00000	rel
213	GPS7	2006 04 07 20 00 00	0.00000	rel
214	GPS7	2006 04 07 22 00 00	0.00000	rel
215	GPS7	2006 04 08 00 00 00	0.00000	rel
216	GPS7	2006 04 08 02 00 00	0.00000	rel
217	GPS7	2006 04 08 04 00 00	0.00000	rel
218	GPS7	2006 04 08 06 00 00	0.00000	rel
219	GPS7	2006 04 08 08 00 00	0.00000	rel
220	GPS7	2006 04 08 10 00 00	0.00000	rel
221	GPS7	2006 04 08 12 00 00	0.00000	rel
222	GPS7	2006 04 08 14 00 00	0.00000	rel
223	GPS7	2006 04 08 16 00 00	0.00000	rel
224	GPS7	2006 04 08 18 00 00	0.00000	rel
225	GPS7	2006 04 08 20 00 00	0.00000	rel
226	GPS7	2006 04 08 22 00 00	0.00000	rel
227	GPS7	2006 04 09 00 00 00	0.00000	rel
228	GPS7	2006 04 09 02 00 00	0.00000	rel
229	GPS7	2006 04 09 04 00 00	0.00000	rel
230	GPS7	2006 04 09 06 00 00	0.00000	rel
231	GPS7	2006 04 09 08 00 00	0.00000	rel
232	GPS7	2006 04 09 10 00 00	0.00000	rel
233	GPS7	2006 04 09 12 00 00	0.00000	rel
234	GPS7	2006 04 09 14 00 00	0.00000	rel
235	GPS7	2006 04 09 16 00 00	0.00000	rel
236	GPS7	2006 04 09 18 00 00	0.00000	rel
237	GPS7	2006 04 09 20 00 00	0.00000	rel
238	GPS7	2006 04 09 22 00 00	0.00000	rel
239	GPS7	2006 04 10 00 00 00	0.00000	rel
240	GPS7	2006 04 10 02 00 00	0.00000	rel
241	GPS7	2006 04 10 04 00 00	0.00000	rel
242	GPS7	2006 04 10 06 00 00	0.00000	rel
243	GPS7	2006 04 10 08 00 00	0.00000	rel
244	GPS7	2006 04 10 10 00 00	0.00000	rel
245	GPS7	2006 04 10 12 00 00	0.00000	rel
246	GPS7	2006 04 10 14 00 00	0.00000	rel
247	GPS8	2006 04 07 06 00 00	0.00000	abs
248	GPS8	2006 04 07 08 00 00	0.00000	rel
249	GPS8	2006 04 07 10 00 00	0.00000	rel
250	GPS8	2006 04 07 12 00 00	0.00000	rel
251	GPS8	2006 04 07 14 00 00	0.00000	rel
252	GPS8	2006 04 07 16 00 00	0.00000	rel
253	GPS8	2006 04 07 18 00 00	0.00000	rel
254	GPS8	2006 04 07 20 00 00	0.00000	rel
255	GPS8	2006 04 07 22 00 00	0.00000	rel
256	GPS8	2006 04 08 00 00 00	0.00000	rel

257	GPS8	2006 04 08 02 00 00	0.00000	rel
258	GPS8	2006 04 08 04 00 00	0.00000	rel
259	GPS8	2006 04 08 06 00 00	0.00000	rel
260	GPS8	2006 04 08 08 00 00	0.00000	rel
261	GPS8	2006 04 08 10 00 00	0.00000	rel
262	GPS8	2006 04 08 12 00 00	0.00000	rel
263	GPS8	2006 04 08 14 00 00	0.00000	rel
264	GPS8	2006 04 08 16 00 00	0.00000	rel
265	GPS8	2006 04 08 18 00 00	0.00000	rel
266	GPS8	2006 04 08 20 00 00	0.00000	rel
267	GPS8	2006 04 08 22 00 00	0.00000	rel
268	GPS8	2006 04 09 00 00 00	0.00000	rel
269	GPS8	2006 04 09 02 00 00	0.00000	rel
270	GPS8	2006 04 09 04 00 00	0.00000	rel
271	GPS8	2006 04 09 06 00 00	0.00000	rel
272	GPS8	2006 04 09 08 00 00	0.00000	rel
273	GPS8	2006 04 09 10 00 00	0.00000	rel
274	GPS8	2006 04 09 12 00 00	0.00000	rel
275	GPS8	2006 04 09 14 00 00	0.00000	rel
276	GPS8	2006 04 09 16 00 00	0.00000	rel
277	GPS8	2006 04 09 18 00 00	0.00000	rel
278	GPS8	2006 04 09 20 00 00	0.00000	rel
279	GPS8	2006 04 09 22 00 00	0.00000	rel
280	GPS8	2006 04 10 00 00 00	0.00000	rel
281	GPS8	2006 04 10 02 00 00	0.00000	rel
282	GPS8	2006 04 10 04 00 00	0.00000	rel
283	GPS8	2006 04 10 06 00 00	0.00000	rel
284	GPS8	2006 04 10 08 00 00	0.00000	rel
285	GPS8	2006 04 10 10 00 00	0.00000	rel
286	GPS8	2006 04 10 12 00 00	0.00000	rel
287	GPS8	2006 04 10 14 00 00	0.00000	rel
288	GPS9	2006 04 07 06 00 00	0.00000	abs
289	GPS9	2006 04 07 08 00 00	0.00000	rel
290	GPS9	2006 04 07 10 00 00	0.00000	rel
291	GPS9	2006 04 07 12 00 00	0.00000	rel
292	GPS9	2006 04 07 14 00 00	0.00000	rel
293	GPS9	2006 04 07 16 00 00	0.00000	rel
294	GPS9	2006 04 07 18 00 00	0.00000	rel
295	GPS9	2006 04 07 20 00 00	0.00000	rel
296	GPS9	2006 04 07 22 00 00	0.00000	rel
297	GPS9	2006 04 08 00 00 00	0.00000	rel
298	GPS9	2006 04 08 02 00 00	0.00000	rel
299	GPS9	2006 04 08 04 00 00	0.00000	rel
300	GPS9	2006 04 08 06 00 00	0.00000	rel
301	GPS9	2006 04 08 08 00 00	0.00000	rel
302	GPS9	2006 04 08 10 00 00	0.00000	rel
303	GPS9	2006 04 08 12 00 00	0.00000	rel
304	GPS9	2006 04 08 14 00 00	0.00000	rel
305	GPS9	2006 04 08 16 00 00	0.00000	rel
306	GPS9	2006 04 08 18 00 00	0.00000	rel
307	GPS9	2006 04 08 20 00 00	0.00000	rel
308	GPS9	2006 04 08 22 00 00	0.00000	rel
309	GPS9	2006 04 09 00 00 00	0.00000	rel

310	GPS9	2006 04 09 02 00 00	0.00000	rel
311	GPS9	2006 04 09 04 00 00	0.00000	rel
312	GPS9	2006 04 09 06 00 00	0.00000	rel
313	GPS9	2006 04 09 08 00 00	0.00000	rel
314	GPS9	2006 04 09 10 00 00	0.00000	rel
315	GPS9	2006 04 09 12 00 00	0.00000	rel
316	GPS9	2006 04 09 14 00 00	0.00000	rel
317	GPS9	2006 04 09 16 00 00	0.00000	rel
318	GPS9	2006 04 09 18 00 00	0.00000	rel
319	GPS9	2006 04 09 20 00 00	0.00000	rel
320	GPS9	2006 04 09 22 00 00	0.00000	rel
321	GPS9	2006 04 10 00 00 00	0.00000	rel
322	GPS9	2006 04 10 02 00 00	0.00000	rel
323	GPS9	2006 04 10 04 00 00	0.00000	rel
324	GPS9	2006 04 10 06 00 00	0.00000	rel
325	GPS9	2006 04 10 08 00 00	0.00000	rel
326	GPS9	2006 04 10 10 00 00	0.00000	rel
327	GPS9	2006 04 10 12 00 00	0.00000	rel
328	GPS9	2006 04 10 14 00 00	0.00000	rel
329	GP13	2006 04 07 06 00 00	0.00000	abs
330	GP13	2006 04 07 08 00 00	0.00000	rel
331	GP13	2006 04 07 10 00 00	0.00000	rel
332	GP13	2006 04 07 12 00 00	0.00000	rel
333	GP13	2006 04 07 14 00 00	0.00000	rel
334	GP13	2006 04 07 16 00 00	0.00000	rel
335	GP13	2006 04 07 18 00 00	0.00000	rel
336	GP13	2006 04 07 20 00 00	0.00000	rel
337	GP13	2006 04 07 22 00 00	0.00000	rel
338	GP13	2006 04 08 00 00 00	0.00000	rel
339	GP13	2006 04 08 02 00 00	0.00000	rel
340	GP13	2006 04 08 04 00 00	0.00000	rel
341	GP13	2006 04 08 06 00 00	0.00000	rel
342	GP13	2006 04 08 08 00 00	0.00000	rel
343	GP13	2006 04 08 10 00 00	0.00000	rel
344	GP13	2006 04 08 12 00 00	0.00000	rel
345	GP13	2006 04 08 14 00 00	0.00000	rel
346	GP13	2006 04 08 16 00 00	0.00000	rel
347	GP13	2006 04 08 18 00 00	0.00000	rel
348	GP13	2006 04 08 20 00 00	0.00000	rel
349	GP13	2006 04 08 22 00 00	0.00000	rel
350	GP13	2006 04 09 00 00 00	0.00000	rel
351	GP13	2006 04 09 02 00 00	0.00000	rel
352	GP13	2006 04 09 04 00 00	0.00000	rel
353	GP13	2006 04 09 06 00 00	0.00000	rel
354	GP13	2006 04 09 08 00 00	0.00000	rel
355	GP13	2006 04 09 10 00 00	0.00000	rel
356	GP13	2006 04 09 12 00 00	0.00000	rel
357	GP13	2006 04 09 14 00 00	0.00000	rel
358	GP13	2006 04 09 16 00 00	0.00000	rel
359	GP13	2006 04 09 18 00 00	0.00000	rel
360	GP13	2006 04 09 20 00 00	0.00000	rel
361	GP13	2006 04 09 22 00 00	0.00000	rel
362	GP13	2006 04 10 00 00 00	0.00000	rel

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363 GP13      2006 04 10 02 00 00      0.00000      rel
364 GP13      2006 04 10 04 00 00      0.00000      rel
365 GP13      2006 04 10 06 00 00      0.00000      rel
366 GP13      2006 04 10 08 00 00      0.00000      rel
367 GP13      2006 04 10 10 00 00      0.00000      rel
368 GP13      2006 04 10 12 00 00      0.00000      rel
369 GP13      2006 04 10 14 00 00      0.00000      rel

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IONOSPHERE MODELS: \${P}/OLKI06K\ATM\OLKI06K.ION

TYPE OF IONOSPHERE MODELS : LOCAL
RADIUS OF THE EARTH : 6378.14 KM

MODEL	DEG. OF DEVELOP.			VALIDITY START	VALIDITY END	ORIGIN OF DEVELOPMENT			HEIGHT (KM)	NORMAIZATION FACTORS		
	TIME	LAT.	MIXED			LOCAL TIME	LAT. (D)	LONG. (D)		TIME (H)	LAT. (D)	ELE.CONT.
1	2	1	2	2006 4 6 23.0	2006 4 7 7.0	2006 4 7 3.0	61.23	21.47	450	2.00	6.00	0.10D+18
2	2	1	2	2006 4 7 5.0	2006 4 7 13.0	2006 4 7 9.0	61.23	21.47	450	2.00	6.00	0.10D+18
3	2	1	2	2006 4 7 11.0	2006 4 7 19.0	2006 4 7 15.0	61.23	21.47	450	2.00	6.00	0.10D+18
4	2	1	2	2006 4 7 17.0	2006 4 8 1.0	2006 4 7 21.0	61.23	21.47	450	2.00	6.00	0.10D+18
5	2	1	2	2006 4 7 23.0	2006 4 8 7.0	2006 4 8 3.0	61.23	21.47	450	2.00	6.00	0.10D+18
6	2	1	2	2006 4 8 5.0	2006 4 8 13.0	2006 4 8 9.0	61.23	21.47	450	2.00	6.00	0.10D+18
7	2	1	2	2006 4 8 11.0	2006 4 8 19.0	2006 4 8 15.0	61.23	21.47	450	2.00	6.00	0.10D+18
8	2	1	2	2006 4 8 17.0	2006 4 9 1.0	2006 4 8 21.0	61.23	21.47	450	2.00	6.00	0.10D+18
9	2	1	2	2006 4 8 23.0	2006 4 9 7.0	2006 4 9 3.0	61.23	21.47	450	2.00	6.00	0.10D+18
10	2	1	2	2006 4 9 5.0	2006 4 9 13.0	2006 4 9 9.0	61.23	21.47	450	2.00	6.00	0.10D+18
11	2	1	2	2006 4 9 11.0	2006 4 9 19.0	2006 4 9 15.0	61.23	21.47	450	2.00	6.00	0.10D+18
12	2	1	2	2006 4 9 17.0	2006 4 10 1.0	2006 4 9 21.0	61.23	21.47	450	2.00	6.00	0.10D+18
13	2	1	2	2006 4 9 23.0	2006 4 10 7.0	2006 4 10 3.0	61.23	21.47	450	2.00	6.00	0.10D+18
14	2	1	2	2006 4 10 5.0	2006 4 10 13.0	2006 4 10 9.0	61.23	21.47	450	2.00	6.00	0.10D+18
15	2	1	2	2006 4 10 11.0	2006 4 10 19.0	2006 4 10 15.0	61.23	21.47	450	2.00	6.00	0.10D+18

MODEL	TERM	POL. DEGREE IN		COEFFICIENT	SIGMA
		TIME	LATIT.		
1	1	0	0	0.501247E+00	0.418665E-02
	2	1	0	0.194050E+00	0.109987E-02
	3	2	0	0.817854E-01	0.975456E-03
	4	0	1	-0.735991E-01	0.138143E-02
	5	1	1	-0.403350E-01	0.132856E-02
2	1	0	0	0.114884E+01	0.286370E-02
	2	1	0	0.162077E+00	0.732405E-03
	3	2	0	-0.335204E-01	0.627317E-03
	4	0	1	-0.133802E+00	0.103396E-02
	5	1	1	-0.249853E-01	0.120893E-02
3	1	0	0	0.110949E+01	0.316925E-02
	2	1	0	-0.387463E-01	0.707622E-03

	3	2	0	-0.106957E-01	0.637490E-03
	4	0	1	-0.163616E+00	0.103015E-02
	5	1	1	0.843936E-02	0.947552E-03
4	1	0	0	0.560822E+00	0.503396E-02
	2	1	0	-0.235125E+00	0.123658E-02
	3	2	0	0.295347E-01	0.117482E-02
	4	0	1	-0.127479E+00	0.190556E-02
	5	1	1	-0.283727E-01	0.211965E-02
5	1	0	0	0.563030E+00	0.458699E-02
	2	1	0	0.207082E+00	0.126088E-02
	3	2	0	0.933955E-01	0.107640E-02
	4	0	1	-0.926012E-01	0.160519E-02
	5	1	1	-0.525172E-01	0.155525E-02
6	1	0	0	0.122599E+01	0.341216E-02
	2	1	0	0.116168E+00	0.922451E-03
	3	2	0	-0.631263E-01	0.787686E-03
	4	0	1	-0.186137E+00	0.128222E-02
	5	1	1	-0.121184E-01	0.150719E-02
7	1	0	0	0.133344E+01	0.228887E-02
	2	1	0	-0.716513E-01	0.572112E-03
	3	2	0	-0.631292E-01	0.495824E-03
	4	0	1	-0.134091E+00	0.777775E-03
	5	1	1	-0.197197E-01	0.778583E-03
8	1	0	0	0.581620E+00	0.419661E-02
	2	1	0	-0.230572E+00	0.104346E-02
	3	2	0	0.365608E-01	0.984393E-03
	4	0	1	-0.168393E+00	0.158183E-02
	5	1	1	-0.219901E-01	0.176216E-02
9	1	0	0	0.685056E+00	0.609250E-02
	2	1	0	0.175119E+00	0.168904E-02
	3	2	0	0.613355E-01	0.144563E-02
	4	0	1	-0.201872E-01	0.215533E-02
	5	1	1	-0.635062E-01	0.215461E-02
10	1	0	0	0.139280E+01	0.731839E-02
	2	1	0	0.113793E+00	0.200878E-02
	3	2	0	-0.110855E+00	0.172997E-02
	4	0	1	-0.173629E+00	0.280938E-02
	5	1	1	-0.230439E-01	0.335001E-02
11	1	0	0	0.109385E+01	0.578240E-02
	2	1	0	-0.309682E-01	0.146991E-02
	3	2	0	-0.513301E-01	0.128326E-02
	4	0	1	-0.102285E+00	0.197423E-02
	5	1	1	-0.792272E-01	0.198764E-02
12	1	0	0	0.286522E+00	0.128870E-01

	2	1	0	-0.114917E+00	0.383235E-02
	3	2	0	0.665916E-01	0.280166E-02
	4	0	1	-0.187537E+00	0.578317E-02
	5	1	1	0.625171E-01	0.523291E-02
13	1	0	0	0.481789E+00	0.453820E-02
	2	1	0	0.165071E+00	0.122044E-02
	3	2	0	0.882689E-01	0.106705E-02
	4	0	1	-0.451664E-01	0.158277E-02
	5	1	1	-0.903342E-02	0.148105E-02
14	1	0	0	0.148020E+01	0.636395E-02
	2	1	0	0.220248E+00	0.177465E-02
	3	2	0	-0.117191E+00	0.154168E-02
	4	0	1	-0.103460E+00	0.247080E-02
	5	1	1	-0.225980E-01	0.298998E-02
15	1	0	0	0.140377E+01	0.446995E-02
	2	1	0	-0.122470E+00	0.114993E-02
	3	2	0	-0.613846E-01	0.100783E-02
	4	0	1	-0.148628E+00	0.153268E-02
	5	1	1	-0.915328E-01	0.155368E-02

1\${P}/OLKI06K
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PROGRAM GPSEST 19-DEC-06 17:03
BERNESE GPS SOFTWARE VERSION 5.0

61

8. POLE COORDINATES AND TIME INFORMATION

A PRIORI POLE AND TIME INFORMATION FROM THE POLE FILE:

DATUM	TIME	X-POLE (") EP-CPO (")	Y-POLE (") PS-CPO (")	UT1-UTC (S)	GPS-UTC (S)	RMS XP (") RMS EP (")	RMS YP (") RMS PS (")	RMS DT (S)
06-04-07	00:00:00	0.10427 0.00000	0.37171 0.00000	0.262203	14.	0.00000 0.00000	0.00000 0.00000	0.000000
06-04-08	00:00:00	0.10409 0.00000	0.37141 0.00000	0.261424	14.	0.00000 0.00000	0.00000 0.00000	0.000000
06-04-09	00:00:00	0.10430 0.00000	0.37085 0.00000	0.260444	14.	0.00000 0.00000	0.00000 0.00000	0.000000
06-04-10	00:00:00	0.10442 0.00000	0.37034 0.00000	0.259270	14.	0.00000 0.00000	0.00000 0.00000	0.000000
06-04-11	00:00:00	0.10403 0.00000	0.36950 0.00000	0.258033	14.	0.00000 0.00000	0.00000 0.00000	0.000000

NUTATION MODEL: IAU2000
SUBDAILY POLE MODEL: IERS2000

1\${P}/OLKI06K
OLKI06K

PROGRAM GPSEST 19-DEC-06 17:03
BERNESE GPS SOFTWARE VERSION 5.0

12. TEST OUTPUT

MIN. AND MAX. ELEVATION/NADIR ANGLES AND MAX. SYNCHRONIZATION ERRORS:

SESS	FILE	STATION NAME 1	STATION NAME 2	MIN/MAX ELEV.	MIN/MAX NADIR	SYNCH. ERR. (NS)
0990	1	GPS1	GPS2	20.0 83.3	1.6 13.2	0.0
1000	2	GPS1	GPS2	20.0 79.8	2.4 13.2	0.0
0990	3	GPS1	GPS3	20.0 83.3	1.6 13.2	0.0
1000	4	GPS1	GPS3	20.0 79.8	2.4 13.2	0.0
0970	5	GPS1	GPS4	20.0 83.3	1.6 13.2	0.0
0980	6	GPS1	GPS4	20.0 79.8	2.4 13.2	0.0
0970	7	GPS1	GPS5	20.0 83.3	1.6 13.2	0.0
0980	8	GPS1	GPS5	20.0 79.8	2.4 13.2	0.0
0990	9	GPS1	GPS5	20.0 83.3	1.6 13.2	0.0
1000	10	GPS1	GPS5	20.0 79.8	2.4 13.2	0.0
0970	11	GPS1	GPS6	20.0 83.3	1.6 13.2	0.0
0980	12	GPS1	GPS6	20.0 79.8	2.4 13.2	0.0
0990	13	GPS1	GPS6	20.0 83.3	1.6 13.2	0.0
1000	14	GPS1	GPS6	20.0 79.8	2.4 13.2	0.0
0970	15	GPS1	GPS7	20.0 83.3	1.6 13.2	0.0
0980	16	GPS1	GPS7	20.0 79.8	2.4 13.2	0.0
0970	17	GPS1	GPS8	20.0 83.3	1.6 13.2	0.0
0980	18	GPS1	GPS8	20.0 79.8	2.4 13.2	0.0
0990	19	GPS1	GPS8	20.0 83.3	1.6 13.2	0.0
1000	20	GPS1	GPS8	20.0 79.8	2.4 13.2	0.0
0970	21	GPS6	GPS9	20.0 83.3	1.6 13.2	0.0
0980	22	GPS6	GPS9	20.0 79.8	2.4 13.2	0.0
0990	23	GPS6	GPS9	20.0 83.3	1.6 13.2	0.0
1000	24	GPS6	GPS9	20.0 79.8	2.4 13.2	0.0
0970	25	GPS6	GP13	20.0 83.3	1.6 13.2	0.0
0980	26	GPS6	GP13	20.0 79.8	2.4 13.2	0.0
0990	27	GPS6	GP13	20.0 83.3	1.6 13.2	0.0
1000	28	GPS6	GP13	20.0 79.8	2.4 13.2	0.0

1\${P}/OLKI06K
OLKI06K

PROGRAM GPSEST 19-DEC-06 17:03
BERNESE GPS SOFTWARE VERSION 5.0

13. RESULTS (PART 1)

 NUMBER OF PARAMETERS (PART 1):

PARAMETER TYPE	#PARAMETERS	#PRE-ELIMINATED	#SET-UP	#NO-OBS	#REF	#SINGULAR
STATION COORDINATES	30	0	30	0	0	0
AMBIGUITIES	24	24 (BEFORE INV)	940	916	0	0
SITE-SPECIFIC TROPOSPHERE PARAMETERS	369	0	369	0	0	146

TOTAL NUMBER OF PARAMETERS	423	24	1339	916	0	146

NUMBER OF OBSERVATIONS (PART 1):

TYPE	FREQUENCY	FILE	#OBSERVATIONS
PHASE	L1	ALL	247738
PHASE	L2	ALL	247738

TOTAL NUMBER OF OBSERVATIONS			495476

A POSTERIORI SIGMA OF UNIT WEIGHT (PART 1):

A POSTERIORI SIGMA OF UNIT WEIGHT : 0.0019 M (SIGMA OF ONE-WAY L1 PHASE OBSERVABLE AT ZENITH)
 DEGREE OF FREEDOM (DOF) : 495199
 CHI**2/DOF : 3.48

1\${P}/OLKI06K
 OLKI06K

PROGRAM GPSEST 19-DEC-06 17:03
 BERNESE GPS SOFTWARE VERSION 5.0

STATION COORDINATES: \${P}/OLKI06K\STA\TOLKI06K.CRD

NUM	STATION NAME	PARAMETER	A PRIORI VALUE	NEW VALUE	NEW- A PRIORI	RMS ERROR	3-D ELLIPSOID	2-D ELLIPSE
1	GPS1	X	2863210.1067	2863210.1067	0.0000	0.0000		
		Y	1126271.4390	1126271.4390	0.0000	0.0000		

	Z	5568267.2990	5568267.2990	0.0000	0.0000					
	HEIGHT	30.5520	30.5520	0.0000	0.0000	0.0000	0.0			
	LATITUDE	61 14 22.754183	61 14 22.754183	0.0000	0.0000	0.0000	90.0	0.0000	90.0	
	LONGITUDE	21 28 21.633926	21 28 21.633926	0.0000	0.0000	0.0000	0.0	0.0000		
2	GPS2									
	X	2863312.4876	2863312.4898	0.0022	0.0002					
	Y	1127586.4513	1127586.4504	-0.0009	0.0001					
	Z	5567953.2561	5567953.2600	0.0039	0.0003					
	HEIGHT	32.8443	32.8485	0.0042	0.0004	0.0004	0.6			
	LATITUDE	61 14 1.535088	61 14 1.535100	0.0004	0.0001	0.0000	89.1	0.0000	89.0	
	LONGITUDE	21 29 41.145601	21 29 41.145489	-0.0017	0.0000	0.0001	0.0	0.0001		
3	GPS3									
	X	2862323.4428	2862323.4470	0.0042	0.0002					
	Y	1126533.7706	1126533.7717	0.0011	0.0001					
	Z	5568664.0772	5568664.0821	0.0049	0.0003					
	HEIGHT	27.6613	27.6677	0.0064	0.0004	0.0004	0.6			
	LATITUDE	61 14 49.568852	61 14 49.568807	-0.0014	0.0001	0.0000	88.9	0.0000	88.8	
	LONGITUDE	21 28 59.767954	21 28 59.767923	-0.0005	0.0000	0.0001	-0.1	0.0001		
4	GPS4									
	X	2862758.9415	2862758.9459	0.0044	0.0002					
	Y	1125923.2376	1125923.2376	0.0000	0.0001					
	Z	5568566.0154	5568566.0236	0.0082	0.0003					
	HEIGHT	29.1133	29.1224	0.0092	0.0004	0.0004	0.5			
	LATITUDE	61 14 42.897724	61 14 42.897734	0.0003	0.0001	0.0000	89.3	0.0000	89.3	
	LONGITUDE	21 28 10.980705	21 28 10.980597	-0.0016	0.0000	0.0001	0.0	0.0001		
5	GPS5									
	X	2864192.3764	2864192.3708	-0.0056	0.0001					
	Y	1126421.6871	1126421.6861	-0.0010	0.0001					
	Z	5567725.8796	5567725.8672	-0.0124	0.0003					
	HEIGHT	22.2982	22.2847	-0.0135	0.0003	0.0003	0.5			
	LATITUDE	61 13 46.892454	61 13 46.892418	-0.0011	0.0000	0.0000	89.9	0.0000	89.9	
	LONGITUDE	21 28 6.906786	21 28 6.906863	0.0011	0.0000	0.0000	0.0	0.0000		
6	GPS6									
	X	2863910.3892	2863910.3937	0.0045	0.0001					
	Y	1125229.5963	1125229.5970	0.0007	0.0001					
	Z	5568112.5408	5568112.5510	0.0102	0.0003					
	HEIGHT	25.0654	25.0765	0.0111	0.0003	0.0003	0.6			
	LATITUDE	61 14 12.686451	61 14 12.686484	0.0010	0.0000	0.0000	89.1	0.0000	89.1	
	LONGITUDE	21 26 59.459035	21 26 59.458971	-0.0009	0.0000	0.0000	0.0	0.0000		
7	GPS7									
	X	2863465.8530	2863465.8554	0.0024	0.0002					
	Y	1124819.7828	1124819.7819	-0.0009	0.0001					
	Z	5568430.2557	5568430.2615	0.0058	0.0003					
	HEIGHT	32.4126	32.4186	0.0060	0.0004	0.0004	0.4			
	LATITUDE	61 14 33.586772	61 14 33.586807	0.0011	0.0001	0.0000	89.5	0.0000	89.4	
	LONGITUDE	21 26 44.784815	21 26 44.784700	-0.0017	0.0000	0.0001	-0.1	0.0001		

8	GPS8	X	2863019.7046	2863019.7089	0.0043	0.0001				
		Y	1124739.5538	1124739.5526	-0.0012	0.0001				
		Z	5568666.6848	5568666.6920	0.0072	0.0003				
		HEIGHT	25.8084	25.8165	0.0081	0.0003	0.0003	0.5		
		LATITUDE	61 14 49.853077	61 14 49.853088	0.0003	0.0000	0.0000	89.0	0.0000	89.0
		LONGITUDE	21 26 50.715669	21 26 50.715486	-0.0027	0.0000	0.0000	-0.1	0.0000	
9	GPS9	X	2863742.0387	2863742.0399	0.0012	0.0001				
		Y	1123996.6145	1123996.6130	-0.0015	0.0001				
		Z	5568453.4720	5568453.4778	0.0058	0.0003				
		HEIGHT	31.7025	31.7078	0.0054	0.0003	0.0003	0.5		
		LATITUDE	61 14 35.187574	61 14 35.187647	0.0023	0.0000	0.0000	89.3	0.0000	89.2
		LONGITUDE	21 25 46.644762	21 25 46.644638	-0.0019	0.0000	0.0000	0.0	0.0000	
10	GP13	X	2864309.0028	2864309.0090	0.0062	0.0001				
		Y	1124134.0361	1124134.0384	0.0023	0.0001				
		Z	5568134.1930	5568134.1987	0.0057	0.0003				
		HEIGHT	29.8962	29.9044	0.0082	0.0003	0.0003	0.5		
		LATITUDE	61 14 13.855835	61 14 13.855736	-0.0030	0.0000	0.0000	89.2	0.0000	89.2
		LONGITUDE	21 25 41.334054	21 25 41.334043	-0.0002	0.0000	0.0000	0.0	0.0000	

1\${P}/OLKI06K
OLKI06K

PROGRAM GPSEST 19-DEC-06 17:03
BERNESE GPS SOFTWARE VERSION 5.0

SITE-SPECIFIC TROPOSPHERE PARAMETERS: (NOT SAVED)

REQU.	STATION NAME	CORRECTIONS (M)			RMS ERRORS (M)			ZENITH VECTOR (")			ERROR ELLIPSE (M)					
		NORTH	EAST	ZENITH	NORTH	EAST	ZENITH	ANGLE	RMS	RATIO	AZI	MAX	RMS	MIN	RMS	AZI
1	GPS2			0.00000			0.00000									
2	GPS2			0.00000			0.00000									
3	GPS2			0.00000			0.00000									
4	GPS2			0.00000			0.00000									
5	GPS2			0.00000			0.00000									
6	GPS2			0.00000			0.00000									
7	GPS2			0.00000			0.00000									
8	GPS2			0.00000			0.00000									
9	GPS2			0.00000			0.00000									
10	GPS2			0.00000			0.00000									
11	GPS2			0.00000			0.00000									
12	GPS2			0.00000			0.00000									
13	GPS2			0.00000			0.00000									
14	GPS2			0.00000			0.00000									
15	GPS2			0.00000			0.00000									

16	GPS2	0.00000	0.00000
17	GPS2	0.00000	0.00000
18	GPS2	0.00000	0.00000
19	GPS2	0.00000	0.00000
20	GPS2	0.00000	0.00000
21	GPS2	0.00000	0.00000
22	GPS2	0.00000	0.00000
23	GPS2	0.00000	0.00000
24	GPS2	0.00000	0.00000
25	GPS2	0.00399	0.00081
26	GPS2	-0.00337	0.00029
27	GPS2	-0.00115	0.00027
28	GPS2	-0.00197	0.00029
29	GPS2	-0.00251	0.00028
30	GPS2	-0.00261	0.00027
31	GPS2	0.00013	0.00032
32	GPS2	-0.00042	0.00028
33	GPS2	-0.00381	0.00028
34	GPS2	-0.00046	0.00027
35	GPS2	-0.00209	0.00026
36	GPS2	-0.00423	0.00027
37	GPS2	-0.00184	0.00027
38	GPS2	-0.00307	0.00025
39	GPS2	-0.00030	0.00027
40	GPS2	-0.00256	0.00037
41	GPS2	-0.00462	0.00181
42	GPS3	0.00000	0.00000
43	GPS3	0.00000	0.00000
44	GPS3	0.00000	0.00000
45	GPS3	0.00000	0.00000
46	GPS3	0.00000	0.00000
47	GPS3	0.00000	0.00000
48	GPS3	0.00000	0.00000
49	GPS3	0.00000	0.00000
50	GPS3	0.00000	0.00000
51	GPS3	0.00000	0.00000
52	GPS3	0.00000	0.00000
53	GPS3	0.00000	0.00000
54	GPS3	0.00000	0.00000
55	GPS3	0.00000	0.00000
56	GPS3	0.00000	0.00000
57	GPS3	0.00000	0.00000
58	GPS3	0.00000	0.00000
59	GPS3	0.00000	0.00000
60	GPS3	0.00000	0.00000
61	GPS3	0.00000	0.00000
62	GPS3	0.00000	0.00000
63	GPS3	0.00000	0.00000
64	GPS3	0.00000	0.00000
65	GPS3	0.00000	0.00000
66	GPS3	0.00695	0.00173
67	GPS3	-0.00643	0.00031
68	GPS3	-0.00330	0.00027

69	GPS3	-0.00433	0.00029
70	GPS3	-0.00347	0.00028
71	GPS3	-0.00326	0.00027
72	GPS3	-0.00410	0.00032
73	GPS3	-0.00371	0.00028
74	GPS3	-0.00282	0.00028
75	GPS3	-0.00407	0.00028
76	GPS3	-0.00535	0.00026
77	GPS3	-0.00505	0.00027
78	GPS3	-0.00314	0.00027
79	GPS3	-0.00451	0.00025
80	GPS3	-0.00442	0.00027
81	GPS3	-0.00398	0.00039
82	GPS3	-0.00936	0.00701
83	GPS4	-0.01268	0.00221
84	GPS4	-0.00191	0.00031
85	GPS4	-0.00240	0.00027
86	GPS4	-0.00423	0.00030
87	GPS4	-0.00416	0.00029
88	GPS4	-0.00418	0.00027
89	GPS4	-0.00314	0.00032
90	GPS4	-0.00280	0.00028
91	GPS4	-0.00310	0.00028
92	GPS4	-0.00371	0.00028
93	GPS4	-0.00313	0.00026
94	GPS4	-0.00364	0.00027
95	GPS4	-0.00352	0.00028
96	GPS4	-0.00300	0.00025
97	GPS4	-0.00250	0.00027
98	GPS4	-0.00419	0.00036
99	GPS4	-0.00467	0.00134
100	GPS4	0.00000	0.00000
101	GPS4	0.00000	0.00000
102	GPS4	0.00000	0.00000
103	GPS4	0.00000	0.00000
104	GPS4	0.00000	0.00000
105	GPS4	0.00000	0.00000
106	GPS4	0.00000	0.00000
107	GPS4	0.00000	0.00000
108	GPS4	0.00000	0.00000
109	GPS4	0.00000	0.00000
110	GPS4	0.00000	0.00000
111	GPS4	0.00000	0.00000
112	GPS4	0.00000	0.00000
113	GPS4	0.00000	0.00000
114	GPS4	0.00000	0.00000
115	GPS4	0.00000	0.00000
116	GPS4	0.00000	0.00000
117	GPS4	0.00000	0.00000
118	GPS4	0.00000	0.00000
119	GPS4	0.00000	0.00000
120	GPS4	0.00000	0.00000
121	GPS4	0.00000	0.00000

122	GPS4	0.00000	0.00000
123	GPS4	0.00000	0.00000
124	GPS5	0.00378	0.00044
125	GPS5	0.00505	0.00025
126	GPS5	0.00377	0.00026
127	GPS5	-0.00005	0.00029
128	GPS5	0.00151	0.00027
129	GPS5	0.00359	0.00026
130	GPS5	0.00237	0.00031
131	GPS5	0.00684	0.00027
132	GPS5	0.00099	0.00027
133	GPS5	0.00313	0.00026
134	GPS5	0.00238	0.00024
135	GPS5	0.00270	0.00025
136	GPS5	0.00326	0.00026
137	GPS5	0.00553	0.00023
138	GPS5	0.00335	0.00027
139	GPS5	-0.00580	0.00080
140	GPS5	0.00000	0.00000
141	GPS5	0.00000	0.00000
142	GPS5	0.00000	0.00000
143	GPS5	0.00000	0.00000
144	GPS5	0.00000	0.00000
145	GPS5	0.00000	0.00000
146	GPS5	0.00000	0.00000
147	GPS5	0.00000	0.00000
148	GPS5	0.00000	0.00000
149	GPS5	0.01929	0.00125
150	GPS5	0.00040	0.00030
151	GPS5	0.00041	0.00029
152	GPS5	0.00175	0.00027
153	GPS5	0.00260	0.00026
154	GPS5	0.00397	0.00033
155	GPS5	0.00708	0.00028
156	GPS5	-0.00135	0.00027
157	GPS5	0.00419	0.00026
158	GPS5	0.00074	0.00024
159	GPS5	0.00040	0.00025
160	GPS5	0.00183	0.00026
161	GPS5	0.00270	0.00024
162	GPS5	0.00218	0.00037
163	GPS5	0.00000	0.00000
164	GPS5	0.00000	0.00000
165	GPS6	-0.00682	0.00092
166	GPS6	-0.00255	0.00027
167	GPS6	-0.00235	0.00026
168	GPS6	-0.00554	0.00029
169	GPS6	-0.00352	0.00027
170	GPS6	-0.00470	0.00025
171	GPS6	-0.00403	0.00031
172	GPS6	-0.00268	0.00027
173	GPS6	-0.00271	0.00027
174	GPS6	-0.00394	0.00026

175	GPS6	-0.00235	0.00024
176	GPS6	-0.00317	0.00025
177	GPS6	-0.00314	0.00026
178	GPS6	-0.00216	0.00023
179	GPS6	-0.00295	0.00026
180	GPS6	-0.00536	0.00035
181	GPS6	0.00388	0.00191
182	GPS6	0.00000	0.00000
183	GPS6	0.00000	0.00000
184	GPS6	0.00000	0.00000
185	GPS6	0.00000	0.00000
186	GPS6	0.00000	0.00000
187	GPS6	0.00000	0.00000
188	GPS6	0.00000	0.00000
189	GPS6	0.00000	0.00000
190	GPS6	-0.00425	0.00094
191	GPS6	-0.00353	0.00029
192	GPS6	-0.00551	0.00028
193	GPS6	-0.00409	0.00026
194	GPS6	-0.00541	0.00025
195	GPS6	-0.00259	0.00031
196	GPS6	-0.00341	0.00026
197	GPS6	-0.00281	0.00027
198	GPS6	-0.00695	0.00026
199	GPS6	-0.00504	0.00024
200	GPS6	-0.00566	0.00025
201	GPS6	-0.00412	0.00026
202	GPS6	-0.00504	0.00024
203	GPS6	-0.00244	0.00027
204	GPS6	-0.00307	0.00048
205	GPS6	0.00000	0.00000
206	GPS7	0.00000	0.00000
207	GPS7	-0.00246	0.00048
208	GPS7	-0.00188	0.00028
209	GPS7	-0.00474	0.00030
210	GPS7	-0.00340	0.00029
211	GPS7	-0.00395	0.00027
212	GPS7	-0.00349	0.00032
213	GPS7	-0.00226	0.00029
214	GPS7	-0.00252	0.00028
215	GPS7	-0.00377	0.00028
216	GPS7	-0.00230	0.00026
217	GPS7	-0.00324	0.00027
218	GPS7	-0.00271	0.00028
219	GPS7	-0.00193	0.00025
220	GPS7	-0.00249	0.00027
221	GPS7	-0.00486	0.00037
222	GPS7	0.00238	0.00256
223	GPS7	0.00000	0.00000
224	GPS7	0.00000	0.00000
225	GPS7	0.00000	0.00000
226	GPS7	0.00000	0.00000
227	GPS7	0.00000	0.00000

228	GPS7	0.00000	0.00000
229	GPS7	0.00000	0.00000
230	GPS7	0.00000	0.00000
231	GPS7	0.00000	0.00000
232	GPS7	0.00000	0.00000
233	GPS7	0.00000	0.00000
234	GPS7	0.00000	0.00000
235	GPS7	0.00000	0.00000
236	GPS7	0.00000	0.00000
237	GPS7	0.00000	0.00000
238	GPS7	0.00000	0.00000
239	GPS7	0.00000	0.00000
240	GPS7	0.00000	0.00000
241	GPS7	0.00000	0.00000
242	GPS7	0.00000	0.00000
243	GPS7	0.00000	0.00000
244	GPS7	0.00000	0.00000
245	GPS7	0.00000	0.00000
246	GPS7	0.00000	0.00000
247	GPS8	-0.04600	0.01134
248	GPS8	-0.00008	0.00031
249	GPS8	-0.00234	0.00027
250	GPS8	-0.00469	0.00029
251	GPS8	-0.00352	0.00027
252	GPS8	-0.00414	0.00025
253	GPS8	-0.00148	0.00031
254	GPS8	-0.00281	0.00027
255	GPS8	-0.00290	0.00027
256	GPS8	-0.00542	0.00027
257	GPS8	-0.00271	0.00024
258	GPS8	-0.00290	0.00025
259	GPS8	-0.00365	0.00026
260	GPS8	-0.00141	0.00023
261	GPS8	-0.00208	0.00027
262	GPS8	-0.00582	0.00044
263	GPS8	0.00000	0.00000
264	GPS8	0.00000	0.00000
265	GPS8	0.00000	0.00000
266	GPS8	0.00000	0.00000
267	GPS8	0.00000	0.00000
268	GPS8	0.00000	0.00000
269	GPS8	0.00000	0.00000
270	GPS8	0.00000	0.00000
271	GPS8	-0.08997	0.01790
272	GPS8	-0.00200	0.00033
273	GPS8	-0.00291	0.00027
274	GPS8	-0.00556	0.00029
275	GPS8	-0.00372	0.00026
276	GPS8	-0.00327	0.00025
277	GPS8	-0.00342	0.00031
278	GPS8	-0.00336	0.00026
279	GPS8	-0.00145	0.00027
280	GPS8	-0.00574	0.00026

281	GPS8	-0.00461	0.00024
282	GPS8	-0.00520	0.00025
283	GPS8	-0.00322	0.00026
284	GPS8	-0.00354	0.00024
285	GPS8	-0.00230	0.00027
286	GPS8	-0.00358	0.00043
287	GPS8	0.00000	0.00000
288	GPS9	0.00000	0.00000
289	GPS9	0.02680	0.00064
290	GPS9	-0.00269	0.00027
291	GPS9	-0.00324	0.00029
292	GPS9	-0.00214	0.00027
293	GPS9	-0.00269	0.00025
294	GPS9	-0.00283	0.00031
295	GPS9	-0.00175	0.00027
296	GPS9	-0.00039	0.00027
297	GPS9	-0.00325	0.00026
298	GPS9	-0.00178	0.00024
299	GPS9	-0.00078	0.00025
300	GPS9	-0.00267	0.00026
301	GPS9	0.00052	0.00023
302	GPS9	-0.00072	0.00026
303	GPS9	-0.00540	0.00037
304	GPS9	0.35366	0.22390
305	GPS9	0.00000	0.00000
306	GPS9	0.00000	0.00000
307	GPS9	0.00000	0.00000
308	GPS9	0.00000	0.00000
309	GPS9	0.00000	0.00000
310	GPS9	0.00000	0.00000
311	GPS9	0.00000	0.00000
312	GPS9	0.00000	0.00000
313	GPS9	0.00157	0.00094
314	GPS9	-0.00170	0.00029
315	GPS9	-0.00417	0.00028
316	GPS9	-0.00234	0.00026
317	GPS9	-0.00276	0.00025
318	GPS9	-0.00290	0.00031
319	GPS9	-0.00292	0.00026
320	GPS9	0.00123	0.00027
321	GPS9	-0.00634	0.00026
322	GPS9	-0.00338	0.00024
323	GPS9	-0.00267	0.00025
324	GPS9	-0.00270	0.00026
325	GPS9	-0.00064	0.00024
326	GPS9	-0.00091	0.00027
327	GPS9	0.00010	0.00066
328	GPS9	0.00000	0.00000
329	GP13	0.00000	0.00000
330	GP13	0.00318	0.00111
331	GP13	-0.00185	0.00028
332	GP13	-0.00465	0.00029
333	GP13	-0.00268	0.00027

334	GP13	-0.00472	0.00025
335	GP13	-0.00354	0.00031
336	GP13	-0.00239	0.00027
337	GP13	-0.00232	0.00027
338	GP13	-0.00405	0.00026
339	GP13	-0.00196	0.00024
340	GP13	-0.00311	0.00025
341	GP13	-0.00244	0.00026
342	GP13	-0.00154	0.00023
343	GP13	-0.00221	0.00026
344	GP13	-0.00544	0.00036
345	GP13	0.02480	0.00503
346	GP13	0.00000	0.00000
347	GP13	0.00000	0.00000
348	GP13	0.00000	0.00000
349	GP13	0.00000	0.00000
350	GP13	0.00000	0.00000
351	GP13	0.00000	0.00000
352	GP13	0.00000	0.00000
353	GP13	0.00000	0.00000
354	GP13	-0.00269	0.00094
355	GP13	-0.00264	0.00029
356	GP13	-0.00509	0.00028
357	GP13	-0.00335	0.00026
358	GP13	-0.00543	0.00025
359	GP13	-0.00233	0.00031
360	GP13	-0.00367	0.00026
361	GP13	-0.00158	0.00027
362	GP13	-0.00786	0.00026
363	GP13	-0.00336	0.00024
364	GP13	-0.00431	0.00025
365	GP13	-0.00304	0.00026
366	GP13	-0.00500	0.00024
367	GP13	-0.00183	0.00028
368	GP13	-0.00050	0.00118
369	GP13	0.00000	0.00000

1\${P}/OLKI06K
OLKI06K

PROGRAM GPSEST 19-DEC-06 17:03
BERNESE GPS SOFTWARE VERSION 5.0

RMS ERRORS OF ELLIP. COORDINATES AND COORDINATE DIFFER. IN MM (PART 1):

NUM		1	2	3	4	5	6	7	8	9	10
1	B	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
1	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	H	0.0	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3

2	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.4	0.4	0.4	0.5	0.4	0.4	0.5	0.4	0.4	0.4
3	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.4	0.4	0.4	0.5	0.4	0.4	0.5	0.4	0.4	0.4
4	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.4	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4
5	B	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.3	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3
6	B	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.3	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3
7	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.4	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4
8	B	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.3	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3
9	B	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.3	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3
10	B	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.3	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3

1\${P}/OLKI06K
OLKI06K

PROGRAM GPSEST 19-DEC-06 17:03
BERNESE GPS SOFTWARE VERSION 5.0

SLOPE DISTANCES AND RMS ERRORS IN M (PART 1):

NUM		2 N	3 N	4 N	5 N	6 N	7 N	8 N	9 N
1	O	1355.8621	1006.1927	643.4483	1131.6197	1264.8248	1482.9925	1594.5013	2343.5952
	N	1355.8605	1006.1912	643.4490	1131.6207	1264.8255	1482.9944	1594.5037	2343.5974
	RMS	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000

2	O	1609.8487	1856.9241	1477.3558	2436.7239	2811.6728	2949.4962	3649.8847
N	N	1609.8466	1856.9240	1477.3536	2436.7233	2811.6731	2949.4971	3649.8854
	RMS	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
3	O		756.3239	2094.2040	2126.8432	2073.0479	1924.5782	2914.4348
N	N		756.3245	2094.2032	2126.8423	2073.0486	1924.5805	2914.4356
	RMS		0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
4	O			1734.6515	1418.6646	1317.4851	1216.2397	2165.8769
N	N			1734.6529	1418.6636	1317.4850	1216.2408	2165.8769
	RMS			0.0001	0.0000	0.0000	0.0000	0.0000
5	O				1284.5638	1894.7505	2256.0687	2571.6088
N	N				1284.5668	1894.7541	2256.0720	2571.6133
	RMS				0.0000	0.0000	0.0000	0.0000
6	O					683.0097	1157.8153	1290.2791
N	N					683.0100	1157.8148	1290.2805
	RMS					0.0001	0.0000	0.0000
7	O						511.2571	868.5756
N	N						511.2561	868.5758
	RMS						0.0001	0.0000
8	O							1057.9154
N	N							1057.9138
	RMS							0.0000
9	O							
N	N							
	RMS							

1\${P}/OLKI06K
OLKI06K

PROGRAM GPSEST 19-DEC-06 17:03
BERNESE GPS SOFTWARE VERSION 5.0

SLOPE DISTANCES AND RMS ERRORS IN M (PART 1): CONTINUATION

NUM		10 N
1	O	2407.0274
N	N	2407.0279
	RMS	0.0000
2	O	3597.9093
N	N	3597.9075
	RMS	0.0000

3	O	3159.4226
N	N	3159.4230
	RMS	0.0000
4	O	2406.3255
N	N	2406.3255
	RMS	0.0000
5	O	2326.7292
N	N	2326.7298
	RMS	0.0000
6	O	1166.0248
N	N	1166.0239
	RMS	0.0000
7	O	1126.4117
N	N	1126.4126
	RMS	0.0000
8	O	1520.6870
N	N	1520.6878
	RMS	0.0000
9	O	665.0354
N	N	665.0405
	RMS	0.0000

Appendix III. Results of the second measurements at Olkiluoto in 2006.

```
=====
Program : GPSEST                               Bernese GPS Software Version 5.0
Purpose : Parameter estimation
Campaign: ${P}/OLKI06S                          Default session: 2870 year 2006
Date    : 19-Jan-2007 13:03                    User name      : ja
=====
```

OLKI06S

```
1${P}/OLKI06S                                PROGRAM GPSEST  19-JAN-07 13:03
OLKI06S                                       BERNESE GPS SOFTWARE VERSION 5.0
-----
```

TABLE OF CONTENTS -----

1. CAMPAIGNS
2. OBSERVATION FILES
3. GENERAL OPTIONS
4. STATIONS
5. SATELLITE ORBITS
6. ATMOSPHERE
7. CLOCK PARAMETERS
8. POLE COORDINATES AND TIME INFORMATION
9. ANTENNA PHASE CENTERS
10. CONSTANTS
11. PARAMETER CHARACTERIZATION LIST
12. TEST OUTPUT
13. RESULTS (PART 1)
14. RESULTS (PART 2)

```
1${P}/OLKI06S                                PROGRAM GPSEST  19-JAN-07 13:03
OLKI06S                                       BERNESE GPS SOFTWARE VERSION 5.0
-----
```

INPUT AND OUTPUT FILENAMES -----

```
-----
Session table          : ${P}/OLKI06S\STA\SESSIONS.SES
```



```

General constants      : ${X}/GEN\CONST.
Geodetic datum        : ${X}/GEN\DATUM.
Station information    : ${P}/OLKI06S\STA\OLKI06S.STA
Earth rotation parameters : ${P}/OLKI06S\ORB\C04_2006.ERP
Subdaily pole model   : ${X}/GEN\IERS2000.SUB
Nutation model        : ${X}/GEN\IAU2000.NUT
Satellite information  : ${X}/GEN\SATELLIT.
Receiver information   : ${X}/GEN\RECEIVER.
Satellite problems    : ${X}/GEN\SAT_2006.CRX
Phase center eccentricities : ${X}/GEN\PHAS_IGS.REL
SINEX general input file : ${X}/GEN\SINEX.
IONEX control file    : ${X}/GEN\IONEX.
Difference GPS-UTC    : ---
A priori station coordinates: ${P}/OLKI06S\STA\OLKI.CRD
GNSS standard orbits  : ${P}/OLKI06S\ORB\OLKI06S.STD
GNSS orbit partials   : ---
Ionosphere models     : ${P}/OLKI06S\ATM\OLKI06S.ION
Troposphere estimates : ---
Station sigma factors : ---
Station eccentricities : ---
Ocean loading tables  : ---
GNSS clock corrections : ---
Differential code biases : ---
Receiver antenna orientation: ---
Kinematic coordinates : ---
Kinematic velocities  : ---
Standard orbit(s)     : ---
Orbit partials        : ---
Attitude data         : ---
Precise orbit(s)      : ---
LEO orbital elements  : ---
Station coordinates   : ${P}/OLKI06S\STA\TOLKI06S.CRD
GNSS orbital elements : ---
Troposphere estimates : ---
Troposphere SINEX     : ---
Ionosphere models     : ---
IONEX                 : ---
Residuals             : ---
Coordinate covariance matrix: ---
Full covariance matrix : ---
Normal equations      : ---
Bernese ERP file      : ---
IERS ERP file         : ---
GNSS clock corrections : ---
Clock RINEX           : ---
Kinematic coordinates : ---
Differential code biases : ---
Phase center variations (gri: ---
Phase center variations (har: ---
Scratch file          : ${U}/WORK\GPSEST.SCR
Scratch files         : ${U}/WORK\GPSEST.SC1
Program output        : ${P}/OLKI06S\OUT\GPSEST.L28
Error message         : ${U}/WORK\ERROR.MSG

```

1\${P}/OLKI06S
OLKI06S

PROGRAM GPSEST 19-JAN-07 13:03
BERNESE GPS SOFTWARE VERSION 5.0

1. CAMPAIGNS

CAMPAIGN NAME	NUM STATION NAME	NUM STATION NAME	NUM STATION NAME	NUM STATION NAME	NUM STATION NAME
\${P}/OLKI06S :	1 GPS1	2 GPS2	3 GPS3	4 GPS4	5 GPS5
	6 GPS6	7 GPS7	8 GPS8	9 GPS9	10 GP13

2. OBSERVATION FILES

\${P}/OLKI06S

MAIN CHARACTERISTICS:

FILE	OBSERVATION FILE HEADER	OBSERVATION FILE	SESS	RECEIVER 1	RECEIVER 2
1	\${P}/OLKI06S/OBS/01022860.PSH	\${P}/OLKI06S/OBS/01022860.PSO	2860	ASHTECH Z-XII3	ASHTECH Z-XII3
2	\${P}/OLKI06S/OBS/01022870.PSH	\${P}/OLKI06S/OBS/01022870.PSO	2870	ASHTECH Z-XII3	ASHTECH Z-XII3
3	\${P}/OLKI06S/OBS/01032860.PSH	\${P}/OLKI06S/OBS/01032860.PSO	2860	ASHTECH Z-XII3	ASHTECH Z-XII3
4	\${P}/OLKI06S/OBS/01032870.PSH	\${P}/OLKI06S/OBS/01032870.PSO	2870	ASHTECH Z-XII3	ASHTECH Z-XII3
5	\${P}/OLKI06S/OBS/01042840.PSH	\${P}/OLKI06S/OBS/01042840.PSO	2840	ASHTECH Z-XII3	ASHTECH Z-XII3
6	\${P}/OLKI06S/OBS/01042850.PSH	\${P}/OLKI06S/OBS/01042850.PSO	2850	ASHTECH Z-XII3	ASHTECH Z-XII3
7	\${P}/OLKI06S/OBS/01052840.PSH	\${P}/OLKI06S/OBS/01052840.PSO	2840	ASHTECH Z-XII3	ASHTECH Z-XII3
8	\${P}/OLKI06S/OBS/01052850.PSH	\${P}/OLKI06S/OBS/01052850.PSO	2850	ASHTECH Z-XII3	ASHTECH Z-XII3
9	\${P}/OLKI06S/OBS/01052860.PSH	\${P}/OLKI06S/OBS/01052860.PSO	2860	ASHTECH Z-XII3	ASHTECH Z-XII3
10	\${P}/OLKI06S/OBS/01052870.PSH	\${P}/OLKI06S/OBS/01052870.PSO	2870	ASHTECH Z-XII3	ASHTECH Z-XII3
11	\${P}/OLKI06S/OBS/01062840.PSH	\${P}/OLKI06S/OBS/01062840.PSO	2840	ASHTECH Z-XII3	ASHTECH Z-XII3
12	\${P}/OLKI06S/OBS/01062850.PSH	\${P}/OLKI06S/OBS/01062850.PSO	2850	ASHTECH Z-XII3	ASHTECH Z-XII3
13	\${P}/OLKI06S/OBS/01062860.PSH	\${P}/OLKI06S/OBS/01062860.PSO	2860	ASHTECH Z-XII3	ASHTECH Z-XII3
14	\${P}/OLKI06S/OBS/01062870.PSH	\${P}/OLKI06S/OBS/01062870.PSO	2870	ASHTECH Z-XII3	ASHTECH Z-XII3
15	\${P}/OLKI06S/OBS/01072840.PSH	\${P}/OLKI06S/OBS/01072840.PSO	2840	ASHTECH Z-XII3	ASHTECH Z-XII3
16	\${P}/OLKI06S/OBS/01072850.PSH	\${P}/OLKI06S/OBS/01072850.PSO	2850	ASHTECH Z-XII3	ASHTECH Z-XII3
17	\${P}/OLKI06S/OBS/01082840.PSH	\${P}/OLKI06S/OBS/01082840.PSO	2840	ASHTECH Z-XII3	ASHTECH Z-XII3
18	\${P}/OLKI06S/OBS/01082850.PSH	\${P}/OLKI06S/OBS/01082850.PSO	2850	ASHTECH Z-XII3	ASHTECH Z-XII3
19	\${P}/OLKI06S/OBS/01082860.PSH	\${P}/OLKI06S/OBS/01082860.PSO	2860	ASHTECH Z-XII3	ASHTECH Z-XII3
20	\${P}/OLKI06S/OBS/01082870.PSH	\${P}/OLKI06S/OBS/01082870.PSO	2870	ASHTECH Z-XII3	ASHTECH Z-XII3

21	\$(P)/OLKI06S/OBS/06092840.PSH	\$(P)/OLKI06S/OBS/06092840.PSO	2840	ASHTECH Z-XII3	ASHTECH Z-XII3
22	\$(P)/OLKI06S/OBS/06092850.PSH	\$(P)/OLKI06S/OBS/06092850.PSO	2850	ASHTECH Z-XII3	ASHTECH Z-XII3
23	\$(P)/OLKI06S/OBS/06092860.PSH	\$(P)/OLKI06S/OBS/06092860.PSO	2860	ASHTECH Z-XII3	ASHTECH Z-XII3
24	\$(P)/OLKI06S/OBS/06092870.PSH	\$(P)/OLKI06S/OBS/06092870.PSO	2870	ASHTECH Z-XII3	ASHTECH Z-XII3
25	\$(P)/OLKI06S/OBS/06132840.PSH	\$(P)/OLKI06S/OBS/06132840.PSO	2840	ASHTECH Z-XII3	ASHTECH UZ-12
26	\$(P)/OLKI06S/OBS/06132850.PSH	\$(P)/OLKI06S/OBS/06132850.PSO	2850	ASHTECH Z-XII3	ASHTECH UZ-12
27	\$(P)/OLKI06S/OBS/06132860.PSH	\$(P)/OLKI06S/OBS/06132860.PSO	2860	ASHTECH Z-XII3	ASHTECH UZ-12
28	\$(P)/OLKI06S/OBS/06132870.PSH	\$(P)/OLKI06S/OBS/06132870.PSO	2870	ASHTECH Z-XII3	ASHTECH UZ-12

FILE	TYP	FREQ.	STATION 1	STATION 2	SESS	FIRST	OBSERV.TIME	#EPO	DT	#EF	#CLK	ARC	#SAT	AMB. I. + S.			#CLUSTERS				RM	
														W	12	#AMB	L1	L2	L5			
1	P	L1,L2	GPS1	GPS2	2860	6-10-13	6:54:30	2051	30	0	E	E	1	29	N	Y	Y	52	13	13	52	0
2	P	L1,L2	GPS1	GPS2	2870	6-10-14	0:00:30	1128	30	0	E	E	1	29	N	Y	Y	34	11	11	34	0
3	P	L1,L2	GPS1	GPS3	2860	6-10-13	7:21:00	1998	30	0	E	E	1	29	N	Y	Y	56	17	17	56	0
4	P	L1,L2	GPS1	GPS3	2870	6-10-14	0:00:30	1170	30	0	E	E	1	29	N	Y	Y	37	14	14	37	0
5	P	L1,L2	GPS1	GPS4	2840	6-10-11	6:23:30	2113	30	0	E	E	1	28	N	Y	Y	61	24	24	61	0
6	P	L1,L2	GPS1	GPS4	2850	6-10-12	0:00:30	1366	30	0	E	E	1	28	N	Y	Y	49	25	25	49	0
7	P	L1,L2	GPS1	GPS5	2840	6-10-11	5:45:00	2190	30	0	E	E	1	28	N	Y	Y	54	15	15	54	0
8	P	L1,L2	GPS1	GPS5	2850	6-10-12	0:00:30	1318	30	0	E	E	1	26	N	Y	Y	34	9	9	34	0
9	P	L1,L2	GPS1	GPS5	2860	6-10-13	6:13:30	2133	30	0	E	E	1	29	N	Y	Y	58	17	16	58	0
10	P	L1,L2	GPS1	GPS5	2870	6-10-14	0:00:30	1067	30	0	E	E	1	27	N	Y	Y	34	12	11	34	0
11	P	L1,L2	GPS1	GPS6	2840	6-10-11	8:12:30	1895	30	0	E	E	1	28	N	Y	Y	51	18	18	51	0
12	P	L1,L2	GPS1	GPS6	2850	6-10-12	0:00:30	1433	30	0	E	E	1	28	N	Y	Y	42	15	15	42	0
13	P	L1,L2	GPS1	GPS6	2860	6-10-13	7:58:00	1924	30	0	E	E	1	29	N	Y	Y	54	18	18	54	0
14	P	L1,L2	GPS1	GPS6	2870	6-10-14	0:00:30	1374	30	0	E	E	1	29	N	Y	Y	41	13	13	41	0
15	P	L1,L2	GPS1	GPS7	2840	6-10-11	8:28:00	1864	30	0	E	E	1	28	N	Y	Y	49	16	16	49	0
16	P	L1,L2	GPS1	GPS7	2850	6-10-12	0:00:30	1486	30	0	E	E	1	28	N	Y	Y	42	13	13	42	0
17	P	L1,L2	GPS1	GPS8	2840	6-10-11	7:55:00	1930	30	0	E	E	1	28	N	Y	Y	65	26	26	65	0
18	P	L1,L2	GPS1	GPS8	2850	6-10-12	0:00:30	1404	30	0	E	E	1	28	N	Y	Y	53	23	23	53	0
19	P	L1,L2	GPS1	GPS8	2860	6-10-13	7:40:30	1959	30	0	E	E	1	29	N	Y	Y	70	27	27	70	0
20	P	L1,L2	GPS1	GPS8	2870	6-10-14	0:00:30	1275	30	0	E	E	1	29	N	Y	Y	49	22	22	49	0
21	P	L1,L2	GPS6	GPS9	2840	6-10-11	8:43:30	1833	30	0	E	E	1	28	N	Y	Y	46	13	13	46	0
22	P	L1,L2	GPS6	GPS9	2850	6-10-12	0:00:30	1433	30	0	E	E	1	28	N	Y	Y	39	12	12	39	0
23	P	L1,L2	GPS6	GPS9	2860	6-10-13	8:22:00	1876	30	0	E	E	1	29	N	Y	Y	50	14	14	50	0
24	P	L1,L2	GPS6	GPS9	2870	6-10-14	0:00:30	1315	30	0	E	E	1	29	N	Y	Y	38	13	13	38	0
25	P	L1,L2	GPS6	GP13	2840	6-10-11	9:01:30	1797	30	0	E	E	1	28	N	Y	Y	46	14	14	46	0
26	P	L1,L2	GPS6	GP13	2850	6-10-12	0:00:30	1433	30	0	E	E	1	28	N	Y	Y	40	13	13	40	0
27	P	L1,L2	GPS6	GP13	2860	6-10-13	7:58:00	1924	30	0	E	E	1	29	N	Y	Y	57	21	21	57	0
28	P	L1,L2	GPS6	GP13	2870	6-10-14	0:00:30	1349	30	0	E	E	1	29	N	Y	Y	37	12	12	37	0

SATELLITES:

FILE	#SAT	SATELLITES																														
1	29	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
2	29	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
3	29	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
4	29	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		

5	28	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
6	28	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
7	28	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
8	26	1	2	3	4	5	6	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29			
9	29	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
10	27	1	2	3	4	5	6	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
11	28	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
12	28	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
13	29	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
14	29	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
15	28	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
16	28	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
17	28	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
18	28	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
19	29	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
20	29	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
21	28	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
22	28	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
23	29	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
24	29	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
25	28	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
26	28	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
27	29	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
28	29	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

OBSERVATION SELECTION:

SAMPLING RATE : 30 SEC
 ELEVATION CUT-OFF ANGLE : 20 DEGREES
 SATELLITE SYSTEM : GPS
 SPECIAL DATA SELECTION : NO

1\${P}/OLKI06S
 OLKI06S

PROGRAM GPSEST 19-JAN-07 13:03
 BERNESE GPS SOFTWARE VERSION 5.0

3. GENERAL OPTIONS

TIDAL CORRECTION OF STATION COORDINATES : IERS CONVENTIONS 2000

A PRIORI SIGMA OF UNIT WEIGHT:

A PRIORI SIGMA OF UNIT WEIGHT : 0.001 M (SIGMA OF ONE-WAY L1 PHASE OBSERVABLE AT ZENITH)

MODEL FOR ELEVATION-DEPENDENT WEIGHTING : 1/COS(Z)

CORRELATIONS AND SESSIONS:

STRATEGY : CORRELATIONS CORRECTLY MODELLED
 TIME INTERVAL : 0.10000 SEC (TO IDENTIFY EPOCH)

SESS #FILE FILE NUMBERS

```
-----
2860 7 1 3 9 13 19 23 27
2870 7 2 4 10 14 20 24 28
2840 7 5 7 11 15 17 21 25
2850 7 6 8 12 16 18 22 26
-----
```

AMBIGUITY RESOLUTION STRATEGY:

AMBIGUITIES PRE-ELIMINATED EVERY 30 SECONDS

SYNCHRONIZATION ERRORS:

STRATEGY : SYNCHRONIZATION ERRORS NOT APPLIED

4. STATIONS

Local geodetic datum: \${X}/GEN/DATUM.

Datum name	Ell. param./ Scale	Shifts to WGS-84	Rotations to WGS-84
WGS - 84	A = 6378137.000 m 1/F= 298.2572236 SC = 0.00000D+00	DX = 0.0000 m DY = 0.0000 m DZ = 0.0000 m	RX = 0.00000 arcsec RY = 0.00000 arcsec RZ = 0.00000 arcsec

A priori station coordinates: \${P}/OLKI06S\STA\OLKI.CRD

num	Station name	obs e/f/h	A priori station coordinates WGS-84			A priori station coordinates Ellipsoidal in local geodetic datum			
			X (m)	Y (m)	Z (m)	Latitude	Longitude	Height (m)	
1	GPS1	Y ESTIM	2863210.1067	1126271.4390	5568267.2990	61 14 22.754183	21 28 21.633926	30.5520	
2	GPS2	Y ESTIM	2863312.4876	1127586.4513	5567953.2561	61 14 1.535088	21 29 41.145601	32.8443	
3	GPS3	Y ESTIM	2862323.4428	1126533.7706	5568664.0772	61 14 49.568852	21 28 59.767954	27.6613	
4	GPS4	Y ESTIM	2862758.9415	1125923.2376	5568566.0154	61 14 42.897724	21 28 10.980705	29.1133	
5	GPS5	Y ESTIM	2864192.3764	1126421.6871	5567725.8796	61 13 46.892454	21 28 6.906786	22.2982	
6	GPS6	Y ESTIM	2863910.3892	1125229.5963	5568112.5408	61 14 12.686451	21 26 59.459035	25.0654	

7	GPS7	Y	ESTIM	2863465.8530	1124819.7828	5568430.2557	61 14 33.586772	21 26 44.784815	32.4126
8	GPS8	Y	ESTIM	2863019.7046	1124739.5538	5568666.6848	61 14 49.853077	21 26 50.715669	25.8084
9	GPS9	Y	ESTIM	2863742.0387	1123996.6145	5568453.4720	61 14 35.187574	21 25 46.644762	31.7025
10	GP13	Y	ESTIM	2864309.0028	1124134.0361	5568134.1930	61 14 13.855835	21 25 41.334054	29.8962

A priori sigma:

Station coordinates a priori sigma
in local geodetic datum

num	Station name	N (m)	E (m)	U (m)
1	GPS1	0.00001	0.00001	0.00001

1\${P}/OLKI06S
OLKI06S

PROGRAM GPSEST 19-JAN-07 13:03
BERNESE GPS SOFTWARE VERSION 5.0

5. SATELLITE ORBITS

ARC CHARACTERISTICS:

ARC	START OF ARC	END OF ARC	SOURCE	#SAT	SATELLITES																		
1	06-10-11 00:00:00	06-10-15 00:00:00	PR2006.287	30	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	
					20	21	22	23	24	25	26	27	28	29	30	31							

OSCULATING ELEMENTS: \${P}/OLKI06S\ORB\OLKI06S.STD

REFERENCE SYSTEM: J2000.0
REFERENCE EPOCH : 54019.2395833 MJD (2006 10 11 5 45 0.00)

SAT	S.MAJ.AXIS	ECCENTRIC.	INCLINAT.	NODE	PERIGEE	M. ANOMALY	PER.PASS.TIME
1	26559760.7	0.00643095	56.686379	19.887777	-102.093001	-15.026238	54019.2603938
2	26562788.2	0.00883093	54.322092	-102.808752	-236.156150	55.967730	54019.1620581
3	26560131.0	0.00866799	53.079083	-168.005051	39.940043	15.777941	54019.2177314
4	26560970.5	0.00749578	54.291354	-101.687403	10.058463	-157.537877	54019.4577788
5	26560327.2	0.00760686	53.792316	132.601493	64.125321	-176.480185	54019.4840056
6	26561168.0	0.00587978	53.510805	-164.592070	257.800606	-107.280338	54019.3881720
7	26559367.0	0.01044673	53.598199	-166.074706	259.970815	-166.088400	54019.4696007
8	26558988.1	0.00993653	55.884320	79.860886	154.072172	-98.716202	54019.3762934

SITE-SPECIFIC TROPOSPHERE PARAMETERS

Mapping function used for delay estimation: $1/\cos(\text{zenith-distance})$
 Troposphere gradient estimation : No

Par	Station name	Reference epoch	sig_n (m)	sig_e (m)	sig_u (m)	abs/rel
1	GPS2	2006 10 11 04 00 00			0.00000	abs
2	GPS2	2006 10 11 06 00 00			0.00000	rel
3	GPS2	2006 10 11 08 00 00			0.00000	rel
4	GPS2	2006 10 11 10 00 00			0.00000	rel
5	GPS2	2006 10 11 12 00 00			0.00000	rel
6	GPS2	2006 10 11 14 00 00			0.00000	rel
7	GPS2	2006 10 11 16 00 00			0.00000	rel
8	GPS2	2006 10 11 18 00 00			0.00000	rel
9	GPS2	2006 10 11 20 00 00			0.00000	rel
10	GPS2	2006 10 11 22 00 00			0.00000	rel
11	GPS2	2006 10 12 00 00 00			0.00000	rel
12	GPS2	2006 10 12 02 00 00			0.00000	rel
13	GPS2	2006 10 12 04 00 00			0.00000	rel
14	GPS2	2006 10 12 06 00 00			0.00000	rel
15	GPS2	2006 10 12 08 00 00			0.00000	rel
16	GPS2	2006 10 12 10 00 00			0.00000	rel
17	GPS2	2006 10 12 12 00 00			0.00000	rel
18	GPS2	2006 10 12 14 00 00			0.00000	rel
19	GPS2	2006 10 12 16 00 00			0.00000	rel
20	GPS2	2006 10 12 18 00 00			0.00000	rel
21	GPS2	2006 10 12 20 00 00			0.00000	rel
22	GPS2	2006 10 12 22 00 00			0.00000	rel
23	GPS2	2006 10 13 00 00 00			0.00000	rel
24	GPS2	2006 10 13 02 00 00			0.00000	rel
25	GPS2	2006 10 13 04 00 00			0.00000	rel
26	GPS2	2006 10 13 06 00 00			0.00000	rel
27	GPS2	2006 10 13 08 00 00			0.00000	rel
28	GPS2	2006 10 13 10 00 00			0.00000	rel
29	GPS2	2006 10 13 12 00 00			0.00000	rel
30	GPS2	2006 10 13 14 00 00			0.00000	rel
31	GPS2	2006 10 13 16 00 00			0.00000	rel
32	GPS2	2006 10 13 18 00 00			0.00000	rel
33	GPS2	2006 10 13 20 00 00			0.00000	rel
34	GPS2	2006 10 13 22 00 00			0.00000	rel
35	GPS2	2006 10 14 00 00 00			0.00000	rel
36	GPS2	2006 10 14 02 00 00			0.00000	rel
37	GPS2	2006 10 14 04 00 00			0.00000	rel
38	GPS2	2006 10 14 06 00 00			0.00000	rel
39	GPS2	2006 10 14 08 00 00			0.00000	rel
40	GPS2	2006 10 14 10 00 00			0.00000	rel
41	GPS2	2006 10 14 12 00 00			0.00000	rel
42	GPS3	2006 10 11 04 00 00			0.00000	abs
43	GPS3	2006 10 11 06 00 00			0.00000	rel
44	GPS3	2006 10 11 08 00 00			0.00000	rel

45	GPS3	2006 10 11 10 00 00	0.00000	rel
46	GPS3	2006 10 11 12 00 00	0.00000	rel
47	GPS3	2006 10 11 14 00 00	0.00000	rel
48	GPS3	2006 10 11 16 00 00	0.00000	rel
49	GPS3	2006 10 11 18 00 00	0.00000	rel
50	GPS3	2006 10 11 20 00 00	0.00000	rel
51	GPS3	2006 10 11 22 00 00	0.00000	rel
52	GPS3	2006 10 12 00 00 00	0.00000	rel
53	GPS3	2006 10 12 02 00 00	0.00000	rel
54	GPS3	2006 10 12 04 00 00	0.00000	rel
55	GPS3	2006 10 12 06 00 00	0.00000	rel
56	GPS3	2006 10 12 08 00 00	0.00000	rel
57	GPS3	2006 10 12 10 00 00	0.00000	rel
58	GPS3	2006 10 12 12 00 00	0.00000	rel
59	GPS3	2006 10 12 14 00 00	0.00000	rel
60	GPS3	2006 10 12 16 00 00	0.00000	rel
61	GPS3	2006 10 12 18 00 00	0.00000	rel
62	GPS3	2006 10 12 20 00 00	0.00000	rel
63	GPS3	2006 10 12 22 00 00	0.00000	rel
64	GPS3	2006 10 13 00 00 00	0.00000	rel
65	GPS3	2006 10 13 02 00 00	0.00000	rel
66	GPS3	2006 10 13 04 00 00	0.00000	rel
67	GPS3	2006 10 13 06 00 00	0.00000	rel
68	GPS3	2006 10 13 08 00 00	0.00000	rel
69	GPS3	2006 10 13 10 00 00	0.00000	rel
70	GPS3	2006 10 13 12 00 00	0.00000	rel
71	GPS3	2006 10 13 14 00 00	0.00000	rel
72	GPS3	2006 10 13 16 00 00	0.00000	rel
73	GPS3	2006 10 13 18 00 00	0.00000	rel
74	GPS3	2006 10 13 20 00 00	0.00000	rel
75	GPS3	2006 10 13 22 00 00	0.00000	rel
76	GPS3	2006 10 14 00 00 00	0.00000	rel
77	GPS3	2006 10 14 02 00 00	0.00000	rel
78	GPS3	2006 10 14 04 00 00	0.00000	rel
79	GPS3	2006 10 14 06 00 00	0.00000	rel
80	GPS3	2006 10 14 08 00 00	0.00000	rel
81	GPS3	2006 10 14 10 00 00	0.00000	rel
82	GPS3	2006 10 14 12 00 00	0.00000	rel
83	GPS4	2006 10 11 04 00 00	0.00000	abs
84	GPS4	2006 10 11 06 00 00	0.00000	rel
85	GPS4	2006 10 11 08 00 00	0.00000	rel
86	GPS4	2006 10 11 10 00 00	0.00000	rel
87	GPS4	2006 10 11 12 00 00	0.00000	rel
88	GPS4	2006 10 11 14 00 00	0.00000	rel
89	GPS4	2006 10 11 16 00 00	0.00000	rel
90	GPS4	2006 10 11 18 00 00	0.00000	rel
91	GPS4	2006 10 11 20 00 00	0.00000	rel
92	GPS4	2006 10 11 22 00 00	0.00000	rel
93	GPS4	2006 10 12 00 00 00	0.00000	rel
94	GPS4	2006 10 12 02 00 00	0.00000	rel
95	GPS4	2006 10 12 04 00 00	0.00000	rel
96	GPS4	2006 10 12 06 00 00	0.00000	rel
97	GPS4	2006 10 12 08 00 00	0.00000	rel

98	GPS4	2006 10 12 10 00 00	0.00000	rel
99	GPS4	2006 10 12 12 00 00	0.00000	rel
100	GPS4	2006 10 12 14 00 00	0.00000	rel
101	GPS4	2006 10 12 16 00 00	0.00000	rel
102	GPS4	2006 10 12 18 00 00	0.00000	rel
103	GPS4	2006 10 12 20 00 00	0.00000	rel
104	GPS4	2006 10 12 22 00 00	0.00000	rel
105	GPS4	2006 10 13 00 00 00	0.00000	rel
106	GPS4	2006 10 13 02 00 00	0.00000	rel
107	GPS4	2006 10 13 04 00 00	0.00000	rel
108	GPS4	2006 10 13 06 00 00	0.00000	rel
109	GPS4	2006 10 13 08 00 00	0.00000	rel
110	GPS4	2006 10 13 10 00 00	0.00000	rel
111	GPS4	2006 10 13 12 00 00	0.00000	rel
112	GPS4	2006 10 13 14 00 00	0.00000	rel
113	GPS4	2006 10 13 16 00 00	0.00000	rel
114	GPS4	2006 10 13 18 00 00	0.00000	rel
115	GPS4	2006 10 13 20 00 00	0.00000	rel
116	GPS4	2006 10 13 22 00 00	0.00000	rel
117	GPS4	2006 10 14 00 00 00	0.00000	rel
118	GPS4	2006 10 14 02 00 00	0.00000	rel
119	GPS4	2006 10 14 04 00 00	0.00000	rel
120	GPS4	2006 10 14 06 00 00	0.00000	rel
121	GPS4	2006 10 14 08 00 00	0.00000	rel
122	GPS4	2006 10 14 10 00 00	0.00000	rel
123	GPS4	2006 10 14 12 00 00	0.00000	rel
124	GPS5	2006 10 11 04 00 00	0.00000	abs
125	GPS5	2006 10 11 06 00 00	0.00000	rel
126	GPS5	2006 10 11 08 00 00	0.00000	rel
127	GPS5	2006 10 11 10 00 00	0.00000	rel
128	GPS5	2006 10 11 12 00 00	0.00000	rel
129	GPS5	2006 10 11 14 00 00	0.00000	rel
130	GPS5	2006 10 11 16 00 00	0.00000	rel
131	GPS5	2006 10 11 18 00 00	0.00000	rel
132	GPS5	2006 10 11 20 00 00	0.00000	rel
133	GPS5	2006 10 11 22 00 00	0.00000	rel
134	GPS5	2006 10 12 00 00 00	0.00000	rel
135	GPS5	2006 10 12 02 00 00	0.00000	rel
136	GPS5	2006 10 12 04 00 00	0.00000	rel
137	GPS5	2006 10 12 06 00 00	0.00000	rel
138	GPS5	2006 10 12 08 00 00	0.00000	rel
139	GPS5	2006 10 12 10 00 00	0.00000	rel
140	GPS5	2006 10 12 12 00 00	0.00000	rel
141	GPS5	2006 10 12 14 00 00	0.00000	rel
142	GPS5	2006 10 12 16 00 00	0.00000	rel
143	GPS5	2006 10 12 18 00 00	0.00000	rel
144	GPS5	2006 10 12 20 00 00	0.00000	rel
145	GPS5	2006 10 12 22 00 00	0.00000	rel
146	GPS5	2006 10 13 00 00 00	0.00000	rel
147	GPS5	2006 10 13 02 00 00	0.00000	rel
148	GPS5	2006 10 13 04 00 00	0.00000	rel
149	GPS5	2006 10 13 06 00 00	0.00000	rel
150	GPS5	2006 10 13 08 00 00	0.00000	rel

151	GPS5	2006 10 13 10 00 00	0.00000	rel
152	GPS5	2006 10 13 12 00 00	0.00000	rel
153	GPS5	2006 10 13 14 00 00	0.00000	rel
154	GPS5	2006 10 13 16 00 00	0.00000	rel
155	GPS5	2006 10 13 18 00 00	0.00000	rel
156	GPS5	2006 10 13 20 00 00	0.00000	rel
157	GPS5	2006 10 13 22 00 00	0.00000	rel
158	GPS5	2006 10 14 00 00 00	0.00000	rel
159	GPS5	2006 10 14 02 00 00	0.00000	rel
160	GPS5	2006 10 14 04 00 00	0.00000	rel
161	GPS5	2006 10 14 06 00 00	0.00000	rel
162	GPS5	2006 10 14 08 00 00	0.00000	rel
163	GPS5	2006 10 14 10 00 00	0.00000	rel
164	GPS5	2006 10 14 12 00 00	0.00000	rel
165	GPS6	2006 10 11 04 00 00	0.00000	abs
166	GPS6	2006 10 11 06 00 00	0.00000	rel
167	GPS6	2006 10 11 08 00 00	0.00000	rel
168	GPS6	2006 10 11 10 00 00	0.00000	rel
169	GPS6	2006 10 11 12 00 00	0.00000	rel
170	GPS6	2006 10 11 14 00 00	0.00000	rel
171	GPS6	2006 10 11 16 00 00	0.00000	rel
172	GPS6	2006 10 11 18 00 00	0.00000	rel
173	GPS6	2006 10 11 20 00 00	0.00000	rel
174	GPS6	2006 10 11 22 00 00	0.00000	rel
175	GPS6	2006 10 12 00 00 00	0.00000	rel
176	GPS6	2006 10 12 02 00 00	0.00000	rel
177	GPS6	2006 10 12 04 00 00	0.00000	rel
178	GPS6	2006 10 12 06 00 00	0.00000	rel
179	GPS6	2006 10 12 08 00 00	0.00000	rel
180	GPS6	2006 10 12 10 00 00	0.00000	rel
181	GPS6	2006 10 12 12 00 00	0.00000	rel
182	GPS6	2006 10 12 14 00 00	0.00000	rel
183	GPS6	2006 10 12 16 00 00	0.00000	rel
184	GPS6	2006 10 12 18 00 00	0.00000	rel
185	GPS6	2006 10 12 20 00 00	0.00000	rel
186	GPS6	2006 10 12 22 00 00	0.00000	rel
187	GPS6	2006 10 13 00 00 00	0.00000	rel
188	GPS6	2006 10 13 02 00 00	0.00000	rel
189	GPS6	2006 10 13 04 00 00	0.00000	rel
190	GPS6	2006 10 13 06 00 00	0.00000	rel
191	GPS6	2006 10 13 08 00 00	0.00000	rel
192	GPS6	2006 10 13 10 00 00	0.00000	rel
193	GPS6	2006 10 13 12 00 00	0.00000	rel
194	GPS6	2006 10 13 14 00 00	0.00000	rel
195	GPS6	2006 10 13 16 00 00	0.00000	rel
196	GPS6	2006 10 13 18 00 00	0.00000	rel
197	GPS6	2006 10 13 20 00 00	0.00000	rel
198	GPS6	2006 10 13 22 00 00	0.00000	rel
199	GPS6	2006 10 14 00 00 00	0.00000	rel
200	GPS6	2006 10 14 02 00 00	0.00000	rel
201	GPS6	2006 10 14 04 00 00	0.00000	rel
202	GPS6	2006 10 14 06 00 00	0.00000	rel
203	GPS6	2006 10 14 08 00 00	0.00000	rel

204	GPS6	2006 10 14 10 00 00	0.00000	rel
205	GPS6	2006 10 14 12 00 00	0.00000	rel
206	GPS7	2006 10 11 04 00 00	0.00000	abs
207	GPS7	2006 10 11 06 00 00	0.00000	rel
208	GPS7	2006 10 11 08 00 00	0.00000	rel
209	GPS7	2006 10 11 10 00 00	0.00000	rel
210	GPS7	2006 10 11 12 00 00	0.00000	rel
211	GPS7	2006 10 11 14 00 00	0.00000	rel
212	GPS7	2006 10 11 16 00 00	0.00000	rel
213	GPS7	2006 10 11 18 00 00	0.00000	rel
214	GPS7	2006 10 11 20 00 00	0.00000	rel
215	GPS7	2006 10 11 22 00 00	0.00000	rel
216	GPS7	2006 10 12 00 00 00	0.00000	rel
217	GPS7	2006 10 12 02 00 00	0.00000	rel
218	GPS7	2006 10 12 04 00 00	0.00000	rel
219	GPS7	2006 10 12 06 00 00	0.00000	rel
220	GPS7	2006 10 12 08 00 00	0.00000	rel
221	GPS7	2006 10 12 10 00 00	0.00000	rel
222	GPS7	2006 10 12 12 00 00	0.00000	rel
223	GPS7	2006 10 12 14 00 00	0.00000	rel
224	GPS7	2006 10 12 16 00 00	0.00000	rel
225	GPS7	2006 10 12 18 00 00	0.00000	rel
226	GPS7	2006 10 12 20 00 00	0.00000	rel
227	GPS7	2006 10 12 22 00 00	0.00000	rel
228	GPS7	2006 10 13 00 00 00	0.00000	rel
229	GPS7	2006 10 13 02 00 00	0.00000	rel
230	GPS7	2006 10 13 04 00 00	0.00000	rel
231	GPS7	2006 10 13 06 00 00	0.00000	rel
232	GPS7	2006 10 13 08 00 00	0.00000	rel
233	GPS7	2006 10 13 10 00 00	0.00000	rel
234	GPS7	2006 10 13 12 00 00	0.00000	rel
235	GPS7	2006 10 13 14 00 00	0.00000	rel
236	GPS7	2006 10 13 16 00 00	0.00000	rel
237	GPS7	2006 10 13 18 00 00	0.00000	rel
238	GPS7	2006 10 13 20 00 00	0.00000	rel
239	GPS7	2006 10 13 22 00 00	0.00000	rel
240	GPS7	2006 10 14 00 00 00	0.00000	rel
241	GPS7	2006 10 14 02 00 00	0.00000	rel
242	GPS7	2006 10 14 04 00 00	0.00000	rel
243	GPS7	2006 10 14 06 00 00	0.00000	rel
244	GPS7	2006 10 14 08 00 00	0.00000	rel
245	GPS7	2006 10 14 10 00 00	0.00000	rel
246	GPS7	2006 10 14 12 00 00	0.00000	rel
247	GPS8	2006 10 11 04 00 00	0.00000	abs
248	GPS8	2006 10 11 06 00 00	0.00000	rel
249	GPS8	2006 10 11 08 00 00	0.00000	rel
250	GPS8	2006 10 11 10 00 00	0.00000	rel
251	GPS8	2006 10 11 12 00 00	0.00000	rel
252	GPS8	2006 10 11 14 00 00	0.00000	rel
253	GPS8	2006 10 11 16 00 00	0.00000	rel
254	GPS8	2006 10 11 18 00 00	0.00000	rel
255	GPS8	2006 10 11 20 00 00	0.00000	rel
256	GPS8	2006 10 11 22 00 00	0.00000	rel

257	GPS8	2006 10 12 00 00 00	0.00000	rel
258	GPS8	2006 10 12 02 00 00	0.00000	rel
259	GPS8	2006 10 12 04 00 00	0.00000	rel
260	GPS8	2006 10 12 06 00 00	0.00000	rel
261	GPS8	2006 10 12 08 00 00	0.00000	rel
262	GPS8	2006 10 12 10 00 00	0.00000	rel
263	GPS8	2006 10 12 12 00 00	0.00000	rel
264	GPS8	2006 10 12 14 00 00	0.00000	rel
265	GPS8	2006 10 12 16 00 00	0.00000	rel
266	GPS8	2006 10 12 18 00 00	0.00000	rel
267	GPS8	2006 10 12 20 00 00	0.00000	rel
268	GPS8	2006 10 12 22 00 00	0.00000	rel
269	GPS8	2006 10 13 00 00 00	0.00000	rel
270	GPS8	2006 10 13 02 00 00	0.00000	rel
271	GPS8	2006 10 13 04 00 00	0.00000	rel
272	GPS8	2006 10 13 06 00 00	0.00000	rel
273	GPS8	2006 10 13 08 00 00	0.00000	rel
274	GPS8	2006 10 13 10 00 00	0.00000	rel
275	GPS8	2006 10 13 12 00 00	0.00000	rel
276	GPS8	2006 10 13 14 00 00	0.00000	rel
277	GPS8	2006 10 13 16 00 00	0.00000	rel
278	GPS8	2006 10 13 18 00 00	0.00000	rel
279	GPS8	2006 10 13 20 00 00	0.00000	rel
280	GPS8	2006 10 13 22 00 00	0.00000	rel
281	GPS8	2006 10 14 00 00 00	0.00000	rel
282	GPS8	2006 10 14 02 00 00	0.00000	rel
283	GPS8	2006 10 14 04 00 00	0.00000	rel
284	GPS8	2006 10 14 06 00 00	0.00000	rel
285	GPS8	2006 10 14 08 00 00	0.00000	rel
286	GPS8	2006 10 14 10 00 00	0.00000	rel
287	GPS8	2006 10 14 12 00 00	0.00000	rel
288	GPS9	2006 10 11 04 00 00	0.00000	abs
289	GPS9	2006 10 11 06 00 00	0.00000	rel
290	GPS9	2006 10 11 08 00 00	0.00000	rel
291	GPS9	2006 10 11 10 00 00	0.00000	rel
292	GPS9	2006 10 11 12 00 00	0.00000	rel
293	GPS9	2006 10 11 14 00 00	0.00000	rel
294	GPS9	2006 10 11 16 00 00	0.00000	rel
295	GPS9	2006 10 11 18 00 00	0.00000	rel
296	GPS9	2006 10 11 20 00 00	0.00000	rel
297	GPS9	2006 10 11 22 00 00	0.00000	rel
298	GPS9	2006 10 12 00 00 00	0.00000	rel
299	GPS9	2006 10 12 02 00 00	0.00000	rel
300	GPS9	2006 10 12 04 00 00	0.00000	rel
301	GPS9	2006 10 12 06 00 00	0.00000	rel
302	GPS9	2006 10 12 08 00 00	0.00000	rel
303	GPS9	2006 10 12 10 00 00	0.00000	rel
304	GPS9	2006 10 12 12 00 00	0.00000	rel
305	GPS9	2006 10 12 14 00 00	0.00000	rel
306	GPS9	2006 10 12 16 00 00	0.00000	rel
307	GPS9	2006 10 12 18 00 00	0.00000	rel
308	GPS9	2006 10 12 20 00 00	0.00000	rel
309	GPS9	2006 10 12 22 00 00	0.00000	rel

310	GPS9	2006 10 13 00 00 00	0.00000	rel
311	GPS9	2006 10 13 02 00 00	0.00000	rel
312	GPS9	2006 10 13 04 00 00	0.00000	rel
313	GPS9	2006 10 13 06 00 00	0.00000	rel
314	GPS9	2006 10 13 08 00 00	0.00000	rel
315	GPS9	2006 10 13 10 00 00	0.00000	rel
316	GPS9	2006 10 13 12 00 00	0.00000	rel
317	GPS9	2006 10 13 14 00 00	0.00000	rel
318	GPS9	2006 10 13 16 00 00	0.00000	rel
319	GPS9	2006 10 13 18 00 00	0.00000	rel
320	GPS9	2006 10 13 20 00 00	0.00000	rel
321	GPS9	2006 10 13 22 00 00	0.00000	rel
322	GPS9	2006 10 14 00 00 00	0.00000	rel
323	GPS9	2006 10 14 02 00 00	0.00000	rel
324	GPS9	2006 10 14 04 00 00	0.00000	rel
325	GPS9	2006 10 14 06 00 00	0.00000	rel
326	GPS9	2006 10 14 08 00 00	0.00000	rel
327	GPS9	2006 10 14 10 00 00	0.00000	rel
328	GPS9	2006 10 14 12 00 00	0.00000	rel
329	GP13	2006 10 11 04 00 00	0.00000	abs
330	GP13	2006 10 11 06 00 00	0.00000	rel
331	GP13	2006 10 11 08 00 00	0.00000	rel
332	GP13	2006 10 11 10 00 00	0.00000	rel
333	GP13	2006 10 11 12 00 00	0.00000	rel
334	GP13	2006 10 11 14 00 00	0.00000	rel
335	GP13	2006 10 11 16 00 00	0.00000	rel
336	GP13	2006 10 11 18 00 00	0.00000	rel
337	GP13	2006 10 11 20 00 00	0.00000	rel
338	GP13	2006 10 11 22 00 00	0.00000	rel
339	GP13	2006 10 12 00 00 00	0.00000	rel
340	GP13	2006 10 12 02 00 00	0.00000	rel
341	GP13	2006 10 12 04 00 00	0.00000	rel
342	GP13	2006 10 12 06 00 00	0.00000	rel
343	GP13	2006 10 12 08 00 00	0.00000	rel
344	GP13	2006 10 12 10 00 00	0.00000	rel
345	GP13	2006 10 12 12 00 00	0.00000	rel
346	GP13	2006 10 12 14 00 00	0.00000	rel
347	GP13	2006 10 12 16 00 00	0.00000	rel
348	GP13	2006 10 12 18 00 00	0.00000	rel
349	GP13	2006 10 12 20 00 00	0.00000	rel
350	GP13	2006 10 12 22 00 00	0.00000	rel
351	GP13	2006 10 13 00 00 00	0.00000	rel
352	GP13	2006 10 13 02 00 00	0.00000	rel
353	GP13	2006 10 13 04 00 00	0.00000	rel
354	GP13	2006 10 13 06 00 00	0.00000	rel
355	GP13	2006 10 13 08 00 00	0.00000	rel
356	GP13	2006 10 13 10 00 00	0.00000	rel
357	GP13	2006 10 13 12 00 00	0.00000	rel
358	GP13	2006 10 13 14 00 00	0.00000	rel
359	GP13	2006 10 13 16 00 00	0.00000	rel
360	GP13	2006 10 13 18 00 00	0.00000	rel
361	GP13	2006 10 13 20 00 00	0.00000	rel
362	GP13	2006 10 13 22 00 00	0.00000	rel

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363 GP13      2006 10 14 00 00 00      0.00000      rel
364 GP13      2006 10 14 02 00 00      0.00000      rel
365 GP13      2006 10 14 04 00 00      0.00000      rel
366 GP13      2006 10 14 06 00 00      0.00000      rel
367 GP13      2006 10 14 08 00 00      0.00000      rel
368 GP13      2006 10 14 10 00 00      0.00000      rel
369 GP13      2006 10 14 12 00 00      0.00000      rel

```

IONOSPHERE MODELS: \${P}/OLKI06S\ATM\OLKI06S.ION

TYPE OF IONOSPHERE MODELS : LOCAL
RADIUS OF THE EARTH : 6378.14 KM

MODEL	DEG. OF DEVELOP.			VALIDITY START	VALIDITY END	ORIGIN OF DEVELOPMENT			HEIGHT (KM)	NORMAIZATION FACTORS		
	TIME	LAT.	MIXED			LOCAL TIME	LAT. (D)	LONG. (D)		TIME (H)	LAT. (D)	ELE.CONT.
1	2	1	2	2006 10 10 23.0	2006 10 11 7.0	2006 10 11 3.0	61.23	21.47	450	2.00	6.00	0.10D+18
2	2	1	2	2006 10 11 5.0	2006 10 11 13.0	2006 10 11 9.0	61.23	21.47	450	2.00	6.00	0.10D+18
3	2	1	2	2006 10 11 11.0	2006 10 11 19.0	2006 10 11 15.0	61.23	21.47	450	2.00	6.00	0.10D+18
4	2	1	2	2006 10 11 17.0	2006 10 12 1.0	2006 10 11 21.0	61.23	21.47	450	2.00	6.00	0.10D+18
5	2	1	2	2006 10 11 23.0	2006 10 12 7.0	2006 10 12 3.0	61.23	21.47	450	2.00	6.00	0.10D+18
6	2	1	2	2006 10 12 5.0	2006 10 12 13.0	2006 10 12 9.0	61.23	21.47	450	2.00	6.00	0.10D+18
7	2	1	2	2006 10 12 11.0	2006 10 12 19.0	2006 10 12 15.0	61.23	21.47	450	2.00	6.00	0.10D+18
8	2	1	2	2006 10 12 17.0	2006 10 13 1.0	2006 10 12 21.0	61.23	21.47	450	2.00	6.00	0.10D+18
9	2	1	2	2006 10 12 23.0	2006 10 13 7.0	2006 10 13 3.0	61.23	21.47	450	2.00	6.00	0.10D+18
10	2	1	2	2006 10 13 5.0	2006 10 13 13.0	2006 10 13 9.0	61.23	21.47	450	2.00	6.00	0.10D+18
11	2	1	2	2006 10 13 11.0	2006 10 13 19.0	2006 10 13 15.0	61.23	21.47	450	2.00	6.00	0.10D+18
12	2	1	2	2006 10 13 17.0	2006 10 14 1.0	2006 10 13 21.0	61.23	21.47	450	2.00	6.00	0.10D+18
13	2	1	2	2006 10 13 23.0	2006 10 14 7.0	2006 10 14 3.0	61.23	21.47	450	2.00	6.00	0.10D+18
14	2	1	2	2006 10 14 5.0	2006 10 14 13.0	2006 10 14 9.0	61.23	21.47	450	2.00	6.00	0.10D+18
15	2	1	2	2006 10 14 11.0	2006 10 14 19.0	2006 10 14 15.0	61.23	21.47	450	2.00	6.00	0.10D+18

MODEL	TERM	POL. DEGREE IN		COEFFICIENT	SIGMA
		TIME	LATIT.		
1	1	0	0	0.222308E+00	0.473350E-02
	2	1	0	0.102805E+00	0.124095E-02
	3	2	0	0.869524E-01	0.109815E-02
	4	0	1	-0.155447E+00	0.171512E-02
	5	1	1	0.115799E-01	0.165555E-02
2	1	0	0	0.102383E+01	0.510645E-02
	2	1	0	0.160282E+00	0.135811E-02
	3	2	0	-0.601064E-01	0.117798E-02
	4	0	1	-0.119350E+00	0.198756E-02
	5	1	1	-0.310170E-01	0.207991E-02
3	1	0	0	0.870297E+00	0.458404E-02
	2	1	0	-0.200744E+00	0.130304E-02

	3	2	0	0.178735E-01	0.109644E-02
	4	0	1	-0.184793E+00	0.164817E-02
	5	1	1	-0.239978E-01	0.150325E-02
4	1	0	0	0.308840E+00	0.539139E-02
	2	1	0	-0.520152E-01	0.154470E-02
	3	2	0	0.142496E-01	0.132363E-02
	4	0	1	-0.207054E+00	0.208285E-02
	5	1	1	-0.219318E-01	0.252806E-02
5	1	0	0	0.223534E+00	0.525225E-02
	2	1	0	0.939255E-01	0.137592E-02
	3	2	0	0.901439E-01	0.120353E-02
	4	0	1	-0.171788E+00	0.192294E-02
	5	1	1	0.124904E-01	0.186313E-02
6	1	0	0	0.106520E+01	0.469382E-02
	2	1	0	0.169231E+00	0.124858E-02
	3	2	0	-0.523796E-01	0.107411E-02
	4	0	1	-0.139619E+00	0.185160E-02
	5	1	1	-0.116037E-01	0.197072E-02
7	1	0	0	0.837550E+00	0.478900E-02
	2	1	0	-0.174248E+00	0.136990E-02
	3	2	0	0.419678E-01	0.113521E-02
	4	0	1	-0.209059E+00	0.172992E-02
	5	1	1	-0.178348E-01	0.159139E-02
8	1	0	0	0.352625E+00	0.611408E-02
	2	1	0	-0.678367E-01	0.175303E-02
	3	2	0	0.948053E-02	0.148835E-02
	4	0	1	-0.233652E+00	0.236714E-02
	5	1	1	-0.312179E-01	0.285570E-02
9	1	0	0	0.309339E+00	0.525143E-02
	2	1	0	0.662749E-01	0.144103E-02
	3	2	0	0.746158E-01	0.122817E-02
	4	0	1	-0.158452E+00	0.188430E-02
	5	1	1	-0.531328E-02	0.202735E-02
10	1	0	0	0.158839E+01	0.111755E-01
	2	1	0	0.221805E+00	0.294971E-02
	3	2	0	-0.168200E+00	0.251816E-02
	4	0	1	-0.179154E+00	0.446843E-02
	5	1	1	-0.146841E+00	0.471795E-02
11	1	0	0	0.820171E+00	0.574208E-02
	2	1	0	-0.128326E+00	0.157696E-02
	3	2	0	-0.875789E-02	0.135764E-02
	4	0	1	-0.213746E+00	0.202978E-02
	5	1	1	-0.568735E-01	0.185634E-02
12	1	0	0	0.690775E+00	0.820355E-02

	2	1	0	0.241974E-01	0.234779E-02
	3	2	0	-0.273467E-01	0.192164E-02
	4	0	1	-0.116037E+00	0.318145E-02
	5	1	1	0.726539E-01	0.376046E-02
13	1	0	0	0.355119E+00	0.366068E-02
	2	1	0	0.218182E-01	0.100577E-02
	3	2	0	0.750801E-01	0.851150E-03
	4	0	1	-0.110774E+00	0.132660E-02
	5	1	1	0.152410E-01	0.140001E-02
14	1	0	0	0.824038E+00	0.535273E-02
	2	1	0	0.787047E-01	0.141123E-02
	3	2	0	-0.482774E-01	0.119481E-02
	4	0	1	-0.155496E+00	0.215718E-02
	5	1	1	-0.232475E-01	0.224486E-02
15	1	0	0	0.697896E+00	0.529092E-02
	2	1	0	-0.159858E+00	0.146310E-02
	3	2	0	0.859208E-03	0.124798E-02
	4	0	1	-0.187766E+00	0.189067E-02
	5	1	1	-0.195337E-01	0.172965E-02

1\${P}/OLKI06S
OLKI06S

PROGRAM GPSEST 19-JAN-07 13:03
BERNESE GPS SOFTWARE VERSION 5.0

93

8. POLE COORDINATES AND TIME INFORMATION

A PRIORI POLE AND TIME INFORMATION FROM THE POLE FILE:

DATUM	TIME	X-POLE (") EP-CPO (")	Y-POLE (") PS-CPO (")	UT1-UTC (S)	GPS-UTC (S)	RMS XP (") RMS EP (")	RMS YP (") RMS PS (")	RMS DT (S)
06-10-11	00:00:00	0.01829 0.00000	0.25762 0.00000	0.130348	14.	0.00000 0.00000	0.00000 0.00000	0.000000
06-10-12	00:00:00	0.01571 0.00000	0.25794 0.00000	0.129318	14.	0.00000 0.00000	0.00000 0.00000	0.000000
06-10-13	00:00:00	0.01313 0.00000	0.25771 0.00000	0.128398	14.	0.00000 0.00000	0.00000 0.00000	0.000000
06-10-14	00:00:00	0.01130 0.00000	0.25742 0.00000	0.127579	14.	0.00000 0.00000	0.00000 0.00000	0.000000
06-10-15	00:00:00	0.00988 0.00000	0.25770 0.00000	0.126705	14.	0.00000 0.00000	0.00000 0.00000	0.000000

NUTATION MODEL: IAU2000
SUBDAILY POLE MODEL: IERS2000

1\${P}/OLKI06S
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PROGRAM GPSEST 19-JAN-07 13:03
BERNESE GPS SOFTWARE VERSION 5.0

12. TEST OUTPUT

MIN. AND MAX. ELEVATION/NADIR ANGLES AND MAX. SYNCHRONIZATION ERRORS:

SESS	FILE	STATION NAME 1	STATION NAME 2	MIN/MAX ELEV.	MIN/MAX NADIR	SYNCH. ERR. (NS)
2860	1	GPS1	GPS2	20.0 80.0	2.4 13.2	0.0
2870	2	GPS1	GPS2	20.0 83.6	1.5 13.2	0.0
2860	3	GPS1	GPS3	20.0 80.0	2.4 13.2	0.0
2870	4	GPS1	GPS3	20.0 83.6	1.5 13.2	0.0
2840	5	GPS1	GPS4	20.0 80.0	2.4 13.2	0.0
2850	6	GPS1	GPS4	20.0 83.6	1.5 13.2	0.0
2840	7	GPS1	GPS5	20.0 80.0	2.4 13.2	0.0
2850	8	GPS1	GPS5	20.0 83.6	1.5 13.2	0.0
2860	9	GPS1	GPS5	20.0 80.0	2.4 13.2	0.0
2870	10	GPS1	GPS5	20.0 83.6	1.5 13.2	0.0
2840	11	GPS1	GPS6	20.0 80.0	2.4 13.2	0.0
2850	12	GPS1	GPS6	20.0 83.6	1.5 13.2	0.0
2860	13	GPS1	GPS6	20.0 80.0	2.4 13.2	0.0
2870	14	GPS1	GPS6	20.0 83.6	1.5 13.2	0.0
2840	15	GPS1	GPS7	20.0 80.0	2.4 13.2	0.0
2850	16	GPS1	GPS7	20.0 83.6	1.5 13.2	0.0
2840	17	GPS1	GPS8	20.0 80.0	2.4 13.2	0.0
2850	18	GPS1	GPS8	20.0 83.6	1.5 13.2	0.0
2860	19	GPS1	GPS8	20.0 80.0	2.4 13.2	0.0
2870	20	GPS1	GPS8	20.0 83.6	1.5 13.2	0.0
2840	21	GPS6	GPS9	20.0 80.0	2.4 13.2	0.0
2850	22	GPS6	GPS9	20.0 83.6	1.5 13.2	0.0
2860	23	GPS6	GPS9	20.0 80.0	2.4 13.2	0.0
2870	24	GPS6	GPS9	20.0 83.6	1.5 13.2	0.0
2840	25	GPS6	GP13	20.0 80.0	2.4 13.2	0.0
2850	26	GPS6	GP13	20.0 83.6	1.5 13.2	0.0
2860	27	GPS6	GP13	20.0 80.0	2.4 13.2	0.0
2870	28	GPS6	GP13	20.0 83.6	1.5 13.2	0.0

1\${P}/OLKI06S
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PROGRAM GPSEST 19-JAN-07 13:03
BERNESE GPS SOFTWARE VERSION 5.0

13. RESULTS (PART 1)

 NUMBER OF PARAMETERS (PART 1):

PARAMETER TYPE	#PARAMETERS	#PRE-ELIMINATED	#SET-UP	#NO-OBS	#REF	#SINGULAR
STATION COORDINATES	30	0	30	0	0	0
AMBIGUITIES	26	26 (BEFORE INV)	918	892	0	0
SITE-SPECIFIC TROPOSPHERE PARAMETERS	369	0	369	0	0	151

TOTAL NUMBER OF PARAMETERS	425	26	1317	892	0	151

NUMBER OF OBSERVATIONS (PART 1):

TYPE	FREQUENCY	FILE	#OBSERVATIONS
PHASE	L1	ALL	242315
PHASE	L2	ALL	242315

TOTAL NUMBER OF OBSERVATIONS			484630

A POSTERIORI SIGMA OF UNIT WEIGHT (PART 1):

A POSTERIORI SIGMA OF UNIT WEIGHT : 0.0019 M (SIGMA OF ONE-WAY L1 PHASE OBSERVABLE AT ZENITH)
 DEGREE OF FREEDOM (DOF) : 484356
 CHI**2/DOF : 3.58

1\${P}/OLKI06S
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PROGRAM GPSEST 19-JAN-07 13:03
 BERNESE GPS SOFTWARE VERSION 5.0

STATION COORDINATES: \${P}/OLKI06S\STA\TOLKI06S.CRD

NUM	STATION NAME	PARAMETER	A PRIORI VALUE	NEW VALUE	NEW- A PRIORI	RMS ERROR	3-D ELLIPSOID	2-D ELLIPSE
1	GPS1	X	2863210.1067	2863210.1067	0.0000	0.0000		
		Y	1126271.4390	1126271.4390	0.0000	0.0000		

	Z	5568267.2990	5568267.2990	0.0000	0.0000					
	HEIGHT	30.5520	30.5520	0.0000	0.0000	0.0000	0.0			
	LATITUDE	61 14 22.754183	61 14 22.754183	0.0000	0.0000	0.0000	90.0	0.0000	90.0	
	LONGITUDE	21 28 21.633926	21 28 21.633926	0.0000	0.0000	0.0000	0.0	0.0000		
2	GPS2									
	X	2863312.4876	2863312.4880	0.0004	0.0002					
	Y	1127586.4513	1127586.4513	0.0000	0.0001					
	Z	5567953.2561	5567953.2572	0.0011	0.0004					
	HEIGHT	32.8443	32.8454	0.0012	0.0004	0.0004	0.4			
	LATITUDE	61 14 1.535088	61 14 1.535094	0.0002	0.0001	0.0000	91.1	0.0000	91.1	
	LONGITUDE	21 29 41.145601	21 29 41.145590	-0.0002	0.0000	0.0001	0.0	0.0001		
3	GPS3									
	X	2862323.4428	2862323.4444	0.0016	0.0002					
	Y	1126533.7706	1126533.7723	0.0017	0.0001					
	Z	5568664.0772	5568664.0785	0.0013	0.0004					
	HEIGHT	27.6613	27.6634	0.0021	0.0004	0.0004	0.3			
	LATITUDE	61 14 49.568852	61 14 49.568812	-0.0012	0.0001	0.0000	91.0	0.0000	91.0	
	LONGITUDE	21 28 59.767954	21 28 59.768018	0.0010	0.0000	0.0001	0.0	0.0001		
4	GPS4									
	X	2862758.9415	2862758.9472	0.0057	0.0002					
	Y	1125923.2376	1125923.2383	0.0007	0.0001					
	Z	5568566.0154	5568566.0237	0.0083	0.0003					
	HEIGHT	29.1133	29.1233	0.0100	0.0004	0.0004	0.5			
	LATITUDE	61 14 42.897724	61 14 42.897695	-0.0009	0.0001	0.0000	90.9	0.0000	90.8	
	LONGITUDE	21 28 10.980705	21 28 10.980606	-0.0015	0.0000	0.0001	-0.1	0.0001		
5	GPS5									
	X	2864192.3764	2864192.3694	-0.0070	0.0001					
	Y	1126421.6871	1126421.6853	-0.0018	0.0001					
	Z	5567725.8796	5567725.8623	-0.0173	0.0003					
	HEIGHT	22.2982	22.2796	-0.0186	0.0003	0.0003	0.4			
	LATITUDE	61 13 46.892454	61 13 46.892388	-0.0020	0.0000	0.0000	91.3	0.0000	91.3	
	LONGITUDE	21 28 6.906786	21 28 6.906844	0.0009	0.0000	0.0000	0.0	0.0000		
6	GPS6									
	X	2863910.3892	2863910.3942	0.0050	0.0001					
	Y	1125229.5963	1125229.5981	0.0018	0.0001					
	Z	5568112.5408	5568112.5513	0.0105	0.0003					
	HEIGHT	25.0654	25.0772	0.0117	0.0003	0.0003	0.4			
	LATITUDE	61 14 12.686451	61 14 12.686462	0.0003	0.0000	0.0000	90.7	0.0000	90.7	
	LONGITUDE	21 26 59.459035	21 26 59.459023	-0.0002	0.0000	0.0000	-0.1	0.0000		
7	GPS7									
	X	2863465.8530	2863465.8553	0.0023	0.0002					
	Y	1124819.7828	1124819.7830	0.0002	0.0001					
	Z	5568430.2557	5568430.2615	0.0058	0.0003					
	HEIGHT	32.4126	32.4187	0.0061	0.0004	0.0004	0.4			
	LATITUDE	61 14 33.586772	61 14 33.586800	0.0009	0.0001	0.0000	90.9	0.0000	90.9	
	LONGITUDE	21 26 44.784815	21 26 44.784772	-0.0006	0.0000	0.0001	-0.1	0.0001		

8	GPS8	X	2863019.7046	2863019.7076	0.0030	0.0001					
		Y	1124739.5538	1124739.5536	-0.0002	0.0001					
		Z	5568666.6848	5568666.6909	0.0061	0.0003					
		HEIGHT	25.8084	25.8151	0.0066	0.0003	0.0003	0.4			
		LATITUDE	61 14 49.853077	61 14 49.853094	0.0005	0.0000	0.0000	90.7	0.0000	90.7	
		LONGITUDE	21 26 50.715669	21 26 50.715582	-0.0013	0.0000	0.0000	-0.1	0.0000		
9	GPS9	X	2863742.0387	2863742.0406	0.0019	0.0001					
		Y	1123996.6145	1123996.6143	-0.0002	0.0001					
		Z	5568453.4720	5568453.4791	0.0071	0.0003					
		HEIGHT	31.7025	31.7095	0.0070	0.0003	0.0003	0.4			
		LATITUDE	61 14 35.187574	61 14 35.187637	0.0019	0.0000	0.0000	90.7	0.0000	90.6	
		LONGITUDE	21 25 46.644762	21 25 46.644703	-0.0009	0.0000	0.0000	-0.1	0.0000		
10	GP13	X	2864309.0028	2864309.0094	0.0066	0.0001					
		Y	1124134.0361	1124134.0385	0.0024	0.0001					
		Z	5568134.1930	5568134.1989	0.0059	0.0003					
		HEIGHT	29.8962	29.9048	0.0086	0.0003	0.0003	0.4			
		LATITUDE	61 14 13.855835	61 14 13.855728	-0.0033	0.0000	0.0000	90.6	0.0000	90.6	
		LONGITUDE	21 25 41.334054	21 25 41.334041	-0.0002	0.0000	0.0000	-0.1	0.0000		

1\${P}/OLKI06S
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PROGRAM GPSEST 19-JAN-07 13:03
BERNESE GPS SOFTWARE VERSION 5.0

SITE-SPECIFIC TROPOSPHERE PARAMETERS: (NOT SAVED)

REQU.	STATION NAME	CORRECTIONS (M)			RMS ERRORS (M)			ZENITH VECTOR (")			ERROR ELLIPSE (M)					
		NORTH	EAST	ZENITH	NORTH	EAST	ZENITH	ANGLE	RMS	RATIO	AZI	MAX	RMS	MIN	RMS	AZI
1	GPS2			0.00000			0.00000									
2	GPS2			0.00000			0.00000									
3	GPS2			0.00000			0.00000									
4	GPS2			0.00000			0.00000									
5	GPS2			0.00000			0.00000									
6	GPS2			0.00000			0.00000									
7	GPS2			0.00000			0.00000									
8	GPS2			0.00000			0.00000									
9	GPS2			0.00000			0.00000									
10	GPS2			0.00000			0.00000									
11	GPS2			0.00000			0.00000									
12	GPS2			0.00000			0.00000									
13	GPS2			0.00000			0.00000									
14	GPS2			0.00000			0.00000									
15	GPS2			0.00000			0.00000									

16	GPS2	0.00000	0.00000
17	GPS2	0.00000	0.00000
18	GPS2	0.00000	0.00000
19	GPS2	0.00000	0.00000
20	GPS2	0.00000	0.00000
21	GPS2	0.00000	0.00000
22	GPS2	0.00000	0.00000
23	GPS2	0.00000	0.00000
24	GPS2	0.00000	0.00000
25	GPS2	0.00000	0.00000
26	GPS2	0.00089	0.00085
27	GPS2	-0.00044	0.00031
28	GPS2	-0.00152	0.00027
29	GPS2	-0.00095	0.00028
30	GPS2	0.00018	0.00028
31	GPS2	0.00025	0.00028
32	GPS2	0.00175	0.00028
33	GPS2	-0.00087	0.00030
34	GPS2	0.00140	0.00029
35	GPS2	-0.00182	0.00029
36	GPS2	0.00039	0.00029
37	GPS2	-0.00081	0.00027
38	GPS2	0.00117	0.00030
39	GPS2	-0.00060	0.00030
40	GPS2	-0.00202	0.00058
41	GPS2	0.00000	0.00000
42	GPS3	0.00000	0.00000
43	GPS3	0.00000	0.00000
44	GPS3	0.00000	0.00000
45	GPS3	0.00000	0.00000
46	GPS3	0.00000	0.00000
47	GPS3	0.00000	0.00000
48	GPS3	0.00000	0.00000
49	GPS3	0.00000	0.00000
50	GPS3	0.00000	0.00000
51	GPS3	0.00000	0.00000
52	GPS3	0.00000	0.00000
53	GPS3	0.00000	0.00000
54	GPS3	0.00000	0.00000
55	GPS3	0.00000	0.00000
56	GPS3	0.00000	0.00000
57	GPS3	0.00000	0.00000
58	GPS3	0.00000	0.00000
59	GPS3	0.00000	0.00000
60	GPS3	0.00000	0.00000
61	GPS3	0.00000	0.00000
62	GPS3	0.00000	0.00000
63	GPS3	0.00000	0.00000
64	GPS3	0.00000	0.00000
65	GPS3	0.00000	0.00000
66	GPS3	0.00000	0.00000
67	GPS3	-0.00063	0.00145
68	GPS3	-0.00084	0.00032

69	GPS3	-0.00259	0.00027
70	GPS3	-0.00172	0.00028
71	GPS3	-0.00116	0.00028
72	GPS3	-0.00181	0.00028
73	GPS3	-0.00144	0.00028
74	GPS3	-0.00133	0.00030
75	GPS3	-0.00401	0.00029
76	GPS3	-0.00439	0.00029
77	GPS3	-0.00044	0.00029
78	GPS3	-0.00253	0.00027
79	GPS3	-0.00230	0.00030
80	GPS3	-0.00061	0.00029
81	GPS3	-0.00410	0.00040
82	GPS3	0.00000	0.00000
83	GPS4	0.00000	0.00000
84	GPS4	-0.00586	0.00055
85	GPS4	-0.00251	0.00029
86	GPS4	-0.00457	0.00027
87	GPS4	-0.00370	0.00028
88	GPS4	-0.00397	0.00028
89	GPS4	-0.00382	0.00029
90	GPS4	-0.00336	0.00028
91	GPS4	-0.00376	0.00029
92	GPS4	-0.00366	0.00029
93	GPS4	-0.00626	0.00030
94	GPS4	-0.00402	0.00031
95	GPS4	-0.00367	0.00027
96	GPS4	-0.00380	0.00031
97	GPS4	-0.00271	0.00028
98	GPS4	-0.00483	0.00028
99	GPS4	-0.00188	0.00072
100	GPS4	0.00000	0.00000
101	GPS4	0.00000	0.00000
102	GPS4	0.00000	0.00000
103	GPS4	0.00000	0.00000
104	GPS4	0.00000	0.00000
105	GPS4	0.00000	0.00000
106	GPS4	0.00000	0.00000
107	GPS4	0.00000	0.00000
108	GPS4	0.00000	0.00000
109	GPS4	0.00000	0.00000
110	GPS4	0.00000	0.00000
111	GPS4	0.00000	0.00000
112	GPS4	0.00000	0.00000
113	GPS4	0.00000	0.00000
114	GPS4	0.00000	0.00000
115	GPS4	0.00000	0.00000
116	GPS4	0.00000	0.00000
117	GPS4	0.00000	0.00000
118	GPS4	0.00000	0.00000
119	GPS4	0.00000	0.00000
120	GPS4	0.00000	0.00000
121	GPS4	0.00000	0.00000

122	GPS4	0.00000	0.00000
123	GPS4	0.00000	0.00000
124	GPS5	-0.07552	0.01086
125	GPS5	0.01006	0.00034
126	GPS5	0.00532	0.00027
127	GPS5	0.00465	0.00025
128	GPS5	0.00544	0.00026
129	GPS5	0.00564	0.00025
130	GPS5	0.00437	0.00027
131	GPS5	0.00991	0.00027
132	GPS5	0.00472	0.00028
133	GPS5	0.00507	0.00028
134	GPS5	0.00362	0.00029
135	GPS5	0.00733	0.00030
136	GPS5	0.00792	0.00025
137	GPS5	0.00985	0.00029
138	GPS5	0.00577	0.00027
139	GPS5	0.00385	0.00028
140	GPS5	0.00494	0.00099
141	GPS5	0.00000	0.00000
142	GPS5	0.00000	0.00000
143	GPS5	0.00000	0.00000
144	GPS5	0.00000	0.00000
145	GPS5	0.00000	0.00000
146	GPS5	0.00000	0.00000
147	GPS5	0.00000	0.00000
148	GPS5	0.00000	0.00000
149	GPS5	0.01270	0.00047
150	GPS5	0.00448	0.00028
151	GPS5	0.00396	0.00025
152	GPS5	0.00426	0.00026
153	GPS5	0.00571	0.00026
154	GPS5	0.00397	0.00026
155	GPS5	0.01249	0.00026
156	GPS5	0.00306	0.00028
157	GPS5	0.00605	0.00028
158	GPS5	0.00387	0.00027
159	GPS5	0.00616	0.00027
160	GPS5	0.00717	0.00025
161	GPS5	0.00921	0.00029
162	GPS5	0.00344	0.00029
163	GPS5	0.01119	0.00097
164	GPS5	0.00000	0.00000
165	GPS6	0.00000	0.00000
166	GPS6	0.00000	0.00000
167	GPS6	-0.00359	0.00036
168	GPS6	-0.00311	0.00026
169	GPS6	-0.00270	0.00026
170	GPS6	-0.00226	0.00025
171	GPS6	-0.00352	0.00027
172	GPS6	-0.00344	0.00026
173	GPS6	-0.00224	0.00028
174	GPS6	-0.00265	0.00028

175	GPS6	-0.00517	0.00029
176	GPS6	-0.00295	0.00029
177	GPS6	-0.00333	0.00025
178	GPS6	-0.00266	0.00029
179	GPS6	-0.00193	0.00026
180	GPS6	-0.00320	0.00026
181	GPS6	-0.00277	0.00036
182	GPS6	0.00000	0.00000
183	GPS6	0.00000	0.00000
184	GPS6	0.00000	0.00000
185	GPS6	0.00000	0.00000
186	GPS6	0.00000	0.00000
187	GPS6	0.00000	0.00000
188	GPS6	0.00000	0.00000
189	GPS6	0.00000	0.00000
190	GPS6	0.32493	0.11145
191	GPS6	-0.00267	0.00033
192	GPS6	-0.00241	0.00026
193	GPS6	-0.00310	0.00026
194	GPS6	-0.00309	0.00026
195	GPS6	-0.00261	0.00026
196	GPS6	-0.00325	0.00026
197	GPS6	-0.00295	0.00028
198	GPS6	-0.00338	0.00028
199	GPS6	-0.00417	0.00026
200	GPS6	-0.00300	0.00027
201	GPS6	-0.00363	0.00025
202	GPS6	-0.00289	0.00028
203	GPS6	-0.00219	0.00026
204	GPS6	-0.00313	0.00027
205	GPS6	0.00062	0.00069
206	GPS7	0.00000	0.00000
207	GPS7	0.00000	0.00000
208	GPS7	-0.00416	0.00043
209	GPS7	-0.00300	0.00028
210	GPS7	-0.00207	0.00028
211	GPS7	-0.00194	0.00027
212	GPS7	-0.00355	0.00029
213	GPS7	-0.00238	0.00028
214	GPS7	-0.00166	0.00029
215	GPS7	-0.00253	0.00029
216	GPS7	-0.00507	0.00030
217	GPS7	-0.00225	0.00031
218	GPS7	-0.00286	0.00027
219	GPS7	-0.00264	0.00030
220	GPS7	-0.00085	0.00028
221	GPS7	-0.00374	0.00027
222	GPS7	-0.00178	0.00034
223	GPS7	-0.01068	0.00370
224	GPS7	0.00000	0.00000
225	GPS7	0.00000	0.00000
226	GPS7	0.00000	0.00000
227	GPS7	0.00000	0.00000

228	GPS7	0.00000	0.00000
229	GPS7	0.00000	0.00000
230	GPS7	0.00000	0.00000
231	GPS7	0.00000	0.00000
232	GPS7	0.00000	0.00000
233	GPS7	0.00000	0.00000
234	GPS7	0.00000	0.00000
235	GPS7	0.00000	0.00000
236	GPS7	0.00000	0.00000
237	GPS7	0.00000	0.00000
238	GPS7	0.00000	0.00000
239	GPS7	0.00000	0.00000
240	GPS7	0.00000	0.00000
241	GPS7	0.00000	0.00000
242	GPS7	0.00000	0.00000
243	GPS7	0.00000	0.00000
244	GPS7	0.00000	0.00000
245	GPS7	0.00000	0.00000
246	GPS7	0.00000	0.00000
247	GPS8	0.00000	0.00000
248	GPS8	-0.29873	0.05588
249	GPS8	0.00151	0.00033
250	GPS8	-0.00818	0.00026
251	GPS8	-0.00638	0.00026
252	GPS8	-0.00052	0.00026
253	GPS8	-0.00320	0.00027
254	GPS8	-0.00233	0.00026
255	GPS8	-0.00146	0.00028
256	GPS8	-0.00252	0.00028
257	GPS8	-0.00497	0.00029
258	GPS8	-0.00276	0.00029
259	GPS8	-0.00226	0.00025
260	GPS8	-0.00239	0.00029
261	GPS8	0.00076	0.00027
262	GPS8	-0.00409	0.00027
263	GPS8	-0.00182	0.00044
264	GPS8	0.00000	0.00000
265	GPS8	0.00000	0.00000
266	GPS8	0.00000	0.00000
267	GPS8	0.00000	0.00000
268	GPS8	0.00000	0.00000
269	GPS8	0.00000	0.00000
270	GPS8	0.00000	0.00000
271	GPS8	0.00000	0.00000
272	GPS8	-0.06480	0.00663
273	GPS8	0.00162	0.00032
274	GPS8	-0.00217	0.00026
275	GPS8	-0.00203	0.00026
276	GPS8	-0.00137	0.00026
277	GPS8	-0.00129	0.00027
278	GPS8	-0.00431	0.00026
279	GPS8	-0.00143	0.00028
280	GPS8	-0.00437	0.00028

281	GPS8	-0.00422	0.00027
282	GPS8	-0.00182	0.00027
283	GPS8	-0.00245	0.00025
284	GPS8	-0.00239	0.00028
285	GPS8	0.00021	0.00027
286	GPS8	-0.00389	0.00028
287	GPS8	-0.00033	0.00203
288	GPS9	0.00000	0.00000
289	GPS9	0.00000	0.00000
290	GPS9	-0.00351	0.00058
291	GPS9	-0.00249	0.00027
292	GPS9	-0.00140	0.00026
293	GPS9	-0.00085	0.00026
294	GPS9	-0.00339	0.00027
295	GPS9	-0.00263	0.00026
296	GPS9	-0.00131	0.00028
297	GPS9	-0.00156	0.00028
298	GPS9	-0.00460	0.00029
299	GPS9	-0.00110	0.00029
300	GPS9	-0.00164	0.00025
301	GPS9	-0.00238	0.00029
302	GPS9	0.00093	0.00026
303	GPS9	-0.00356	0.00026
304	GPS9	-0.00158	0.00036
305	GPS9	0.00000	0.00000
306	GPS9	0.00000	0.00000
307	GPS9	0.00000	0.00000
308	GPS9	0.00000	0.00000
309	GPS9	0.00000	0.00000
310	GPS9	0.00000	0.00000
311	GPS9	0.00000	0.00000
312	GPS9	0.00000	0.00000
313	GPS9	0.00000	0.00000
314	GPS9	0.00099	0.00038
315	GPS9	-0.00034	0.00026
316	GPS9	-0.00141	0.00026
317	GPS9	-0.00079	0.00026
318	GPS9	-0.00096	0.00026
319	GPS9	-0.00399	0.00026
320	GPS9	-0.00106	0.00028
321	GPS9	-0.00337	0.00028
322	GPS9	-0.00364	0.00027
323	GPS9	-0.00058	0.00027
324	GPS9	-0.00216	0.00025
325	GPS9	-0.00231	0.00028
326	GPS9	0.00003	0.00026
327	GPS9	-0.00238	0.00028
328	GPS9	0.00287	0.00120
329	GP13	0.00000	0.00000
330	GP13	0.00000	0.00000
331	GP13	-0.00460	0.00121
332	GP13	-0.00300	0.00027
333	GP13	-0.00199	0.00026

334	GP13	-0.00159	0.00026
335	GP13	-0.00423	0.00027
336	GP13	-0.00399	0.00026
337	GP13	-0.00191	0.00028
338	GP13	-0.00198	0.00028
339	GP13	-0.00481	0.00029
340	GP13	-0.00262	0.00029
341	GP13	-0.00300	0.00025
342	GP13	-0.00219	0.00029
343	GP13	-0.00131	0.00026
344	GP13	-0.00396	0.00026
345	GP13	-0.00283	0.00036
346	GP13	0.00000	0.00000
347	GP13	0.00000	0.00000
348	GP13	0.00000	0.00000
349	GP13	0.00000	0.00000
350	GP13	0.00000	0.00000
351	GP13	0.00000	0.00000
352	GP13	0.00000	0.00000
353	GP13	0.00000	0.00000
354	GP13	0.11489	0.11236
355	GP13	-0.00215	0.00033
356	GP13	-0.00148	0.00026
357	GP13	-0.00253	0.00026
358	GP13	-0.00264	0.00026
359	GP13	-0.00169	0.00026
360	GP13	-0.00422	0.00026
361	GP13	-0.00251	0.00028
362	GP13	-0.00257	0.00028
363	GP13	-0.00352	0.00027
364	GP13	-0.00279	0.00027
365	GP13	-0.00349	0.00025
366	GP13	-0.00270	0.00028
367	GP13	-0.00251	0.00026
368	GP13	-0.00260	0.00027
369	GP13	0.00009	0.00096

1\${P}/OLKI06S
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PROGRAM GPSEST 19-JAN-07 13:03
BERNESE GPS SOFTWARE VERSION 5.0

RMS ERRORS OF ELLIP. COORDINATES AND COORDINATE DIFFER. IN MM (PART 1):

NUM		1	2	3	4	5	6	7	8	9	10
	B	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
	1 L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.0	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3

2	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.4	0.4	0.5	0.5	0.4	0.4	0.5	0.4	0.4	0.4
3	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.4	0.5	0.4	0.5	0.4	0.4	0.5	0.4	0.4	0.4
4	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.4	0.5	0.5	0.4	0.4	0.4	0.5	0.4	0.4	0.4
5	B	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.3	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3
6	B	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.3	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3
7	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4
8	B	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.3	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3
9	B	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.3	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3
10	B	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.3	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3

1\${P}/OLKI06S
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PROGRAM GPSEST 19-JAN-07 13:03
BERNESE GPS SOFTWARE VERSION 5.0

SLOPE DISTANCES AND RMS ERRORS IN M (PART 1):

NUM		2 N	3 N	4 N	5 N	6 N	7 N	8 N	9 N
1	O	1355.8621	1006.1927	643.4483	1131.6197	1264.8248	1482.9925	1594.5013	2343.5952
	N	1355.8619	1006.1922	643.4478	1131.6217	1264.8249	1482.9933	1594.5026	2343.5964
	RMS	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000

2	O	1609.8487	1856.9241	1477.3558	2436.7239	2811.6728	2949.4962	3649.8847
N	N	1609.8470	1856.9243	1477.3556	2436.7239	2811.6735	2949.4973	3649.8859
	RMS	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
3	O		756.3239	2094.2040	2126.8432	2073.0479	1924.5782	2914.4348
N	N		756.3261	2094.2048	2126.8433	2073.0490	1924.5805	2914.4361
	RMS		0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
4	O			1734.6515	1418.6646	1317.4851	1216.2397	2165.8769
N	N			1734.6526	1418.6628	1317.4839	1216.2398	2165.8760
	RMS			0.0001	0.0000	0.0000	0.0000	0.0000
5	O				1284.5638	1894.7505	2256.0687	2571.6088
N	N				1284.5661	1894.7538	2256.0721	2571.6126
	RMS				0.0000	0.0000	0.0000	0.0000
6	O					683.0097	1157.8153	1290.2791
N	N					683.0103	1157.8156	1290.2805
	RMS					0.0001	0.0000	0.0000
7	O						511.2571	868.5756
N	N						511.2566	868.5759
	RMS						0.0001	0.0000
8	O							1057.9154
N	N							1057.9144
	RMS							0.0000
9	O							
N	N							
	RMS							

1\${P}/OLKI06S
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PROGRAM GPSEST 19-JAN-07 13:03
BERNESE GPS SOFTWARE VERSION 5.0

SLOPE DISTANCES AND RMS ERRORS IN M (PART 1): CONTINUATION

NUM		10 N
1	O	2407.0274
N	N	2407.0280
	RMS	0.0000
2	O	3597.9093
N	N	3597.9090
	RMS	0.0000

3	O	3159.4226
N	N	3159.4245
	RMS	0.0000
4	O	2406.3255
N	N	2406.3253
	RMS	0.0000
5	O	2326.7292
N	N	2326.7298
	RMS	0.0000
6	O	1166.0248
N	N	1166.0247
	RMS	0.0000
7	O	1126.4117
N	N	1126.4136
	RMS	0.0000
8	O	1520.6870
N	N	1520.6891
	RMS	0.0000
9	O	665.0354
N	N	665.0405
	RMS	0.0000

Appendix IV. Results of the first measurements at the pillars located outside Olkiluoto in 2006.

```
=====
Program : GPSEST                               Bernese GPS Software Version 5.0
Purpose : Parameter estimation
Campaign: ${P}/OL06KU                          Default session: 0960 year 2006
Date    : 21-Feb-2007 16:26                   User name      : ja
=====
```

OL06KU

```
1${P}/OL06KU                                PROGRAM GPSEST  21-FEB-07 16:26
OL06KU                                       BERNESE GPS SOFTWARE VERSION 5.0
=====
```

TABLE OF CONTENTS

- ```

1. CAMPAIGNS
2. OBSERVATION FILES
3. GENERAL OPTIONS
4. STATIONS
5. SATELLITE ORBITS
6. ATMOSPHERE
7. CLOCK PARAMETERS
8. POLE COORDINATES AND TIME INFORMATION
9. ANTENNA PHASE CENTERS
10. CONSTANTS
11. PARAMETER CHARACTERIZATION LIST
12. TEST OUTPUT
13. RESULTS (PART 1)
14. RESULTS (PART 2)
```

```
1${P}/OL06KU PROGRAM GPSEST 21-FEB-07 16:26
OL06KU BERNESE GPS SOFTWARE VERSION 5.0
=====
```

### INPUT AND OUTPUT FILENAMES



```

Session table : ${P}/OL06KU\STA\SESSIONS.SES
General constants : ${X}/GEN\CONST.
Geodetic datum : ${X}/GEN\DATUM.
Station information : ${P}/OL06KU\STA\OL06KU.STA
Earth rotation parameters : ${P}/OL06KU\ORB\C04_2006.ERP
Subdaily pole model : ${X}/GEN\IERS2000.SUB
Nutation model : ${X}/GEN\IAU2000.NUT
Satellite information : ${X}/GEN\SATELLIT.
Receiver information : ${X}/GEN\RECEIVER.
Satellite problems : ${X}/GEN\SAT_2006.CRX
Phase center eccentricities : ${X}/GEN\PHAS_IGS.REL
SINEX general input file : ${X}/GEN\SINEX.
IONEX control file : ${X}/GEN\IONEX.
Difference GPS-UTC : ---
A priori station coordinates: ${P}/OL06KU\STA\OLKIU.CRD
GNSS standard orbits : ${P}/OL06KU\ORB\OL06KU.STD
GNSS orbit partials : ---
Ionosphere models : ---
Troposphere estimates : ---
Station sigma factors : ---
Station eccentricities : ---
Ocean loading tables : ---
GNSS clock corrections : ---
Differential code biases : ---
Receiver antenna orientation: ---
Kinematic coordinates : ---
Kinematic velocities : ---
Standard orbit(s) : ---
Orbit partials : ---
Attitude data : ---
Precise orbit(s) : ---
LEO orbital elements : ---
Station coordinates : ${P}/OL06KU\STA\TOL06KU.CRD
GNSS orbital elements : ---
Troposphere estimates : ---
Troposphere SINEX : ---
Ionosphere models : ---
IONEX : ---
Residuals : ---
Coordinate covariance matrix: ---
Full covariance matrix : ---
Normal equations : ---
Bernese ERP file : ---
IERS ERP file : ---
GNSS clock corrections : ---
Clock RINEX : ---
Kinematic coordinates : ---
Differential code biases : ---
Phase center variations (gri: ---
Phase center variations (har: ---
Scratch file : ${U}/WORK\GPSEST.SCR
Scratch files : ${U}/WORK\GPSEST.SC1
Program output : ${P}/OL06KU\OUT\GPSEST.L15

```

Error message : \${U}/WORK/ERROR.MSG

1\${P}/OL06KU  
OL06KU

PROGRAM GPSEST 21-FEB-07 16:26  
BERNESE GPS SOFTWARE VERSION 5.0

1. CAMPAIGNS

| CAMPAIGN NAME  | NUM STATION NAME | NUM STATION NAME | NUM STATION NAME | NUM STATION NAME | NUM STATION NAME |
|----------------|------------------|------------------|------------------|------------------|------------------|
| 1 \${P}/OL06KU | : 1 GPS1         | 2 GP11           | 4 GP14           | 5 GP15           |                  |

2. OBSERVATION FILES

1 \${P}/OL06KU

MAIN CHARACTERISTICS:

| FILE | OBSERVATION FILE HEADER          | OBSERVATION FILE                 | SESS | RECEIVER 1     | RECEIVER 2     |
|------|----------------------------------|----------------------------------|------|----------------|----------------|
| 1    | 1 \${P}/OL06KU/OBS/01110940.PSH  | 1 \${P}/OL06KU/OBS/01110940.PSO  | 0940 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 2    | 2 \${P}/OL06KU/OBS/01110950.PSH  | 2 \${P}/OL06KU/OBS/01110950.PSO  | 0950 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 3    | 3 \${P}/OL06KU/OBS/01110960.PSH  | 3 \${P}/OL06KU/OBS/01110960.PSO  | 0960 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 4    | 4 \${P}/OL06KU/OBS/01140940.PSH  | 4 \${P}/OL06KU/OBS/01140940.PSO  | 0940 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 5    | 5 \${P}/OL06KU/OBS/01140950.PSH  | 5 \${P}/OL06KU/OBS/01140950.PSO  | 0950 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 6    | 6 \${P}/OL06KU/OBS/01140960.PSH  | 6 \${P}/OL06KU/OBS/01140960.PSO  | 0960 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 7    | 7 \${P}/OL06KU/OBS/01150940.PSH  | 7 \${P}/OL06KU/OBS/01150940.PSO  | 0940 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 8    | 8 \${P}/OL06KU/OBS/01150950.PSH  | 8 \${P}/OL06KU/OBS/01150950.PSO  | 0950 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 9    | 9 \${P}/OL06KU/OBS/01150960.PSH  | 9 \${P}/OL06KU/OBS/01150960.PSO  | 0960 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 10   | 10 \${P}/OL06KU/OBS/14110940.PSH | 10 \${P}/OL06KU/OBS/14110940.PSO | 0940 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 11   | 11 \${P}/OL06KU/OBS/14110950.PSH | 11 \${P}/OL06KU/OBS/14110950.PSO | 0950 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 12   | 12 \${P}/OL06KU/OBS/14110960.PSH | 12 \${P}/OL06KU/OBS/14110960.PSO | 0960 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 13   | 13 \${P}/OL06KU/OBS/14150940.PSH | 13 \${P}/OL06KU/OBS/14150940.PSO | 0940 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 14   | 14 \${P}/OL06KU/OBS/14150950.PSH | 14 \${P}/OL06KU/OBS/14150950.PSO | 0950 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 15   | 15 \${P}/OL06KU/OBS/14150960.PSH | 15 \${P}/OL06KU/OBS/14150960.PSO | 0960 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |

| FILE | TYP | FREQ. | STATION 1 | STATION 2 | SESS | FIRST | OBSERV.TIME | #EPO | DT | #EF | #CLK | ARC | #SAT | W 12 | #AMB | L1 | L2 | L5 | RM | AMB.I.+S. | #CLUSTERS |
|------|-----|-------|-----------|-----------|------|-------|-------------|------|----|-----|------|-----|------|------|------|----|----|----|----|-----------|-----------|
|------|-----|-------|-----------|-----------|------|-------|-------------|------|----|-----|------|-----|------|------|------|----|----|----|----|-----------|-----------|

|    |   |       |      |      |      |         |          |      |    |   |   |   |   |    |   |   |   |    |    |    |    |   |
|----|---|-------|------|------|------|---------|----------|------|----|---|---|---|---|----|---|---|---|----|----|----|----|---|
| 1  | P | L1,L2 | GPS1 | GP11 | 0940 | 6-04-04 | 12:51:30 | 1337 | 30 | 0 | E | E | 1 | 28 | N | Y | Y | 37 | 13 | 13 | 37 | 0 |
| 2  | P | L1,L2 | GPS1 | GP11 | 0950 | 6-04-05 | 0:00:30  | 2879 | 30 | 0 | E | E | 1 | 29 | N | Y | Y | 76 | 29 | 29 | 76 | 0 |
| 3  | P | L1,L2 | GPS1 | GP11 | 0960 | 6-04-06 | 0:00:30  | 1322 | 30 | 0 | E | E | 1 | 29 | N | Y | Y | 40 | 15 | 15 | 40 | 0 |
| 4  | P | L1,L2 | GPS1 | GP14 | 0940 | 6-04-04 | 13:38:30 | 1243 | 30 | 0 | E | E | 1 | 29 | N | Y | Y | 37 | 14 | 14 | 37 | 0 |
| 5  | P | L1,L2 | GPS1 | GP14 | 0950 | 6-04-05 | 0:00:30  | 2879 | 30 | 0 | E | E | 1 | 29 | N | Y | Y | 76 | 29 | 29 | 76 | 0 |
| 6  | P | L1,L2 | GPS1 | GP14 | 0960 | 6-04-06 | 0:00:30  | 1389 | 30 | 0 | E | E | 1 | 29 | N | Y | Y | 40 | 14 | 14 | 40 | 0 |
| 7  | P | L1,L2 | GPS1 | GP15 | 0940 | 6-04-04 | 14:18:30 | 1163 | 30 | 0 | E | E | 1 | 29 | N | Y | Y | 36 | 15 | 15 | 36 | 0 |
| 8  | P | L1,L2 | GPS1 | GP15 | 0950 | 6-04-05 | 0:00:30  | 2879 | 30 | 0 | E | E | 1 | 29 | N | Y | Y | 72 | 25 | 25 | 72 | 0 |
| 9  | P | L1,L2 | GPS1 | GP15 | 0960 | 6-04-06 | 0:00:30  | 1444 | 30 | 0 | E | E | 1 | 29 | N | Y | Y | 39 | 12 | 12 | 39 | 0 |
| 10 | P | L1,L2 | GP14 | GP11 | 0940 | 6-04-04 | 13:38:30 | 1243 | 30 | 0 | E | E | 1 | 29 | N | Y | Y | 43 | 20 | 20 | 43 | 0 |
| 11 | P | L1,L2 | GP14 | GP11 | 0950 | 6-04-05 | 0:00:30  | 2879 | 30 | 0 | E | E | 1 | 29 | N | Y | Y | 77 | 30 | 30 | 77 | 0 |
| 12 | P | L1,L2 | GP14 | GP11 | 0960 | 6-04-06 | 0:00:30  | 1322 | 30 | 0 | E | E | 1 | 29 | N | Y | Y | 44 | 19 | 19 | 44 | 0 |
| 13 | P | L1,L2 | GP14 | GP15 | 0940 | 6-04-04 | 14:18:30 | 1163 | 30 | 0 | E | E | 1 | 29 | N | Y | Y | 40 | 19 | 19 | 40 | 0 |
| 14 | P | L1,L2 | GP14 | GP15 | 0950 | 6-04-05 | 0:00:30  | 2879 | 30 | 0 | E | E | 1 | 29 | N | Y | Y | 73 | 26 | 26 | 73 | 0 |
| 15 | P | L1,L2 | GP14 | GP15 | 0960 | 6-04-06 | 0:00:30  | 1389 | 30 | 0 | E | E | 1 | 29 | N | Y | Y | 39 | 13 | 13 | 39 | 0 |

SATELLITES:

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FILE #SAT SATELLITES

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|    |    |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 28 | 1 | 2 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |    |
| 2  | 29 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 3  | 29 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 4  | 29 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 5  | 29 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 6  | 29 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 7  | 29 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 8  | 29 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 9  | 29 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 10 | 29 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 11 | 29 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 12 | 29 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 13 | 29 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 14 | 29 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 15 | 29 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |

OBSERVATION SELECTION:

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SAMPLING RATE : 30 SEC  
ELEVATION CUT-OFF ANGLE : 20 DEGREES  
SATELLITE SYSTEM : GPS  
SPECIAL DATA SELECTION : NO

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PROGRAM GPSEST 21-FEB-07 16:26  
BERNESE GPS SOFTWARE VERSION 5.0

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3. GENERAL OPTIONS

TIDAL CORRECTION OF STATION COORDINATES : IERS CONVENTIONS 2000

A PRIORI SIGMA OF UNIT WEIGHT:

A PRIORI SIGMA OF UNIT WEIGHT : 0.001 M (SIGMA OF ONE-WAY L1 PHASE OBSERVABLE AT ZENITH)

MODEL FOR ELEVATION-DEPENDENT WEIGHTING : 1/COS(Z)

CORRELATIONS AND SESSIONS:

STRATEGY : CORRELATIONS WITHIN BASELINE

AMBIGUITY RESOLUTION STRATEGY:

AMBIGUITIES PRE-ELIMINATED EVERY 30 SECONDS

SYNCHRONIZATION ERRORS:

STRATEGY : SYNCHRONIZATION ERRORS NOT APPLIED

4. STATIONS

Local geodetic datum: \${X}/GEN\DATUM.

| Datum name | Ell. param./ Scale                                        | Shifts to WGS-84                                | Rotations to WGS-84                                               |
|------------|-----------------------------------------------------------|-------------------------------------------------|-------------------------------------------------------------------|
| WGS - 84   | A = 6378137.000 m<br>1/F= 298.2572236<br>SC = 0.00000D+00 | DX = 0.0000 m<br>DY = 0.0000 m<br>DZ = 0.0000 m | RX = 0.00000 arcsec<br>RY = 0.00000 arcsec<br>RZ = 0.00000 arcsec |

A priori station coordinates: \${P}/OL06KU\STA\OLKIU.CRD

| num | Station name | obs e/f/h | A priori station coordinates<br>WGS-84 |              |              | A priori station coordinates<br>Ellipsoidal in local geodetic datum |                 |            |
|-----|--------------|-----------|----------------------------------------|--------------|--------------|---------------------------------------------------------------------|-----------------|------------|
|     |              |           | X (m)                                  | Y (m)        | Z (m)        | Latitude                                                            | Longitude       | Height (m) |
| 1   | GPS1         | Y ESTIM   | 2863210.2855                           | 1126271.3627 | 5568267.2028 | 61 14 22.748766                                                     | 21 28 21.624778 | 30.5343    |

|   |      |   |       |              |              |              |       |           |                 |         |
|---|------|---|-------|--------------|--------------|--------------|-------|-----------|-----------------|---------|
| 2 | GP11 | Y | ESTIM | 2859164.4451 | 1133699.2391 | 5568849.3287 | 61 15 | 1.096558  | 21 37 44.500394 | 43.1905 |
| 4 | GP14 | Y | ESTIM | 2864514.8990 | 1133711.1997 | 5566120.9120 | 61 11 | 57.682867 | 21 35 33.201720 | 48.3365 |
| 5 | GP15 | Y | ESTIM | 2866984.1300 | 1129664.4472 | 5565663.1052 | 61 11 | 27.618629 | 21 30 20.512380 | 37.5870 |

A priori sigma:

Station coordinates a priori sigma  
in local geodetic datum

| num | Station name | N (m)   | E (m)   | U (m)   |
|-----|--------------|---------|---------|---------|
| 1   | GPS1         | 0.00001 | 0.00001 | 0.00001 |

1\${P}/OL06KU  
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PROGRAM GPSEST 21-FEB-07 16:26  
BERNESE GPS SOFTWARE VERSION 5.0

5. SATELLITE ORBITS

ARC CHARACTERISTICS:

| ARC | START OF ARC      | END OF ARC        | SOURCE     | #SAT | SATELLITES |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
|-----|-------------------|-------------------|------------|------|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|
| 1   | 06-04-04 00:00:00 | 06-04-07 00:00:00 | PR2006. 96 | 29   | 1          | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |  |
|     |                   |                   |            |      | 20         | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |    |    |    |    |    |    |    |  |

OSCULATING ELEMENTS:                   \${P}/OL06KU\ORB\OL06KU.STD

REFERENCE SYSTEM: J2000.0  
REFERENCE EPOCH : 53829.5357639 MJD (2006 4 4 12 51 30.00)

| SAT | S.MAJ.AXIS | ECCENTRIC. | INCLINAT. | NODE        | PERIGEE     | M. ANOMALY  | PER.PASS.TIME |
|-----|------------|------------|-----------|-------------|-------------|-------------|---------------|
| 1   | 26559079.8 | 0.00627349 | 56.594856 | 27.245385   | -98.187098  | 168.154473  | 53829.3028890 |
| 2   | 26561960.6 | 0.00915816 | 54.438313 | -95.074026  | 115.178210  | -109.473939 | 53829.6873976 |
| 3   | 26559692.2 | 0.00796427 | 53.088051 | -160.159872 | 37.934662   | -157.740899 | 53829.7542247 |
| 4   | 26559854.1 | 0.00739213 | 54.411259 | -93.941616  | 8.782571    | 23.192346   | 53829.5036437 |
| 5   | 26558718.1 | 0.00681221 | 53.749173 | 140.367531  | 59.501720   | 9.263123    | 53829.5229358 |
| 6   | 26560655.3 | 0.00611271 | 53.518311 | -156.830954 | -105.144812 | 83.419122   | 53829.4202276 |
| 7   | 26612171.6 | 0.01185040 | 53.605795 | -158.328370 | -105.666382 | 44.793439   | 53829.4735439 |
| 8   | 26559412.8 | 0.00943728 | 55.732751 | 87.354685   | -208.411476 | 83.599840   | 53829.4199854 |
| 9   | 26560060.2 | 0.01770809 | 55.019776 | 82.844608   | 70.149447   | 65.537845   | 53829.4449964 |



SITE-SPECIFIC TROPOSPHERE PARAMETERS

Mapping function used for delay estimation: 1/cos(zenith-distance)  
 Troposphere gradient estimation : No

| Par | Station name | Reference epoch     | sig_n (m) | sig_e (m) | sig_u (m) | abs/rel |
|-----|--------------|---------------------|-----------|-----------|-----------|---------|
| 1   | GP11         | 2006 04 04 12 00 00 |           |           | 0.00000   | abs     |
| 2   | GP11         | 2006 04 04 14 00 00 |           |           | 0.00000   | rel     |
| 3   | GP11         | 2006 04 04 16 00 00 |           |           | 0.00000   | rel     |
| 4   | GP11         | 2006 04 04 18 00 00 |           |           | 0.00000   | rel     |
| 5   | GP11         | 2006 04 04 20 00 00 |           |           | 0.00000   | rel     |
| 6   | GP11         | 2006 04 04 22 00 00 |           |           | 0.00000   | rel     |
| 7   | GP11         | 2006 04 05 00 00 00 |           |           | 0.00000   | rel     |
| 8   | GP11         | 2006 04 05 02 00 00 |           |           | 0.00000   | rel     |
| 9   | GP11         | 2006 04 05 04 00 00 |           |           | 0.00000   | rel     |
| 10  | GP11         | 2006 04 05 06 00 00 |           |           | 0.00000   | rel     |
| 11  | GP11         | 2006 04 05 08 00 00 |           |           | 0.00000   | rel     |
| 12  | GP11         | 2006 04 05 10 00 00 |           |           | 0.00000   | rel     |
| 13  | GP11         | 2006 04 05 12 00 00 |           |           | 0.00000   | rel     |
| 14  | GP11         | 2006 04 05 14 00 00 |           |           | 0.00000   | rel     |
| 15  | GP11         | 2006 04 05 16 00 00 |           |           | 0.00000   | rel     |
| 16  | GP11         | 2006 04 05 18 00 00 |           |           | 0.00000   | rel     |
| 17  | GP11         | 2006 04 05 20 00 00 |           |           | 0.00000   | rel     |
| 18  | GP11         | 2006 04 05 22 00 00 |           |           | 0.00000   | rel     |
| 19  | GP11         | 2006 04 06 00 00 00 |           |           | 0.00000   | rel     |
| 20  | GP11         | 2006 04 06 02 00 00 |           |           | 0.00000   | rel     |
| 21  | GP11         | 2006 04 06 04 00 00 |           |           | 0.00000   | rel     |
| 22  | GP11         | 2006 04 06 06 00 00 |           |           | 0.00000   | rel     |
| 23  | GP11         | 2006 04 06 08 00 00 |           |           | 0.00000   | rel     |
| 24  | GP11         | 2006 04 06 10 00 00 |           |           | 0.00000   | rel     |
| 25  | GP11         | 2006 04 06 12 00 00 |           |           | 0.00000   | rel     |
| 26  | GP11         | 2006 04 06 14 00 00 |           |           | 0.00000   | rel     |
| 27  | GP14         | 2006 04 04 12 00 00 |           |           | 0.00000   | abs     |
| 28  | GP14         | 2006 04 04 14 00 00 |           |           | 0.00000   | rel     |
| 29  | GP14         | 2006 04 04 16 00 00 |           |           | 0.00000   | rel     |
| 30  | GP14         | 2006 04 04 18 00 00 |           |           | 0.00000   | rel     |
| 31  | GP14         | 2006 04 04 20 00 00 |           |           | 0.00000   | rel     |
| 32  | GP14         | 2006 04 04 22 00 00 |           |           | 0.00000   | rel     |
| 33  | GP14         | 2006 04 05 00 00 00 |           |           | 0.00000   | rel     |
| 34  | GP14         | 2006 04 05 02 00 00 |           |           | 0.00000   | rel     |
| 35  | GP14         | 2006 04 05 04 00 00 |           |           | 0.00000   | rel     |
| 36  | GP14         | 2006 04 05 06 00 00 |           |           | 0.00000   | rel     |
| 37  | GP14         | 2006 04 05 08 00 00 |           |           | 0.00000   | rel     |
| 38  | GP14         | 2006 04 05 10 00 00 |           |           | 0.00000   | rel     |
| 39  | GP14         | 2006 04 05 12 00 00 |           |           | 0.00000   | rel     |
| 40  | GP14         | 2006 04 05 14 00 00 |           |           | 0.00000   | rel     |
| 41  | GP14         | 2006 04 05 16 00 00 |           |           | 0.00000   | rel     |
| 42  | GP14         | 2006 04 05 18 00 00 |           |           | 0.00000   | rel     |
| 43  | GP14         | 2006 04 05 20 00 00 |           |           | 0.00000   | rel     |

|    |      |                     |         |     |
|----|------|---------------------|---------|-----|
| 44 | GP14 | 2006 04 05 22 00 00 | 0.00000 | rel |
| 45 | GP14 | 2006 04 06 00 00 00 | 0.00000 | rel |
| 46 | GP14 | 2006 04 06 02 00 00 | 0.00000 | rel |
| 47 | GP14 | 2006 04 06 04 00 00 | 0.00000 | rel |
| 48 | GP14 | 2006 04 06 06 00 00 | 0.00000 | rel |
| 49 | GP14 | 2006 04 06 08 00 00 | 0.00000 | rel |
| 50 | GP14 | 2006 04 06 10 00 00 | 0.00000 | rel |
| 51 | GP14 | 2006 04 06 12 00 00 | 0.00000 | rel |
| 52 | GP14 | 2006 04 06 14 00 00 | 0.00000 | rel |
| 53 | GP15 | 2006 04 04 12 00 00 | 0.00000 | abs |
| 54 | GP15 | 2006 04 04 14 00 00 | 0.00000 | rel |
| 55 | GP15 | 2006 04 04 16 00 00 | 0.00000 | rel |
| 56 | GP15 | 2006 04 04 18 00 00 | 0.00000 | rel |
| 57 | GP15 | 2006 04 04 20 00 00 | 0.00000 | rel |
| 58 | GP15 | 2006 04 04 22 00 00 | 0.00000 | rel |
| 59 | GP15 | 2006 04 05 00 00 00 | 0.00000 | rel |
| 60 | GP15 | 2006 04 05 02 00 00 | 0.00000 | rel |
| 61 | GP15 | 2006 04 05 04 00 00 | 0.00000 | rel |
| 62 | GP15 | 2006 04 05 06 00 00 | 0.00000 | rel |
| 63 | GP15 | 2006 04 05 08 00 00 | 0.00000 | rel |
| 64 | GP15 | 2006 04 05 10 00 00 | 0.00000 | rel |
| 65 | GP15 | 2006 04 05 12 00 00 | 0.00000 | rel |
| 66 | GP15 | 2006 04 05 14 00 00 | 0.00000 | rel |
| 67 | GP15 | 2006 04 05 16 00 00 | 0.00000 | rel |
| 68 | GP15 | 2006 04 05 18 00 00 | 0.00000 | rel |
| 69 | GP15 | 2006 04 05 20 00 00 | 0.00000 | rel |
| 70 | GP15 | 2006 04 05 22 00 00 | 0.00000 | rel |
| 71 | GP15 | 2006 04 06 00 00 00 | 0.00000 | rel |
| 72 | GP15 | 2006 04 06 02 00 00 | 0.00000 | rel |
| 73 | GP15 | 2006 04 06 04 00 00 | 0.00000 | rel |
| 74 | GP15 | 2006 04 06 06 00 00 | 0.00000 | rel |
| 75 | GP15 | 2006 04 06 08 00 00 | 0.00000 | rel |
| 76 | GP15 | 2006 04 06 10 00 00 | 0.00000 | rel |
| 77 | GP15 | 2006 04 06 12 00 00 | 0.00000 | rel |
| 78 | GP15 | 2006 04 06 14 00 00 | 0.00000 | rel |

IONOSPHERE MODELS:

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NO IONOSPHERE MODELS APPLIED

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PROGRAM GPSEST 21-FEB-07 16:26  
BERNESE GPS SOFTWARE VERSION 5.0

8. POLE COORDINATES AND TIME INFORMATION

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A PRIORI POLE AND TIME INFORMATION FROM THE POLE FILE:

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| DATUM    | TIME     | X-POLE (")<br>EP-CPO (") | Y-POLE (")<br>PS-CPO (") | UT1-UTC (S) | GPS-UTC (S) | RMS XP (")<br>RMS EP (") | RMS YP (")<br>RMS PS (") | RMS DT (S) |
|----------|----------|--------------------------|--------------------------|-------------|-------------|--------------------------|--------------------------|------------|
| 06-04-04 | 00:00:00 | 0.10403<br>0.00000       | 0.37272<br>0.00000       | 0.263950    | 14.         | 0.00000<br>0.00000       | 0.00000<br>0.00000       | 0.000000   |
| 06-04-05 | 00:00:00 | 0.10443<br>0.00000       | 0.37235<br>0.00000       | 0.263418    | 14.         | 0.00000<br>0.00000       | 0.00000<br>0.00000       | 0.000000   |
| 06-04-06 | 00:00:00 | 0.10451<br>0.00000       | 0.37190<br>0.00000       | 0.262850    | 14.         | 0.00000<br>0.00000       | 0.00000<br>0.00000       | 0.000000   |
| 06-04-07 | 00:00:00 | 0.10427<br>0.00000       | 0.37171<br>0.00000       | 0.262203    | 14.         | 0.00000<br>0.00000       | 0.00000<br>0.00000       | 0.000000   |

NUTATION MODEL: IAU2000  
SUBDAILY POLE MODEL: IERS2000

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PROGRAM GPSEST 21-FEB-07 16:26  
BERNESE GPS SOFTWARE VERSION 5.0

12. TEST OUTPUT

MIN. AND MAX. ELEVATION/NADIR ANGLES AND MAX. SYNCHRONIZATION ERRORS:

| SESS | FILE | STATION NAME 1 | STATION NAME 2 | MIN/MAX ELEV. | MIN/MAX NADIR | SYNCH. ERR. (NS) |
|------|------|----------------|----------------|---------------|---------------|------------------|
| 0001 | 1    | GPS1           | GP11           | 20.0 83.3     | 1.6 13.2      | 0.0              |
| 0002 | 2    | GPS1           | GP11           | 20.0 83.3     | 1.6 13.2      | 0.0              |
| 0003 | 3    | GPS1           | GP11           | 20.0 79.8     | 2.4 13.2      | 0.0              |
| 0004 | 4    | GPS1           | GP14           | 20.0 83.4     | 1.5 13.2      | 0.0              |
| 0005 | 5    | GPS1           | GP14           | 20.0 83.4     | 1.5 13.2      | 0.0              |
| 0006 | 6    | GPS1           | GP14           | 20.0 79.8     | 2.4 13.2      | 0.0              |
| 0007 | 7    | GPS1           | GP15           | 20.0 83.4     | 1.5 13.2      | 0.0              |
| 0008 | 8    | GPS1           | GP15           | 20.0 83.4     | 1.5 13.2      | 0.0              |
| 0009 | 9    | GPS1           | GP15           | 20.0 79.9     | 2.4 13.2      | 0.0              |
| 0010 | 10   | GP14           | GP11           | 20.0 83.4     | 1.5 13.2      | 0.0              |
| 0011 | 11   | GP14           | GP11           | 20.0 83.4     | 1.5 13.2      | 0.0              |
| 0012 | 12   | GP14           | GP11           | 20.0 79.8     | 2.4 13.2      | 0.0              |
| 0013 | 13   | GP14           | GP15           | 20.0 83.4     | 1.5 13.2      | 0.0              |
| 0014 | 14   | GP14           | GP15           | 20.0 83.4     | 1.5 13.2      | 0.0              |
| 0015 | 15   | GP14           | GP15           | 20.0 79.9     | 2.4 13.2      | 0.0              |

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PROGRAM GPSEST 21-FEB-07 16:26  
BERNESE GPS SOFTWARE VERSION 5.0

13. RESULTS (PART 1)

NUMBER OF PARAMETERS (PART 1):

| PARAMETER TYPE                       | #PARAMETERS | #PRE-ELIMINATED | #SET-UP | #NO-OBS | #REF | #SINGULAR |
|--------------------------------------|-------------|-----------------|---------|---------|------|-----------|
| STATION COORDINATES                  | 12          | 0               | 12      | 0       | 0    | 0         |
| AMBIGUITIES                          | 30          | 30 (BEFORE INV) | 586     | 556     | 0    | 7         |
| SITE-SPECIFIC TROPOSPHERE PARAMETERS | 78          | 0               | 78      | 0       | 0    | 3         |
| TOTAL NUMBER OF PARAMETERS           | 120         | 30              | 676     | 556     | 0    | 10        |

NUMBER OF OBSERVATIONS (PART 1):

| TYPE                         | FREQUENCY | FILE | #OBSERVATIONS |
|------------------------------|-----------|------|---------------|
| PHASE                        | L1        | ALL  | 148304        |
| PHASE                        | L2        | ALL  | 148304        |
| TOTAL NUMBER OF OBSERVATIONS |           |      | 296608        |

A POSTERIORI SIGMA OF UNIT WEIGHT (PART 1):

A POSTERIORI SIGMA OF UNIT WEIGHT : 0.0037 M (SIGMA OF ONE-WAY L1 PHASE OBSERVABLE AT ZENITH)

DEGREE OF FREEDOM (DOF) : 296498

CHI\*\*2/DOF : 13.72

1\${P}/OL06KU  
OL06KU

PROGRAM GPSEST 21-FEB-07 16:26  
BERNESE GPS SOFTWARE VERSION 5.0

STATION COORDINATES: \${P}/OL06KU\STA\TOL06KU.CRD

| NUM | STATION NAME | PARAMETER | A PRIORI VALUE | NEW VALUE | NEW- A PRIORI | RMS ERROR | 3-D ELLIPSOID | 2-D ELLIPSE |
|-----|--------------|-----------|----------------|-----------|---------------|-----------|---------------|-------------|
|-----|--------------|-----------|----------------|-----------|---------------|-----------|---------------|-------------|

|   |      |           |                 |                 |         |        |        |      |        |      |  |
|---|------|-----------|-----------------|-----------------|---------|--------|--------|------|--------|------|--|
| 1 | GPS1 | X         | 2863210.2855    | 2863210.2855    | 0.0000  | 0.0000 |        |      |        |      |  |
|   |      | Y         | 1126271.3627    | 1126271.3627    | 0.0000  | 0.0000 |        |      |        |      |  |
|   |      | Z         | 5568267.2028    | 5568267.2028    | 0.0000  | 0.0000 |        |      |        |      |  |
|   |      | HEIGHT    | 30.5343         | 30.5343         | 0.0000  | 0.0000 | 0.0000 | 0.0  |        |      |  |
|   |      | LATITUDE  | 61 14 22.748766 | 61 14 22.748766 | 0.0000  | 0.0000 | 0.0000 | 90.0 | 0.0000 | 90.0 |  |
|   |      | LONGITUDE | 21 28 21.624778 | 21 28 21.624778 | 0.0000  | 0.0000 | 0.0000 | 0.0  | 0.0000 |      |  |
| 2 | GP11 | X         | 2859164.4451    | 2859164.4547    | 0.0096  | 0.0002 |        |      |        |      |  |
|   |      | Y         | 1133699.2391    | 1133699.2374    | -0.0017 | 0.0001 |        |      |        |      |  |
|   |      | Z         | 5568849.3287    | 5568849.3381    | 0.0094  | 0.0005 |        |      |        |      |  |
|   |      | HEIGHT    | 43.1905         | 43.2027         | 0.0122  | 0.0005 | 0.0005 | 0.5  |        |      |  |
|   |      | LATITUDE  | 61 15 1.096558  | 61 15 1.096470  | -0.0027 | 0.0001 | 0.0001 | 89.3 | 0.0001 | 89.4 |  |
|   |      | LONGITUDE | 21 37 44.500394 | 21 37 44.500052 | -0.0051 | 0.0001 | 0.0001 | -0.1 | 0.0001 |      |  |
| 4 | GP14 | X         | 2864514.8990    | 2864514.9033    | 0.0043  | 0.0002 |        |      |        |      |  |
|   |      | Y         | 1133711.1997    | 1133711.2051    | 0.0054  | 0.0001 |        |      |        |      |  |
|   |      | Z         | 5566120.9120    | 5566120.9145    | 0.0025  | 0.0004 |        |      |        |      |  |
|   |      | HEIGHT    | 48.3365         | 48.3416         | 0.0051  | 0.0005 | 0.0005 | 0.5  |        |      |  |
|   |      | LATITUDE  | 61 11 57.682867 | 61 11 57.682737 | -0.0040 | 0.0001 | 0.0001 | 89.2 | 0.0001 | 89.3 |  |
|   |      | LONGITUDE | 21 35 33.201720 | 21 35 33.201949 | 0.0034  | 0.0001 | 0.0001 | -0.1 | 0.0001 |      |  |
| 5 | GP15 | X         | 2866984.1300    | 2866984.1354    | 0.0054  | 0.0003 |        |      |        |      |  |
|   |      | Y         | 1129664.4472    | 1129664.4520    | 0.0048  | 0.0001 |        |      |        |      |  |
|   |      | Z         | 5565663.1052    | 5565663.1076    | 0.0024  | 0.0005 |        |      |        |      |  |
|   |      | HEIGHT    | 37.5870         | 37.5923         | 0.0053  | 0.0005 | 0.0005 | 0.6  |        |      |  |
|   |      | LATITUDE  | 61 11 27.618629 | 61 11 27.618474 | -0.0048 | 0.0001 | 0.0001 | 89.4 | 0.0001 | 89.5 |  |
|   |      | LONGITUDE | 21 30 20.512380 | 21 30 20.512544 | 0.0024  | 0.0001 | 0.0001 | -0.1 | 0.0001 |      |  |

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PROGRAM GPSEST 21-FEB-07 16:26  
BERNESE GPS SOFTWARE VERSION 5.0

SITE-SPECIFIC TROPOSPHERE PARAMETERS: (NOT SAVED)

| REQU. | STATION NAME | CORRECTIONS (M) |      |          | RMS ERRORS (M) |      |         | ZENITH VECTOR (") |     |       |     | ERROR ELLIPSE (M) |         |     |
|-------|--------------|-----------------|------|----------|----------------|------|---------|-------------------|-----|-------|-----|-------------------|---------|-----|
|       |              | NORTH           | EAST | ZENITH   | NORTH          | EAST | ZENITH  | ANGLE             | RMS | RATIO | AZI | MAX RMS           | MIN RMS | AZI |
| 1     | GP11         |                 |      | 0.00006  |                |      | 0.00170 |                   |     |       |     |                   |         |     |
| 2     | GP11         |                 |      | -0.00436 |                |      | 0.00046 |                   |     |       |     |                   |         |     |
| 3     | GP11         |                 |      | -0.00046 |                |      | 0.00042 |                   |     |       |     |                   |         |     |
| 4     | GP11         |                 |      | 0.00184  |                |      | 0.00047 |                   |     |       |     |                   |         |     |
| 5     | GP11         |                 |      | -0.00544 |                |      | 0.00044 |                   |     |       |     |                   |         |     |
| 6     | GP11         |                 |      | -0.00433 |                |      | 0.00042 |                   |     |       |     |                   |         |     |
| 7     | GP11         |                 |      | -0.00259 |                |      | 0.00042 |                   |     |       |     |                   |         |     |

|    |      |          |         |
|----|------|----------|---------|
| 8  | GP11 | -0.00134 | 0.00038 |
| 9  | GP11 | -0.00471 | 0.00041 |
| 10 | GP11 | -0.00508 | 0.00043 |
| 11 | GP11 | -0.00252 | 0.00036 |
| 12 | GP11 | -0.00392 | 0.00040 |
| 13 | GP11 | -0.00761 | 0.00044 |
| 14 | GP11 | 0.00059  | 0.00042 |
| 15 | GP11 | -0.00284 | 0.00041 |
| 16 | GP11 | -0.00540 | 0.00048 |
| 17 | GP11 | -0.00166 | 0.00044 |
| 18 | GP11 | -0.00498 | 0.00042 |
| 19 | GP11 | -0.00244 | 0.00043 |
| 20 | GP11 | -0.00157 | 0.00038 |
| 21 | GP11 | -0.00356 | 0.00041 |
| 22 | GP11 | -0.00013 | 0.00043 |
| 23 | GP11 | -0.00664 | 0.00036 |
| 24 | GP11 | -0.00569 | 0.00044 |
| 25 | GP11 | -0.00944 | 0.00157 |
| 26 | GP11 | 0.00000  | 0.00000 |
| 27 | GP14 | 0.07280  | 0.00986 |
| 28 | GP14 | -0.00678 | 0.00046 |
| 29 | GP14 | -0.00214 | 0.00038 |
| 30 | GP14 | -0.00279 | 0.00042 |
| 31 | GP14 | 0.01242  | 0.00039 |
| 32 | GP14 | -0.00770 | 0.00037 |
| 33 | GP14 | -0.00811 | 0.00038 |
| 34 | GP14 | -0.00344 | 0.00034 |
| 35 | GP14 | -0.00426 | 0.00037 |
| 36 | GP14 | -0.00582 | 0.00039 |
| 37 | GP14 | -0.00402 | 0.00032 |
| 38 | GP14 | -0.00465 | 0.00036 |
| 39 | GP14 | -0.00689 | 0.00039 |
| 40 | GP14 | -0.00282 | 0.00037 |
| 41 | GP14 | 0.00728  | 0.00037 |
| 42 | GP14 | -0.00236 | 0.00043 |
| 43 | GP14 | -0.00547 | 0.00039 |
| 44 | GP14 | -0.00220 | 0.00038 |
| 45 | GP14 | -0.00296 | 0.00038 |
| 46 | GP14 | -0.00123 | 0.00034 |
| 47 | GP14 | -0.00237 | 0.00037 |
| 48 | GP14 | -0.00068 | 0.00038 |
| 49 | GP14 | -0.00820 | 0.00033 |
| 50 | GP14 | -0.00653 | 0.00038 |
| 51 | GP14 | -0.00450 | 0.00075 |
| 52 | GP14 | 0.00000  | 0.00000 |
| 53 | GP15 | 0.00000  | 0.00000 |
| 54 | GP15 | -0.00794 | 0.00073 |
| 55 | GP15 | -0.00278 | 0.00043 |
| 56 | GP15 | -0.00519 | 0.00047 |
| 57 | GP15 | 0.01573  | 0.00044 |
| 58 | GP15 | -0.00733 | 0.00042 |
| 59 | GP15 | -0.00758 | 0.00042 |
| 60 | GP15 | -0.00399 | 0.00038 |

|    |      |          |         |
|----|------|----------|---------|
| 61 | GP15 | -0.00349 | 0.00041 |
| 62 | GP15 | -0.00487 | 0.00043 |
| 63 | GP15 | -0.00513 | 0.00036 |
| 64 | GP15 | -0.00431 | 0.00040 |
| 65 | GP15 | -0.00390 | 0.00044 |
| 66 | GP15 | -0.00584 | 0.00042 |
| 67 | GP15 | 0.00939  | 0.00041 |
| 68 | GP15 | -0.00115 | 0.00048 |
| 69 | GP15 | -0.00559 | 0.00044 |
| 70 | GP15 | -0.00122 | 0.00042 |
| 71 | GP15 | -0.00340 | 0.00043 |
| 72 | GP15 | -0.00156 | 0.00038 |
| 73 | GP15 | -0.00221 | 0.00041 |
| 74 | GP15 | -0.00240 | 0.00043 |
| 75 | GP15 | -0.00638 | 0.00036 |
| 76 | GP15 | -0.00408 | 0.00042 |
| 77 | GP15 | -0.00657 | 0.00064 |
| 78 | GP15 | -0.55148 | 0.36248 |

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PROGRAM GPSEST 21-FEB-07 16:26  
BERNESE GPS SOFTWARE VERSION 5.0

-----  
RMS ERRORS OF ELLIP. COORDINATES AND COORDINATE DIFFER. IN MM (PART 1):  
-----

| NUM |   | 1   | 2   | 4   | 5   |
|-----|---|-----|-----|-----|-----|
| 1   | B | 0.0 | 0.1 | 0.1 | 0.1 |
| 1   | L | 0.0 | 0.0 | 0.0 | 0.0 |
| 1   | H | 0.0 | 0.5 | 0.5 | 0.5 |
| 2   | B | 0.1 | 0.1 | 0.1 | 0.1 |
| 2   | L | 0.0 | 0.1 | 0.0 | 0.1 |
| 2   | H | 0.5 | 0.5 | 0.5 | 0.7 |
| 4   | B | 0.1 | 0.1 | 0.1 | 0.1 |
| 4   | L | 0.0 | 0.0 | 0.1 | 0.0 |
| 4   | H | 0.5 | 0.5 | 0.5 | 0.5 |
| 5   | B | 0.1 | 0.1 | 0.1 | 0.1 |
| 5   | L | 0.0 | 0.1 | 0.0 | 0.1 |
| 5   | H | 0.5 | 0.7 | 0.5 | 0.5 |

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PROGRAM GPSEST 21-FEB-07 16:26  
BERNESE GPS SOFTWARE VERSION 5.0

SLOPE DISTANCES AND RMS ERRORS IN M (PART 1):

| NUM |     | 2 N       | 4 N       | 5 N       |
|-----|-----|-----------|-----------|-----------|
| 1   | O   | 8478.2689 | 7852.3726 | 5704.0555 |
|     | N   | 8478.2635 | 7852.3777 | 5704.0608 |
|     | RMS | 0.0000    | 0.0001    | 0.0001    |
| 2   | O   |           | 6005.9768 | 9358.3673 |
|     | N   |           | 6005.9753 | 9358.3634 |
|     | RMS |           | 0.0001    | 0.0001    |
| 4   | O   |           |           | 4762.6563 |
|     | N   |           |           | 4762.6574 |
|     | RMS |           |           | 0.0000    |

## Appendix V. Results of the second measurements at the pillars located outside Oikiluoto in 2006.

```
=====
Program : GPSEST Bernese GPS Software Version 5.0
Purpose : Parameter estimation
Campaign: ${P}/OL06SU Default session: 2890 year 2006
Date : 22-Feb-2007 12:58 User name : ja
=====
```

OL06SU

-----

```
1${P}/OL06SU PROGRAM GPSEST 22-FEB-07 12:58
OL06SU BERNESE GPS SOFTWARE VERSION 5.0

```

### TABLE OF CONTENTS

-----

1. CAMPAIGNS
2. OBSERVATION FILES
3. GENERAL OPTIONS
4. STATIONS
5. SATELLITE ORBITS
6. ATMOSPHERE
7. CLOCK PARAMETERS
8. POLE COORDINATES AND TIME INFORMATION
9. ANTENNA PHASE CENTERS
10. CONSTANTS
11. PARAMETER CHARACTERIZATION LIST
12. TEST OUTPUT
13. RESULTS (PART 1)
14. RESULTS (PART 2)

```
1${P}/OL06SU PROGRAM GPSEST 22-FEB-07 12:58
OL06SU BERNESE GPS SOFTWARE VERSION 5.0

```

INPUT AND OUTPUT FILENAMES

```

Session table : ${P}/OL06SU\STA\SESSIONS.SES
General constants : ${X}/GEN\CONST.
Geodetic datum : ${X}/GEN\DATUM.
Station information : ${P}/OL06SU\STA\OL06SU.STA
Earth rotation parameters : ${P}/OL06SU\ORB\C04_2006.ERP
Subdaily pole model : ${X}/GEN\IERS2000.SUB
Nutation model : ${X}/GEN\IAU2000.NUT
Satellite information : ${X}/GEN\SATELLIT.
Receiver information : ${X}/GEN\RECEIVER.
Satellite problems : ${X}/GEN\SAT_2006.CRX
Phase center eccentricities : ${X}/GEN\PHAS_IGS.REL
SINEX general input file : ${X}/GEN\SINEX.
IONEX control file : ${X}/GEN\IONEX.
Difference GPS-UTC : ---
A priori station coordinates: ${P}/OL06SU\STA\OLKIU.CRD
GNSS standard orbits : ${P}/OL06SU\ORB\OL06SU.STD
GNSS orbit partials : ---
Ionosphere models : ---
Troposphere estimates : ---
Station sigma factors : ---
Station eccentricities : ---
Ocean loading tables : ---
GNSS clock corrections : ---
Differential code biases : ---
Receiver antenna orientation: ---
Kinematic coordinates : ---
Kinematic velocities : ---
Standard orbit(s) : ---
Orbit partials : ---
Attitude data : ---
Precise orbit(s) : ---
LEO orbital elements : ---
Station coordinates : ${P}/OL06SU\STA\TOL06SU.CRD
GNSS orbital elements : ---
Troposphere estimates : ---
Troposphere SINEX : ---
Ionosphere models : ---
IONEX : ---
Residuals : ---
Coordinate covariance matrix: ---
Full covariance matrix : ---
Normal equations : ---
Bernese ERP file : ---
IERS ERP file : ---
GNSS clock corrections : ---
Clock RINEX : ---
Kinematic coordinates : ---
Differential code biases : ---
Phase center variations (gri: ---
Phase center variations (har: ---

```



```

Scratch file : ${U}/WORK/GPSEST.SCR
Scratch files : ${U}/WORK/GPSEST.SC1
Program output : ${P}/OL06SU\OUT\GPSEST.L19
Error message : ${U}/WORK\ERROR.MSG

```

```

1${P}/OL06SU
OL06SU

```

```

PROGRAM GPSEST 22-FEB-07 12:58
BERNESE GPS SOFTWARE VERSION 5.0

```

1. CAMPAIGNS

| CAMPAIGN NAME | NUM STATION NAME | NUM STATION NAME | NUM STATION NAME | NUM STATION NAME | NUM STATION NAME |
|---------------|------------------|------------------|------------------|------------------|------------------|
| \${P}/OL06SU  | : 1 GPS1         | 2 GP11           | 3 GP12           | 4 GP14           | 5 GP15           |

2. OBSERVATION FILES

```

${P}/OL06SU

```

MAIN CHARACTERISTICS:

| FILE | OBSERVATION FILE HEADER       | OBSERVATION FILE              | SESS | RECEIVER 1     | RECEIVER 2     |
|------|-------------------------------|-------------------------------|------|----------------|----------------|
| 1    | \${P}/OL06SU\OBS\01112870.PSH | \${P}/OL06SU\OBS\01112870.PSO | 2870 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 2    | \${P}/OL06SU\OBS\01112880.PSH | \${P}/OL06SU\OBS\01112880.PSO | 2880 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 3    | \${P}/OL06SU\OBS\01112890.PSH | \${P}/OL06SU\OBS\01112890.PSO | 2890 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 4    | \${P}/OL06SU\OBS\01122870.PSH | \${P}/OL06SU\OBS\01122870.PSO | 2870 | ASHTECH Z-XII3 | ASHTECH UZ-12  |
| 5    | \${P}/OL06SU\OBS\01122890.PSH | \${P}/OL06SU\OBS\01122890.PSO | 2890 | ASHTECH Z-XII3 | ASHTECH UZ-12  |
| 6    | \${P}/OL06SU\OBS\01142870.PSH | \${P}/OL06SU\OBS\01142870.PSO | 2870 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 7    | \${P}/OL06SU\OBS\01142880.PSH | \${P}/OL06SU\OBS\01142880.PSO | 2880 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 8    | \${P}/OL06SU\OBS\01142890.PSH | \${P}/OL06SU\OBS\01142890.PSO | 2890 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 9    | \${P}/OL06SU\OBS\01152870.PSH | \${P}/OL06SU\OBS\01152870.PSO | 2870 | ASHTECH Z-XII3 | ASHTECH UZ-12  |
| 10   | \${P}/OL06SU\OBS\01152880.PSH | \${P}/OL06SU\OBS\01152880.PSO | 2880 | ASHTECH Z-XII3 | ASHTECH UZ-12  |
| 11   | \${P}/OL06SU\OBS\01152890.PSH | \${P}/OL06SU\OBS\01152890.PSO | 2890 | ASHTECH Z-XII3 | ASHTECH UZ-12  |
| 12   | \${P}/OL06SU\OBS\11122870.PSH | \${P}/OL06SU\OBS\11122870.PSO | 2870 | ASHTECH Z-XII3 | ASHTECH UZ-12  |
| 13   | \${P}/OL06SU\OBS\11122890.PSH | \${P}/OL06SU\OBS\11122890.PSO | 2890 | ASHTECH Z-XII3 | ASHTECH UZ-12  |
| 14   | \${P}/OL06SU\OBS\14112870.PSH | \${P}/OL06SU\OBS\14112870.PSO | 2870 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 15   | \${P}/OL06SU\OBS\14112880.PSH | \${P}/OL06SU\OBS\14112880.PSO | 2880 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 16   | \${P}/OL06SU\OBS\14112890.PSH | \${P}/OL06SU\OBS\14112890.PSO | 2890 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |
| 17   | \${P}/OL06SU\OBS\14152870.PSH | \${P}/OL06SU\OBS\14152870.PSO | 2870 | ASHTECH Z-XII3 | ASHTECH UZ-12  |

18 \${P}/OL06SU\OBS\14152880.PSH      \${P}/OL06SU\OBS\14152880.PSO      2880      ASHTECH Z-XII3      ASHTECH UZ-12  
 19 \${P}/OL06SU\OBS\14152890.PSH      \${P}/OL06SU\OBS\14152890.PSO      2890      ASHTECH Z-XII3      ASHTECH UZ-12

| FILE | TYP | FREQ. | STATION 1 | STATION 2 | SESS | FIRST   | OBSERV.TIME | #EPO | DT | #EF | #CLK | ARC | #SAT | AMB.I.+S. |    |      | #CLUSTERS |    |    |    | RM |   |
|------|-----|-------|-----------|-----------|------|---------|-------------|------|----|-----|------|-----|------|-----------|----|------|-----------|----|----|----|----|---|
|      |     |       |           |           |      |         |             |      |    |     |      |     |      | W         | 12 | #AMB | L1        | L2 | L5 |    |    |   |
| 1    | P   | L1,L2 | GPS1      | GP11      | 2870 | 6-10-14 | 12:59:00    | 1322 | 30 | 0   | E    | E   | 1    | 29        | N  | Y    | Y         | 47 | 20 | 20 | 47 | 0 |
| 2    | P   | L1,L2 | GPS1      | GP11      | 2880 | 6-10-15 | 0:00:30     | 2879 | 30 | 0   | E    | E   | 1    | 28        | N  | Y    | Y         | 77 | 29 | 29 | 77 | 0 |
| 3    | P   | L1,L2 | GPS1      | GP11      | 2890 | 6-10-16 | 0:00:30     | 1329 | 30 | 0   | E    | E   | 1    | 29        | N  | Y    | Y         | 39 | 15 | 15 | 39 | 0 |
| 4    | P   | L1,L2 | GPS1      | GP12      | 2870 | 6-10-14 | 0:00:30     | 2879 | 30 | 0   | E    | E   | 1    | 29        | N  | Y    | Y         | 77 | 27 | 27 | 77 | 0 |
| 5    | P   | L1,L2 | GPS1      | GP12      | 2890 | 6-10-16 | 0:00:30     | 2879 | 30 | 0   | E    | E   | 1    | 29        | N  | Y    | Y         | 73 | 22 | 22 | 73 | 0 |
| 6    | P   | L1,L2 | GPS1      | GP14      | 2870 | 6-10-14 | 13:25:30    | 1269 | 30 | 0   | E    | E   | 1    | 29        | N  | Y    | Y         | 44 | 18 | 18 | 44 | 0 |
| 7    | P   | L1,L2 | GPS1      | GP14      | 2880 | 6-10-15 | 0:00:30     | 2879 | 30 | 0   | E    | E   | 1    | 28        | N  | Y    | Y         | 77 | 29 | 29 | 77 | 0 |
| 8    | P   | L1,L2 | GPS1      | GP14      | 2890 | 6-10-16 | 0:00:30     | 1375 | 30 | 0   | E    | E   | 1    | 29        | N  | Y    | Y         | 41 | 16 | 16 | 41 | 0 |
| 9    | P   | L1,L2 | GPS1      | GP15      | 2870 | 6-10-14 | 13:50:30    | 1219 | 30 | 0   | E    | E   | 1    | 29        | N  | Y    | Y         | 37 | 13 | 13 | 37 | 0 |
| 10   | P   | L1,L2 | GPS1      | GP15      | 2880 | 6-10-15 | 0:00:30     | 2879 | 30 | 0   | E    | E   | 1    | 28        | N  | Y    | Y         | 76 | 28 | 28 | 76 | 0 |
| 11   | P   | L1,L2 | GPS1      | GP15      | 2890 | 6-10-16 | 0:00:30     | 1420 | 30 | 0   | E    | E   | 1    | 29        | N  | Y    | Y         | 43 | 16 | 16 | 43 | 0 |
| 12   | P   | L1,L2 | GP11      | GP12      | 2870 | 6-10-14 | 12:59:00    | 1322 | 30 | 0   | E    | E   | 1    | 29        | N  | Y    | Y         | 38 | 10 | 10 | 38 | 0 |
| 13   | P   | L1,L2 | GP11      | GP12      | 2890 | 6-10-16 | 0:00:30     | 1329 | 30 | 0   | E    | E   | 1    | 29        | N  | Y    | Y         | 40 | 16 | 16 | 40 | 0 |
| 14   | P   | L1,L2 | GP14      | GP11      | 2870 | 6-10-14 | 13:25:30    | 1269 | 30 | 0   | E    | E   | 1    | 29        | N  | Y    | Y         | 38 | 12 | 12 | 38 | 0 |
| 15   | P   | L1,L2 | GP14      | GP11      | 2880 | 6-10-15 | 0:00:30     | 2879 | 30 | 0   | E    | E   | 1    | 28        | N  | Y    | Y         | 74 | 25 | 25 | 74 | 0 |
| 16   | P   | L1,L2 | GP14      | GP11      | 2890 | 6-10-16 | 0:00:30     | 1329 | 30 | 0   | E    | E   | 1    | 29        | N  | Y    | Y         | 42 | 18 | 18 | 42 | 0 |
| 17   | P   | L1,L2 | GP14      | GP15      | 2870 | 6-10-14 | 13:50:30    | 1219 | 30 | 0   | E    | E   | 1    | 29        | N  | Y    | Y         | 36 | 13 | 13 | 36 | 0 |
| 18   | P   | L1,L2 | GP14      | GP15      | 2880 | 6-10-15 | 0:00:30     | 2879 | 30 | 0   | E    | E   | 1    | 28        | N  | Y    | Y         | 66 | 18 | 18 | 66 | 0 |
| 19   | P   | L1,L2 | GP14      | GP15      | 2890 | 6-10-16 | 0:00:30     | 1375 | 30 | 0   | E    | E   | 1    | 29        | N  | Y    | Y         | 41 | 14 | 14 | 41 | 0 |

SATELLITES:

-----

FILE #SAT SATELLITES

| FILE | #SAT | SATELLITES                                                                    |
|------|------|-------------------------------------------------------------------------------|
| 1    | 29   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 |
| 2    | 28   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 30 31    |
| 3    | 29   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 |
| 4    | 29   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 |
| 5    | 29   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 |
| 6    | 29   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 |
| 7    | 28   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 30 31    |
| 8    | 29   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 |
| 9    | 29   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 |
| 10   | 28   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 30 31    |
| 11   | 29   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 |
| 12   | 29   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 |
| 13   | 29   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 |
| 14   | 29   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 |
| 15   | 28   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 30 31    |
| 16   | 29   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 |
| 17   | 29   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 |
| 18   | 28   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 30 31    |
| 19   | 29   | 1 2 3 4 5 6 7 8 9 10 11 13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 |

OBSERVATION SELECTION:

-----

SAMPLING RATE : 30 SEC  
ELEVATION CUT-OFF ANGLE : 20 DEGREES  
SATELLITE SYSTEM : GPS  
SPECIAL DATA SELECTION : NO

1\${P}/OL06SU  
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PROGRAM GPSEST 22-FEB-07 12:58  
BERNESE GPS SOFTWARE VERSION 5.0

3. GENERAL OPTIONS

-----

TIDAL CORRECTION OF STATION COORDINATES : IERS CONVENTIONS 2000

A PRIORI SIGMA OF UNIT WEIGHT:

-----

A PRIORI SIGMA OF UNIT WEIGHT : 0.001 M (SIGMA OF ONE-WAY L1 PHASE OBSERVABLE AT ZENITH)

MODEL FOR ELEVATION-DEPENDENT WEIGHTING : 1/COS(Z)

CORRELATIONS AND SESSIONS:

-----

STRATEGY : CORRELATIONS WITHIN BASELINE

AMBIGUITY RESOLUTION STRATEGY:

-----

AMBIGUITIES PRE-ELIMINATED EVERY 30 SECONDS

SYNCHRONIZATION ERRORS:

-----

STRATEGY : SYNCHRONIZATION ERRORS NOT APPLIED

4. STATIONS

-----

Local geodetic datum: \${X}/GEN\DATUM.

```

Datum name Ell. param./ Scale Shifts to WGS-84 Rotations to WGS-84

WGS - 84 A = 6378137.000 m DX = 0.0000 m RX = 0.00000 arcsec
 1/F= 298.2572236 DY = 0.0000 m RY = 0.00000 arcsec
 SC = 0.00000D+00 DZ = 0.0000 m RZ = 0.00000 arcsec

```

A priori station coordinates:           \${P}/OL06SU\STA\OLKIU.CRD

```

 A priori station coordinates A priori station coordinates
 WGS-84 Ellipsoidal in local geodetic datum

num Station name obs e/f/h X (m) Y (m) Z (m) Latitude Longitude Height (m)

1 GPS1 Y ESTIM 2863210.2855 1126271.3627 5568267.2028 61 14 22.748766 21 28 21.624778 30.5343
2 GP11 Y ESTIM 2859164.4451 1133699.2391 5568849.3287 61 15 1.096558 21 37 44.500394 43.1905
3 GP12 Y ESTIM 2861097.0631 1122358.5353 5570120.7180 61 16 27.780953 21 25 9.163734 21.8609
4 GP14 Y ESTIM 2864514.8990 1133711.1997 5566120.9120 61 11 57.682867 21 35 33.201720 48.3365
5 GP15 Y ESTIM 2866984.1300 1129664.4472 5565663.1052 61 11 27.618629 21 30 20.512380 37.5870

```

A priori sigma:

```

 Station coordinates a priori sigma
 in local geodetic datum

num Station name N (m) E (m) U (m)

1 GPS1 0.00001 0.00001 0.00001

```

```

1${P}/OL06SU PROGRAM GPSEST 22-FEB-07 12:58
OL06SU BERNESE GPS SOFTWARE VERSION 5.0

```

5. SATELLITE ORBITS

ARC CHARACTERISTICS:

```

ARC START OF ARC END OF ARC SOURCE #SAT SATELLITES

1 06-10-14 00:00:00 06-10-17 00:00:00 PR2006.289 30
 1 2 3 4 5 6 7 8 9 10 11 13 14 15 16 17 18 19
 20 21 22 23 24 25 26 27 28 29 30 31

```

OSCULATING ELEMENTS:           \${P}/OL06SU\ORB\OL06SU.STD

REFERENCE SYSTEM: J2000.0  
 REFERENCE EPOCH : 54022.0003472 MJD (2006 10 14 0 0 30.00)

| SAT | S.MAJ.AXIS | ECCENTRIC. | INCLINAT. | NODE        | PERIGEE     | M. ANOMALY  | PER.PASS.TIME |
|-----|------------|------------|-----------|-------------|-------------|-------------|---------------|
| 1   | 26559188.3 | 0.00652047 | 56.685277 | 19.779487   | -102.361033 | 178.590492  | 54021.7530181 |
| 2   | 26562516.0 | 0.00877462 | 54.319136 | -102.917807 | 123.304769  | -110.149353 | 54022.1529212 |
| 3   | 26559532.8 | 0.00873528 | 53.076320 | -168.119516 | 39.948821   | -150.830037 | 54022.2092351 |
| 4   | 26560245.8 | 0.00750134 | 54.287916 | -101.797337 | 10.332940   | 35.600502   | 54021.9510413 |
| 5   | 26559801.7 | 0.00754202 | 53.795863 | 132.488560  | 64.209053   | 16.745457   | 54021.9771557 |
| 6   | 26561782.6 | 0.00591050 | 53.508511 | -164.704364 | -101.330277 | 85.293255   | 54021.8822077 |
| 7   | 26559582.7 | 0.01036173 | 53.595852 | -166.187962 | -100.141269 | 27.388112   | 54021.9624167 |
| 8   | 26558242.9 | 0.00991247 | 55.886925 | 79.754074   | -206.152064 | 95.001123   | 54021.8687876 |
| 9   | 26561698.0 | 0.01848444 | 55.183397 | 75.090512   | 73.871598   | 74.554553   | 54021.8970823 |
| 10  | 26559905.1 | 0.00708962 | 55.663129 | -41.357321  | 24.958106   | -81.388148  | 54022.1130658 |
| 11  | 26561399.6 | 0.00596747 | 51.300708 | -111.617919 | 22.895090   | 120.858159  | 54021.8329504 |
| 13  | 26561869.0 | 0.00296359 | 56.926053 | 18.983851   | 73.070555   | -93.782938  | 54022.1302464 |
| 14  | 26559379.5 | 0.00280313 | 56.585041 | 18.186432   | 238.107200  | -121.728708 | 54022.1689306 |
| 15  | 26558844.3 | 0.00986639 | 54.686800 | -98.453323  | -205.007609 | 90.037013   | 54021.8756578 |
| 16  | 26561500.3 | 0.00343950 | 55.176929 | 137.914610  | -42.932609  | -4.059678   | 54022.0059702 |
| 17  | 26560077.7 | 0.00218580 | 55.016858 | -162.570759 | 176.636838  | -58.935450  | 54022.0819707 |
| 18  | 26561583.0 | 0.00779113 | 54.752766 | -40.223531  | -150.074793 | 0.304542    | 54021.9999254 |
| 19  | 26560655.1 | 0.00356984 | 54.897474 | -159.189821 | -63.073461  | -78.490214  | 54022.1090570 |
| 20  | 26558947.4 | 0.00270446 | 54.720869 | -43.264511  | 77.760004   | -8.292413   | 54022.0118312 |
| 21  | 26558822.8 | 0.01168192 | 53.917050 | -100.689416 | -167.136784 | 74.434632   | 54021.8972652 |
| 22  | 26562106.0 | 0.00500696 | 54.613909 | -39.777784  | 263.476288  | -86.655231  | 54022.1203754 |
| 23  | 26562387.5 | 0.00477300 | 55.568800 | 17.276544   | 145.409132  | -135.734472 | 54022.1883592 |
| 24  | 26577879.4 | 0.00882347 | 54.871485 | -99.780077  | -47.201372  | 91.366729   | 54021.8736803 |
| 25  | 26560979.5 | 0.01261778 | 54.804291 | 71.921564   | -75.650039  | 107.811250  | 54021.8510248 |
| 26  | 26560964.8 | 0.01748785 | 56.817069 | 19.009474   | -313.173518 | 174.852984  | 54021.7581699 |
| 27  | 26557732.2 | 0.01993639 | 55.062989 | 73.777983   | -108.440178 | 24.999353   | 54021.9657286 |
| 28  | 26562199.2 | 0.01175839 | 55.068290 | 138.455321  | -128.569899 | -43.848625  | 54022.0610833 |
| 29  | 26559014.4 | 0.00960950 | 56.619557 | 17.004167   | -48.045712  | -79.959335  | 54022.1110814 |
| 30  | 26560457.7 | 0.00948778 | 54.169986 | 135.211680  | 75.571311   | -28.232379  | 54022.0394489 |
| 31  | 26559902.7 | 0.00583449 | 54.988419 | 77.054983   | -82.156767  | 116.651417  | 54021.8387907 |

SATELLITE PROBLEMS:

| SAT | PROBLEM TYPE   | ACTION       | FROM              | TO                |
|-----|----------------|--------------|-------------------|-------------------|
| 118 | BAD PHASE+CODE | OBS. REMOVED | 06-09-24 00:00:00 | 06-10-22 23:59:59 |
| 121 | BAD PHASE+CODE | OBS. REMOVED | 06-09-24 00:00:00 | 06-10-22 23:59:59 |
| 29  | BAD PHASE+CODE | OBS. REMOVED | 06-10-15 00:00:00 | 06-10-15 23:59:59 |

1\${P}/OL06SU  
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PROGRAM GPSEST 22-FEB-07 12:58  
 BERNESE GPS SOFTWARE VERSION 5.0



|    |      |                     |         |     |
|----|------|---------------------|---------|-----|
| 29 | GP11 | 2006 10 16 08 00 00 | 0.00000 | rel |
| 30 | GP11 | 2006 10 16 10 00 00 | 0.00000 | rel |
| 31 | GP11 | 2006 10 16 12 00 00 | 0.00000 | rel |
| 32 | GP11 | 2006 10 16 14 00 00 | 0.00000 | rel |
| 33 | GP11 | 2006 10 16 16 00 00 | 0.00000 | rel |
| 34 | GP11 | 2006 10 16 18 00 00 | 0.00000 | rel |
| 35 | GP11 | 2006 10 16 20 00 00 | 0.00000 | rel |
| 36 | GP11 | 2006 10 16 22 00 00 | 0.00000 | rel |
| 37 | GP11 | 2006 10 17 00 00 00 | 0.00000 | rel |
| 38 | GP12 | 2006 10 14 00 00 00 | 0.00000 | abs |
| 39 | GP12 | 2006 10 14 02 00 00 | 0.00000 | rel |
| 40 | GP12 | 2006 10 14 04 00 00 | 0.00000 | rel |
| 41 | GP12 | 2006 10 14 06 00 00 | 0.00000 | rel |
| 42 | GP12 | 2006 10 14 08 00 00 | 0.00000 | rel |
| 43 | GP12 | 2006 10 14 10 00 00 | 0.00000 | rel |
| 44 | GP12 | 2006 10 14 12 00 00 | 0.00000 | rel |
| 45 | GP12 | 2006 10 14 14 00 00 | 0.00000 | rel |
| 46 | GP12 | 2006 10 14 16 00 00 | 0.00000 | rel |
| 47 | GP12 | 2006 10 14 18 00 00 | 0.00000 | rel |
| 48 | GP12 | 2006 10 14 20 00 00 | 0.00000 | rel |
| 49 | GP12 | 2006 10 14 22 00 00 | 0.00000 | rel |
| 50 | GP12 | 2006 10 15 00 00 00 | 0.00000 | rel |
| 51 | GP12 | 2006 10 15 02 00 00 | 0.00000 | rel |
| 52 | GP12 | 2006 10 15 04 00 00 | 0.00000 | rel |
| 53 | GP12 | 2006 10 15 06 00 00 | 0.00000 | rel |
| 54 | GP12 | 2006 10 15 08 00 00 | 0.00000 | rel |
| 55 | GP12 | 2006 10 15 10 00 00 | 0.00000 | rel |
| 56 | GP12 | 2006 10 15 12 00 00 | 0.00000 | rel |
| 57 | GP12 | 2006 10 15 14 00 00 | 0.00000 | rel |
| 58 | GP12 | 2006 10 15 16 00 00 | 0.00000 | rel |
| 59 | GP12 | 2006 10 15 18 00 00 | 0.00000 | rel |
| 60 | GP12 | 2006 10 15 20 00 00 | 0.00000 | rel |
| 61 | GP12 | 2006 10 15 22 00 00 | 0.00000 | rel |
| 62 | GP12 | 2006 10 16 00 00 00 | 0.00000 | rel |
| 63 | GP12 | 2006 10 16 02 00 00 | 0.00000 | rel |
| 64 | GP12 | 2006 10 16 04 00 00 | 0.00000 | rel |
| 65 | GP12 | 2006 10 16 06 00 00 | 0.00000 | rel |
| 66 | GP12 | 2006 10 16 08 00 00 | 0.00000 | rel |
| 67 | GP12 | 2006 10 16 10 00 00 | 0.00000 | rel |
| 68 | GP12 | 2006 10 16 12 00 00 | 0.00000 | rel |
| 69 | GP12 | 2006 10 16 14 00 00 | 0.00000 | rel |
| 70 | GP12 | 2006 10 16 16 00 00 | 0.00000 | rel |
| 71 | GP12 | 2006 10 16 18 00 00 | 0.00000 | rel |
| 72 | GP12 | 2006 10 16 20 00 00 | 0.00000 | rel |
| 73 | GP12 | 2006 10 16 22 00 00 | 0.00000 | rel |
| 74 | GP12 | 2006 10 17 00 00 00 | 0.00000 | rel |
| 75 | GP14 | 2006 10 14 00 00 00 | 0.00000 | abs |
| 76 | GP14 | 2006 10 14 02 00 00 | 0.00000 | rel |
| 77 | GP14 | 2006 10 14 04 00 00 | 0.00000 | rel |
| 78 | GP14 | 2006 10 14 06 00 00 | 0.00000 | rel |
| 79 | GP14 | 2006 10 14 08 00 00 | 0.00000 | rel |
| 80 | GP14 | 2006 10 14 10 00 00 | 0.00000 | rel |
| 81 | GP14 | 2006 10 14 12 00 00 | 0.00000 | rel |

|     |      |                     |         |     |
|-----|------|---------------------|---------|-----|
| 82  | GP14 | 2006 10 14 14 00 00 | 0.00000 | rel |
| 83  | GP14 | 2006 10 14 16 00 00 | 0.00000 | rel |
| 84  | GP14 | 2006 10 14 18 00 00 | 0.00000 | rel |
| 85  | GP14 | 2006 10 14 20 00 00 | 0.00000 | rel |
| 86  | GP14 | 2006 10 14 22 00 00 | 0.00000 | rel |
| 87  | GP14 | 2006 10 15 00 00 00 | 0.00000 | rel |
| 88  | GP14 | 2006 10 15 02 00 00 | 0.00000 | rel |
| 89  | GP14 | 2006 10 15 04 00 00 | 0.00000 | rel |
| 90  | GP14 | 2006 10 15 06 00 00 | 0.00000 | rel |
| 91  | GP14 | 2006 10 15 08 00 00 | 0.00000 | rel |
| 92  | GP14 | 2006 10 15 10 00 00 | 0.00000 | rel |
| 93  | GP14 | 2006 10 15 12 00 00 | 0.00000 | rel |
| 94  | GP14 | 2006 10 15 14 00 00 | 0.00000 | rel |
| 95  | GP14 | 2006 10 15 16 00 00 | 0.00000 | rel |
| 96  | GP14 | 2006 10 15 18 00 00 | 0.00000 | rel |
| 97  | GP14 | 2006 10 15 20 00 00 | 0.00000 | rel |
| 98  | GP14 | 2006 10 15 22 00 00 | 0.00000 | rel |
| 99  | GP14 | 2006 10 16 00 00 00 | 0.00000 | rel |
| 100 | GP14 | 2006 10 16 02 00 00 | 0.00000 | rel |
| 101 | GP14 | 2006 10 16 04 00 00 | 0.00000 | rel |
| 102 | GP14 | 2006 10 16 06 00 00 | 0.00000 | rel |
| 103 | GP14 | 2006 10 16 08 00 00 | 0.00000 | rel |
| 104 | GP14 | 2006 10 16 10 00 00 | 0.00000 | rel |
| 105 | GP14 | 2006 10 16 12 00 00 | 0.00000 | rel |
| 106 | GP14 | 2006 10 16 14 00 00 | 0.00000 | rel |
| 107 | GP14 | 2006 10 16 16 00 00 | 0.00000 | rel |
| 108 | GP14 | 2006 10 16 18 00 00 | 0.00000 | rel |
| 109 | GP14 | 2006 10 16 20 00 00 | 0.00000 | rel |
| 110 | GP14 | 2006 10 16 22 00 00 | 0.00000 | rel |
| 111 | GP14 | 2006 10 17 00 00 00 | 0.00000 | rel |
| 112 | GP15 | 2006 10 14 00 00 00 | 0.00000 | abs |
| 113 | GP15 | 2006 10 14 02 00 00 | 0.00000 | rel |
| 114 | GP15 | 2006 10 14 04 00 00 | 0.00000 | rel |
| 115 | GP15 | 2006 10 14 06 00 00 | 0.00000 | rel |
| 116 | GP15 | 2006 10 14 08 00 00 | 0.00000 | rel |
| 117 | GP15 | 2006 10 14 10 00 00 | 0.00000 | rel |
| 118 | GP15 | 2006 10 14 12 00 00 | 0.00000 | rel |
| 119 | GP15 | 2006 10 14 14 00 00 | 0.00000 | rel |
| 120 | GP15 | 2006 10 14 16 00 00 | 0.00000 | rel |
| 121 | GP15 | 2006 10 14 18 00 00 | 0.00000 | rel |
| 122 | GP15 | 2006 10 14 20 00 00 | 0.00000 | rel |
| 123 | GP15 | 2006 10 14 22 00 00 | 0.00000 | rel |
| 124 | GP15 | 2006 10 15 00 00 00 | 0.00000 | rel |
| 125 | GP15 | 2006 10 15 02 00 00 | 0.00000 | rel |
| 126 | GP15 | 2006 10 15 04 00 00 | 0.00000 | rel |
| 127 | GP15 | 2006 10 15 06 00 00 | 0.00000 | rel |
| 128 | GP15 | 2006 10 15 08 00 00 | 0.00000 | rel |
| 129 | GP15 | 2006 10 15 10 00 00 | 0.00000 | rel |
| 130 | GP15 | 2006 10 15 12 00 00 | 0.00000 | rel |
| 131 | GP15 | 2006 10 15 14 00 00 | 0.00000 | rel |
| 132 | GP15 | 2006 10 15 16 00 00 | 0.00000 | rel |
| 133 | GP15 | 2006 10 15 18 00 00 | 0.00000 | rel |
| 134 | GP15 | 2006 10 15 20 00 00 | 0.00000 | rel |



|     |      |                     |         |     |
|-----|------|---------------------|---------|-----|
| 135 | GP15 | 2006 10 15 22 00 00 | 0.00000 | rel |
| 136 | GP15 | 2006 10 16 00 00 00 | 0.00000 | rel |
| 137 | GP15 | 2006 10 16 02 00 00 | 0.00000 | rel |
| 138 | GP15 | 2006 10 16 04 00 00 | 0.00000 | rel |
| 139 | GP15 | 2006 10 16 06 00 00 | 0.00000 | rel |
| 140 | GP15 | 2006 10 16 08 00 00 | 0.00000 | rel |
| 141 | GP15 | 2006 10 16 10 00 00 | 0.00000 | rel |
| 142 | GP15 | 2006 10 16 12 00 00 | 0.00000 | rel |
| 143 | GP15 | 2006 10 16 14 00 00 | 0.00000 | rel |
| 144 | GP15 | 2006 10 16 16 00 00 | 0.00000 | rel |
| 145 | GP15 | 2006 10 16 18 00 00 | 0.00000 | rel |
| 146 | GP15 | 2006 10 16 20 00 00 | 0.00000 | rel |
| 147 | GP15 | 2006 10 16 22 00 00 | 0.00000 | rel |
| 148 | GP15 | 2006 10 17 00 00 00 | 0.00000 | rel |

IONOSPHERE MODELS:

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NO IONOSPHERE MODELS APPLIED

1\${P}/OL06SU  
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PROGRAM GPSEST 22-FEB-07 12:58  
BERNESE GPS SOFTWARE VERSION 5.0

8. POLE COORDINATES AND TIME INFORMATION

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A PRIORI POLE AND TIME INFORMATION FROM THE POLE FILE:

-----

| DATUM    | TIME     | X-POLE ("<br>EP-CPO (" | Y-POLE ("<br>PS-CPO (" | UT1-UTC (S) | GPS-UTC (S) | RMS XP ("<br>RMS EP (" | RMS YP ("<br>RMS PS (" | RMS DT (S) |
|----------|----------|------------------------|------------------------|-------------|-------------|------------------------|------------------------|------------|
| 06-10-14 | 00:00:00 | 0.01130                | 0.25742                | 0.127579    | 14.         | 0.00000                | 0.00000                | 0.000000   |
|          |          | 0.00000                | 0.00000                |             |             | 0.00000                | 0.00000                |            |
| 06-10-15 | 00:00:00 | 0.00988                | 0.25770                | 0.126705    | 14.         | 0.00000                | 0.00000                | 0.000000   |
|          |          | 0.00000                | 0.00000                |             |             | 0.00000                | 0.00000                |            |
| 06-10-16 | 00:00:00 | 0.00850                | 0.25857                | 0.125686    | 14.         | 0.00000                | 0.00000                | 0.000000   |
|          |          | 0.00000                | 0.00000                |             |             | 0.00000                | 0.00000                |            |
| 06-10-17 | 00:00:00 | 0.00726                | 0.25953                | 0.124507    | 14.         | 0.00000                | 0.00000                | 0.000000   |
|          |          | 0.00000                | 0.00000                |             |             | 0.00000                | 0.00000                |            |

NUTATION MODEL: IAU2000  
SUBDAILY POLE MODEL: IERS2000

1\${P}/OL06SU  
OL06SU

PROGRAM GPSEST 22-FEB-07 12:58  
BERNESE GPS SOFTWARE VERSION 5.0

-----  
 12. TEST OUTPUT  
 -----

MIN. AND MAX. ELEVATION/NADIR ANGLES AND MAX. SYNCHRONIZATION ERRORS:  
 -----

| SESS | FILE | STATION NAME 1 | STATION NAME 2 | MIN/MAX ELEV. | MIN/MAX NADIR | SYNCH. ERR. (NS) |
|------|------|----------------|----------------|---------------|---------------|------------------|
| 0001 | 1    | GPS1           | GP11           | 20.0 79.4     | 2.5 13.2      | 0.0              |
| 0002 | 2    | GPS1           | GP11           | 20.0 83.6     | 1.5 13.2      | 0.0              |
| 0003 | 3    | GPS1           | GP11           | 20.0 83.6     | 1.5 13.2      | 0.0              |
| 0004 | 4    | GPS1           | GP12           | 20.0 83.6     | 1.5 13.2      | 0.0              |
| 0005 | 5    | GPS1           | GP12           | 20.0 83.6     | 1.5 13.2      | 0.0              |
| 0006 | 6    | GPS1           | GP14           | 20.0 79.5     | 2.5 13.2      | 0.0              |
| 0007 | 7    | GPS1           | GP14           | 20.0 83.7     | 1.5 13.2      | 0.0              |
| 0008 | 8    | GPS1           | GP14           | 20.0 83.7     | 1.5 13.2      | 0.0              |
| 0009 | 9    | GPS1           | GP15           | 20.0 79.5     | 2.5 13.2      | 0.0              |
| 0010 | 10   | GPS1           | GP15           | 20.0 83.7     | 1.5 13.2      | 0.0              |
| 0011 | 11   | GPS1           | GP15           | 20.0 83.7     | 1.5 13.2      | 0.0              |
| 0012 | 12   | GP11           | GP12           | 20.0 79.4     | 2.5 13.2      | 0.0              |
| 0013 | 13   | GP11           | GP12           | 20.0 83.6     | 1.5 13.2      | 0.0              |
| 0014 | 14   | GP14           | GP11           | 20.0 79.5     | 2.5 13.2      | 0.0              |
| 0015 | 15   | GP14           | GP11           | 20.0 83.7     | 1.5 13.2      | 0.0              |
| 0016 | 16   | GP14           | GP11           | 20.0 83.7     | 1.5 13.2      | 0.0              |
| 0017 | 17   | GP14           | GP15           | 20.0 79.5     | 2.5 13.2      | 0.0              |
| 0018 | 18   | GP14           | GP15           | 20.0 83.7     | 1.5 13.2      | 0.0              |
| 0019 | 19   | GP14           | GP15           | 20.0 83.7     | 1.5 13.2      | 0.0              |

1\${P}/OL06SU  
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PROGRAM GPSEST 22-FEB-07 12:58  
 BERNESE GPS SOFTWARE VERSION 5.0

-----  
 13. RESULTS (PART 1)  
 -----

NUMBER OF PARAMETERS (PART 1):  
 -----

| PARAMETER TYPE                       | #PARAMETERS | #PRE-ELIMINATED | #SET-UP | #NO-OBS | #REF | #SINGULAR |
|--------------------------------------|-------------|-----------------|---------|---------|------|-----------|
| STATION COORDINATES                  | 15          | 0               | 15      | 0       | 0    | 0         |
| AMBIGUITIES                          | 65          | 65 (BEFORE INV) | 718     | 653     | 0    | 9         |
| SITE-SPECIFIC TROPOSPHERE PARAMETERS | 148         | 0               | 148     | 0       | 0    | 47        |
| -----                                |             |                 |         |         |      |           |
| TOTAL NUMBER OF PARAMETERS           | 228         | 65              | 881     | 653     | 0    | 56        |



|   |      |           |                 |                 |         |        |        |      |        |      |  |
|---|------|-----------|-----------------|-----------------|---------|--------|--------|------|--------|------|--|
| 3 | GP12 | X         | 2861097.0631    | 2861097.0712    | 0.0081  | 0.0002 |        |      |        |      |  |
|   |      | Y         | 1122358.5353    | 1122358.5370    | 0.0017  | 0.0001 |        |      |        |      |  |
|   |      | Z         | 5570120.7180    | 5570120.7304    | 0.0124  | 0.0003 |        |      |        |      |  |
|   |      | HEIGHT    | 21.8609         | 21.8757         | 0.0148  | 0.0004 | 0.0004 | 0.3  |        |      |  |
|   |      | LATITUDE  | 61 16 27.780953 | 61 16 27.780913 | -0.0012 | 0.0001 | 0.0000 | 90.6 | 0.0000 | 90.6 |  |
|   |      | LONGITUDE | 21 25 9.163734  | 21 25 9.163639  | -0.0014 | 0.0000 | 0.0001 | -0.1 | 0.0001 |      |  |
| 4 | GP14 | X         | 2864514.8990    | 2864514.9014    | 0.0024  | 0.0002 |        |      |        |      |  |
|   |      | Y         | 1133711.1997    | 1133711.2047    | 0.0050  | 0.0001 |        |      |        |      |  |
|   |      | Z         | 5566120.9120    | 5566120.9114    | -0.0006 | 0.0003 |        |      |        |      |  |
|   |      | HEIGHT    | 48.3365         | 48.3379         | 0.0015  | 0.0003 | 0.0003 | 0.3  |        |      |  |
|   |      | LATITUDE  | 61 11 57.682867 | 61 11 57.682743 | -0.0038 | 0.0001 | 0.0000 | 89.9 | 0.0000 | 90.0 |  |
|   |      | LONGITUDE | 21 35 33.201720 | 21 35 33.201974 | 0.0038  | 0.0000 | 0.0001 | -0.1 | 0.0001 |      |  |
| 5 | GP15 | X         | 2866984.1300    | 2866984.1350    | 0.0050  | 0.0002 |        |      |        |      |  |
|   |      | Y         | 1129664.4472    | 1129664.4512    | 0.0040  | 0.0001 |        |      |        |      |  |
|   |      | Z         | 5565663.1052    | 5565663.1059    | 0.0007  | 0.0003 |        |      |        |      |  |
|   |      | HEIGHT    | 37.5870         | 37.5906         | 0.0036  | 0.0004 | 0.0004 | 0.3  |        |      |  |
|   |      | LATITUDE  | 61 11 27.618629 | 61 11 27.618466 | -0.0050 | 0.0001 | 0.0000 | 90.1 | 0.0000 | 90.2 |  |
|   |      | LONGITUDE | 21 30 20.512380 | 21 30 20.512508 | 0.0019  | 0.0000 | 0.0001 | -0.1 | 0.0001 |      |  |

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PROGRAM GPSEST 22-FEB-07 12:58  
BERNESE GPS SOFTWARE VERSION 5.0

SITE-SPECIFIC TROPOSPHERE PARAMETERS: (NOT SAVED)

| REQU. | STATION NAME | CORRECTIONS (M) |      |          | RMS ERRORS (M) |      |         | ZENITH VECTOR (") |     |       |     | ERROR ELLIPSE (M) |         |     |
|-------|--------------|-----------------|------|----------|----------------|------|---------|-------------------|-----|-------|-----|-------------------|---------|-----|
|       |              | NORTH           | EAST | ZENITH   | NORTH          | EAST | ZENITH  | ANGLE             | RMS | RATIO | AZI | MAX RMS           | MIN RMS | AZI |
| 1     | GP11         |                 |      | 0.00000  |                |      | 0.00000 |                   |     |       |     |                   |         |     |
| 2     | GP11         |                 |      | 0.00000  |                |      | 0.00000 |                   |     |       |     |                   |         |     |
| 3     | GP11         |                 |      | 0.00000  |                |      | 0.00000 |                   |     |       |     |                   |         |     |
| 4     | GP11         |                 |      | 0.00000  |                |      | 0.00000 |                   |     |       |     |                   |         |     |
| 5     | GP11         |                 |      | 0.00000  |                |      | 0.00000 |                   |     |       |     |                   |         |     |
| 6     | GP11         |                 |      | 0.00000  |                |      | 0.00000 |                   |     |       |     |                   |         |     |
| 7     | GP11         |                 |      | -0.00982 |                |      | 0.00078 |                   |     |       |     |                   |         |     |
| 8     | GP11         |                 |      | 0.00279  |                |      | 0.00030 |                   |     |       |     |                   |         |     |
| 9     | GP11         |                 |      | -0.00507 |                |      | 0.00026 |                   |     |       |     |                   |         |     |
| 10    | GP11         |                 |      | -0.00477 |                |      | 0.00025 |                   |     |       |     |                   |         |     |
| 11    | GP11         |                 |      | -0.00788 |                |      | 0.00028 |                   |     |       |     |                   |         |     |
| 12    | GP11         |                 |      | 0.00075  |                |      | 0.00027 |                   |     |       |     |                   |         |     |
| 13    | GP11         |                 |      | -0.00971 |                |      | 0.00027 |                   |     |       |     |                   |         |     |
| 14    | GP11         |                 |      | -0.00106 |                |      | 0.00029 |                   |     |       |     |                   |         |     |
| 15    | GP11         |                 |      | 0.00100  |                |      | 0.00027 |                   |     |       |     |                   |         |     |
| 16    | GP11         |                 |      | -0.01123 |                |      | 0.00034 |                   |     |       |     |                   |         |     |

|    |      |          |         |
|----|------|----------|---------|
| 17 | GP11 | -0.00218 | 0.00030 |
| 18 | GP11 | -0.00042 | 0.00029 |
| 19 | GP11 | 0.00170  | 0.00027 |
| 20 | GP11 | -0.00085 | 0.00029 |
| 21 | GP11 | 0.00265  | 0.00029 |
| 22 | GP11 | 0.00374  | 0.00030 |
| 23 | GP11 | -0.00933 | 0.00031 |
| 24 | GP11 | 0.00036  | 0.00030 |
| 25 | GP11 | -0.00421 | 0.00027 |
| 26 | GP11 | -0.00067 | 0.00026 |
| 27 | GP11 | -0.00267 | 0.00024 |
| 28 | GP11 | -0.00023 | 0.00027 |
| 29 | GP11 | 0.00158  | 0.00025 |
| 30 | GP11 | -0.00098 | 0.00026 |
| 31 | GP11 | 0.00149  | 0.00103 |
| 32 | GP11 | 0.00000  | 0.00000 |
| 33 | GP11 | 0.00000  | 0.00000 |
| 34 | GP11 | 0.00000  | 0.00000 |
| 35 | GP11 | 0.00000  | 0.00000 |
| 36 | GP11 | 0.00000  | 0.00000 |
| 37 | GP11 | 0.00000  | 0.00000 |
| 38 | GP12 | -0.01067 | 0.00047 |
| 39 | GP12 | -0.00085 | 0.00037 |
| 40 | GP12 | -0.00546 | 0.00033 |
| 41 | GP12 | -0.00451 | 0.00038 |
| 42 | GP12 | -0.00084 | 0.00035 |
| 43 | GP12 | -0.00601 | 0.00034 |
| 44 | GP12 | -0.00242 | 0.00033 |
| 45 | GP12 | -0.00239 | 0.00030 |
| 46 | GP12 | -0.00501 | 0.00030 |
| 47 | GP12 | -0.00686 | 0.00028 |
| 48 | GP12 | -0.00455 | 0.00031 |
| 49 | GP12 | -0.00542 | 0.00031 |
| 50 | GP12 | 0.00065  | 0.00037 |
| 51 | GP12 | 0.00000  | 0.00000 |
| 52 | GP12 | 0.00000  | 0.00000 |
| 53 | GP12 | 0.00000  | 0.00000 |
| 54 | GP12 | 0.00000  | 0.00000 |
| 55 | GP12 | 0.00000  | 0.00000 |
| 56 | GP12 | 0.00000  | 0.00000 |
| 57 | GP12 | 0.00000  | 0.00000 |
| 58 | GP12 | 0.00000  | 0.00000 |
| 59 | GP12 | 0.00000  | 0.00000 |
| 60 | GP12 | 0.00000  | 0.00000 |
| 61 | GP12 | 0.00000  | 0.00000 |
| 62 | GP12 | -0.00328 | 0.00037 |
| 63 | GP12 | -0.00395 | 0.00030 |
| 64 | GP12 | -0.00246 | 0.00028 |
| 65 | GP12 | -0.00523 | 0.00031 |
| 66 | GP12 | -0.00464 | 0.00029 |
| 67 | GP12 | -0.00171 | 0.00028 |
| 68 | GP12 | -0.00302 | 0.00033 |
| 69 | GP12 | -0.00348 | 0.00036 |

|     |      |          |         |
|-----|------|----------|---------|
| 70  | GP12 | -0.00305 | 0.00036 |
| 71  | GP12 | -0.00014 | 0.00033 |
| 72  | GP12 | -0.00577 | 0.00039 |
| 73  | GP12 | -0.00607 | 0.00039 |
| 74  | GP12 | -0.00935 | 0.00046 |
| 75  | GP14 | 0.00000  | 0.00000 |
| 76  | GP14 | 0.00000  | 0.00000 |
| 77  | GP14 | 0.00000  | 0.00000 |
| 78  | GP14 | 0.00000  | 0.00000 |
| 79  | GP14 | 0.00000  | 0.00000 |
| 80  | GP14 | 0.00000  | 0.00000 |
| 81  | GP14 | -0.02439 | 0.00201 |
| 82  | GP14 | -0.00316 | 0.00035 |
| 83  | GP14 | -0.00336 | 0.00026 |
| 84  | GP14 | 0.00072  | 0.00025 |
| 85  | GP14 | -0.00316 | 0.00027 |
| 86  | GP14 | 0.00040  | 0.00027 |
| 87  | GP14 | -0.01103 | 0.00026 |
| 88  | GP14 | 0.00152  | 0.00026 |
| 89  | GP14 | -0.00109 | 0.00024 |
| 90  | GP14 | -0.00722 | 0.00031 |
| 91  | GP14 | -0.00315 | 0.00027 |
| 92  | GP14 | -0.00252 | 0.00026 |
| 93  | GP14 | -0.00131 | 0.00025 |
| 94  | GP14 | -0.00320 | 0.00026 |
| 95  | GP14 | 0.00123  | 0.00026 |
| 96  | GP14 | -0.00027 | 0.00027 |
| 97  | GP14 | -0.00873 | 0.00028 |
| 98  | GP14 | 0.00223  | 0.00027 |
| 99  | GP14 | -0.00459 | 0.00026 |
| 100 | GP14 | -0.00047 | 0.00026 |
| 101 | GP14 | -0.00564 | 0.00024 |
| 102 | GP14 | -0.00188 | 0.00027 |
| 103 | GP14 | 0.00189  | 0.00025 |
| 104 | GP14 | -0.00699 | 0.00026 |
| 105 | GP14 | -0.00323 | 0.00064 |
| 106 | GP14 | 0.00000  | 0.00000 |
| 107 | GP14 | 0.00000  | 0.00000 |
| 108 | GP14 | 0.00000  | 0.00000 |
| 109 | GP14 | 0.00000  | 0.00000 |
| 110 | GP14 | 0.00000  | 0.00000 |
| 111 | GP14 | 0.00000  | 0.00000 |
| 112 | GP15 | 0.00000  | 0.00000 |
| 113 | GP15 | 0.00000  | 0.00000 |
| 114 | GP15 | 0.00000  | 0.00000 |
| 115 | GP15 | 0.00000  | 0.00000 |
| 116 | GP15 | 0.00000  | 0.00000 |
| 117 | GP15 | 0.00000  | 0.00000 |
| 118 | GP15 | -0.25296 | 0.01493 |
| 119 | GP15 | -0.00331 | 0.00045 |
| 120 | GP15 | -0.00132 | 0.00030 |
| 121 | GP15 | 0.00392  | 0.00028 |
| 122 | GP15 | 0.00312  | 0.00031 |

|     |      |          |         |
|-----|------|----------|---------|
| 123 | GP15 | 0.00016  | 0.00030 |
| 124 | GP15 | -0.00668 | 0.00029 |
| 125 | GP15 | 0.00097  | 0.00029 |
| 126 | GP15 | -0.00222 | 0.00027 |
| 127 | GP15 | -0.00203 | 0.00034 |
| 128 | GP15 | -0.00354 | 0.00030 |
| 129 | GP15 | -0.00334 | 0.00029 |
| 130 | GP15 | -0.00265 | 0.00028 |
| 131 | GP15 | -0.00549 | 0.00029 |
| 132 | GP15 | 0.00028  | 0.00030 |
| 133 | GP15 | -0.00358 | 0.00030 |
| 134 | GP15 | -0.00485 | 0.00032 |
| 135 | GP15 | 0.00080  | 0.00030 |
| 136 | GP15 | -0.00346 | 0.00029 |
| 137 | GP15 | -0.00107 | 0.00029 |
| 138 | GP15 | -0.00401 | 0.00027 |
| 139 | GP15 | -0.00040 | 0.00030 |
| 140 | GP15 | -0.00117 | 0.00028 |
| 141 | GP15 | -0.00770 | 0.00029 |
| 142 | GP15 | -0.00595 | 0.00048 |
| 143 | GP15 | 0.00000  | 0.00000 |
| 144 | GP15 | 0.00000  | 0.00000 |
| 145 | GP15 | 0.00000  | 0.00000 |
| 146 | GP15 | 0.00000  | 0.00000 |
| 147 | GP15 | 0.00000  | 0.00000 |
| 148 | GP15 | 0.00000  | 0.00000 |

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PROGRAM GPSEST 22-FEB-07 12:58  
BERNESE GPS SOFTWARE VERSION 5.0

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RMS ERRORS OF ELLIPS. COORDINATES AND COORDINATE DIFFER. IN MM (PART 1):  
-----

| NUM |   | 1   | 2   | 3   | 4   | 5   |
|-----|---|-----|-----|-----|-----|-----|
| 1   | B | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 |
|     | L | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|     | H | 0.0 | 0.3 | 0.4 | 0.3 | 0.4 |
|     | B | 0.0 | 0.1 | 0.1 | 0.0 | 0.1 |
|     | L | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|     | H | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 |
| 2   | B | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
|     | L | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|     | H | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 |
| 3   | B | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
|     | L | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|     | H | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 |
| 4   | B | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
|     | L | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

|   |   |     |     |     |     |     |
|---|---|-----|-----|-----|-----|-----|
|   | H | 0.3 | 0.4 | 0.5 | 0.3 | 0.4 |
|   | B | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 5 | L | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|   | H | 0.4 | 0.5 | 0.5 | 0.4 | 0.4 |

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PROGRAM GPSEST 22-FEB-07 12:58  
BERNESE GPS SOFTWARE VERSION 5.0

SLOPE DISTANCES AND RMS ERRORS IN M (PART 1):

| NUM |     | 2 N       | 3 N        | 4 N        | 5 N        |
|-----|-----|-----------|------------|------------|------------|
| 1   | O   | 8478.2689 | 4817.8258  | 7852.3726  | 5704.0555  |
|     | N   | 8478.2666 | 4817.8257  | 7852.3779  | 5704.0609  |
|     | RMS | 0.0000    | 0.0000     | 0.0000     | 0.0000     |
| 2   | O   |           | 11574.2389 | 6005.9768  | 9358.3673  |
|     | N   |           | 11574.2390 | 6005.9753  | 9358.3657  |
|     | RMS |           | 0.0000     | 0.0000     | 0.0001     |
| 3   | O   |           |            | 12512.5153 | 10387.6955 |
|     | N   |           |            | 12512.5209 | 10387.7004 |
|     | RMS |           |            | 0.0001     | 0.0001     |
| 4   | O   |           |            |            | 4762.6563  |
|     | N   |           |            |            | 4762.6583  |
|     | RMS |           |            |            | 0.0000     |



**Appendix VIa. Results of 15 measurements at Kivetty. Deviations of the vector lengths from their mean in millimeters. Unscaled observations.**

| Vector    | Mean length<br>[mm] | Time [a] |      |      |      |      |      |      |      |      |      |      |      |      |      |      | RMS  |
|-----------|---------------------|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|           |                     | 96.3     | 96.8 | 97.3 | 97.8 | 98.3 | 98.8 | 99.3 | 99.8 | 1.3  | 1.8  | 2.8  | 3.8  | 4.8  | 5.8  | 6.8  |      |
| GPS1-GPS2 | 659084.3            | -0.9     | 0.1  | 0.7  | -0.5 | -0.3 | -0.5 | -0.5 | 0.1  | 0.2  | 0.3  | 1.0  | 0.5  | 0.5  | 0.0  | -0.8 | ±0.5 |
| GPS1-GPS3 | 1613486.0           | 0.2      | 0.1  | 0.9  | -0.6 | 0.1  | -0.4 | 0.6  | -1.0 | 0.0  | -0.1 | -0.1 | 0.3  | -0.1 | 0.2  | -0.6 | 0.5  |
| GPS1-GPS4 | 1591096.5           | 0.0      | -0.1 | 0.4  | -0.9 | 0.0  | -0.2 | 0.0  | 0.8  | -0.7 | -0.1 | -1.0 | 0.4  | -0.3 | 0.6  | 0.9  | 0.6  |
| GPS1-GPS5 | 672046.6            | 0.5      | 0.3  | 0.3  | 0.7  | -0.4 | 0.2  | -0.4 | -0.1 | -0.2 | 0.2  | -1.1 | 0.2  | -0.8 | 0.2  | 0.3  | 0.5  |
| GPS1-GPS6 | 1180588.8           | -0.7     | -0.5 | -0.1 | -0.5 | -1.1 | -0.1 | 0.0  | 0.2  | 0.2  | -0.6 | 0.4  | 0.3  | 0.5  | 0.8  | 1.2  | 0.6  |
| GPS1-GPS7 | 735563.5            | -1.0     | -1.0 | 0.8  | -0.1 | 0.8  | -0.2 | 0.0  | 0.3  | 0.4  | 0.9  | -0.6 | 0.5  | 0.2  | 0.0  | -1.0 | 0.6  |
| GPS2-GPS3 | 955938.4            | 1.1      | -0.1 | 0.2  | -0.2 | 0.5  | 0.2  | 1.3  | -1.0 | -0.2 | -0.3 | -0.9 | -0.3 | -0.4 | 0.2  | 0.3  | 0.6  |
| GPS2-GPS4 | 1198884.3           | -0.4     | -0.9 | 0.0  | -1.5 | 0.4  | 0.8  | 0.5  | 1.3  | -0.9 | 0.4  | -0.8 | 0.6  | -0.3 | 0.3  | 0.9  | 0.8  |
| GPS2-GPS5 | 1167283.9           | -0.9     | 0.3  | 1.3  | 0.3  | -0.6 | -0.1 | -0.7 | 0.5  | 0.1  | 0.6  | 0.3  | 0.8  | -0.2 | -0.3 | -1.4 | 0.6  |
| GPS2-GPS6 | 1829811.1           | -1.5     | -0.2 | 0.8  | -0.8 | -1.2 | -0.6 | -0.5 | 0.3  | 0.3  | -0.1 | 1.2  | 1.1  | 0.7  | 0.6  | -0.2 | 0.8  |
| GPS2-GPS7 | 901317.8            | -0.7     | 0.1  | 0.6  | -0.3 | 0.7  | -0.4 | -0.4 | -0.8 | 0.5  | 0.7  | -1.0 | 0.5  | 0.0  | 0.8  | 0.1  | 0.6  |
| GPS3-GPS4 | 1102332.1           | 0.0      | -0.4 | 0.6  | -0.8 | 0.2  | 0.7  | -0.5 | -3.0 | -0.4 | 1.6  | -1.1 | 0.7  | -0.1 | 1.6  | 1.5  | 1.2  |
| GPS3-GPS5 | 2031115.0           | 0.4      | 0.4  | 1.7  | 0.5  | -0.2 | -0.2 | 0.2  | -1.8 | 0.1  | 0.4  | -0.8 | 0.3  | -0.4 | 0.3  | -0.7 | 0.8  |
| GPS3-GPS6 | 2770065.0           | -0.2     | -0.2 | 1.1  | -0.8 | -0.6 | -0.5 | 0.7  | -1.4 | 0.2  | -0.3 | 0.3  | 0.6  | 0.3  | 1.0  | 0.2  | 0.7  |
| GPS3-GPS7 | 1693397.9           | -0.4     | -0.1 | 0.3  | -1.6 | 1.0  | 0.0  | 1.0  | -0.4 | 0.2  | -0.1 | -0.8 | 0.3  | -0.3 | 0.3  | 0.1  | 0.6  |
| GPS4-GPS5 | 1608741.6           | -0.2     | 0.3  | 1.2  | 0.3  | -0.3 | -0.5 | 0.0  | 1.0  | -0.3 | -0.3 | -0.7 | -0.1 | -0.2 | -0.2 | -0.4 | 0.5  |
| GPS4-GPS6 | 2462388.6           | -0.3     | -0.1 | 0.7  | -0.5 | -0.5 | -0.7 | 0.2  | 1.4  | -0.4 | -0.7 | 0.0  | 0.4  | 0.3  | 0.1  | 0.2  | 0.6  |
| GPS4-GPS7 | 2089326.7           | -1.0     | -0.9 | 0.6  | -1.6 | 1.0  | 0.2  | 0.1  | 0.6  | -0.4 | 0.9  | -2.1 | 0.9  | -0.3 | 1.0  | 0.9  | 1.0  |
| GPS5-GPS6 | 854745.5            | -0.1     | -0.5 | -0.6 | -0.9 | -0.5 | -0.1 | 0.2  | 0.5  | -0.1 | -1.0 | 0.7  | 0.6  | 0.8  | 0.4  | 0.9  | 0.6  |
| GPS5-GPS7 | 1379384.5           | -0.2     | -0.6 | 1.2  | 0.7  | 0.2  | -0.1 | -0.2 | 0.4  | 0.0  | 1.0  | -1.8 | 0.9  | -0.6 | 0.3  | -1.0 | 0.8  |
| GPS6-GPS7 | 1604963.1           | -1.1     | -1.3 | 0.9  | 0.0  | -1.2 | -0.5 | 0.0  | 0.6  | 0.3  | 0.2  | -0.4 | 0.8  | 0.3  | 1.1  | -0.3 | 0.7  |
| Mean:     |                     | -0.4     | -0.3 | 0.6  | -0.4 | -0.1 | -0.1 | 0.1  | -0.1 | -0.1 | 0.2  | -0.5 | 0.5  | 0.0  | 0.4  | 0.1  |      |
| St.dev.:  |                     | ±0.6     | 0.5  | 0.5  | 0.7  | 0.7  | 0.4  | 0.5  | 1.1  | 0.4  | 0.6  | 0.9  | 0.3  | 0.4  | 0.5  | 0.8  |      |
| RMS:      |                     | ±0.7     | 0.5  | 0.8  | 0.8  | 0.7  | 0.4  | 0.5  | 1.1  | 0.4  | 0.6  | 1.0  | 0.6  | 0.4  | 0.6  | 0.8  | ±0.7 |

**Appendix VIb. Results of 15 measurements at Kivetty. Deviations of the vector lengths from their mean in millimeters. Scaled observations.**

| Vector    | Mean length<br>[mm] | Time [a] |      |      |      |      |      |      |      |      |      |      |      |      |      |      | RMS  |
|-----------|---------------------|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|           |                     | 96.3     | 96.8 | 97.3 | 97.8 | 98.3 | 98.8 | 99.3 | 99.8 | 1.3  | 1.8  | 2.8  | 3.8  | 4.8  | 5.8  | 6.8  |      |
| GPS1-GPS2 | 659084.3            | -0.7     | 0.2  | 0.4  | -0.3 | -0.3 | -0.4 | -0.5 | 0.1  | 0.2  | 0.2  | 1.2  | 0.3  | 0.5  | -0.2 | -0.8 | ±0.5 |
| GPS1-GPS3 | 1613486.0           | 0.6      | 0.4  | 0.2  | -0.1 | 0.2  | -0.3 | 0.6  | -0.9 | 0.0  | -0.4 | 0.4  | -0.3 | -0.1 | -0.3 | -0.6 | 0.4  |
| GPS1-GPS4 | 1591096.5           | 0.4      | 0.2  | -0.3 | -0.4 | 0.1  | -0.1 | 0.0  | 0.9  | -0.7 | -0.4 | -0.5 | -0.2 | -0.3 | 0.1  | 0.9  | 0.5  |
| GPS1-GPS5 | 672046.6            | 0.7      | 0.4  | 0.0  | 0.9  | -0.4 | 0.3  | -0.4 | -0.1 | -0.2 | 0.1  | -0.9 | -0.1 | -0.8 | 0.0  | 0.3  | 0.5  |
| GPS1-GPS6 | 1180588.8           | -0.4     | -0.3 | -0.6 | -0.1 | -1.0 | 0.0  | 0.0  | 0.3  | 0.2  | -0.8 | 0.8  | -0.1 | 0.5  | 0.4  | 1.2  | 0.6  |
| GPS1-GPS7 | 735563.5            | -0.8     | -0.8 | 0.5  | 0.1  | 0.8  | -0.1 | 0.0  | 0.4  | 0.4  | 0.8  | -0.4 | 0.2  | 0.2  | -0.2 | -1.0 | 0.5  |
| GPS2-GPS3 | 955938.4            | 1.4      | 0.1  | -0.2 | 0.1  | 0.5  | 0.3  | 1.3  | -0.9 | -0.2 | -0.5 | -0.6 | -0.7 | -0.4 | -0.1 | 0.3  | 0.7  |
| GPS2-GPS4 | 1198884.3           | -0.1     | -0.7 | -0.6 | -1.1 | 0.5  | 0.9  | 0.5  | 1.4  | -0.9 | 0.2  | -0.4 | 0.1  | -0.3 | -0.1 | 0.9  | 0.7  |
| GPS2-GPS5 | 1167283.9           | -0.6     | 0.5  | 0.8  | 0.7  | -0.5 | 0.1  | -0.7 | 0.6  | 0.1  | 0.4  | 0.7  | 0.4  | -0.2 | -0.7 | -1.4 | 0.6  |
| GPS2-GPS6 | 1829811.1           | -1.0     | 0.2  | 0.0  | -0.2 | -1.1 | -0.4 | -0.5 | 0.4  | 0.3  | -0.4 | 1.8  | 0.4  | 0.7  | 0.0  | -0.2 | 0.7  |
| GPS2-GPS7 | 901317.8            | -0.5     | 0.3  | 0.2  | 0.0  | 0.7  | -0.3 | -0.4 | -0.7 | 0.5  | 0.5  | -0.7 | 0.2  | 0.0  | 0.5  | 0.1  | 0.4  |
| GPS3-GPS4 | 1102332.1           | 0.3      | -0.2 | 0.1  | -0.5 | 0.3  | 0.8  | -0.5 | -2.9 | -0.4 | 1.4  | -0.7 | 0.3  | -0.1 | 1.2  | 1.5  | 1.0  |
| GPS3-GPS5 | 2031115.0           | 1.0      | 0.8  | 0.8  | 1.1  | -0.1 | 0.0  | 0.2  | -1.7 | 0.2  | 0.0  | -0.1 | -0.5 | -0.4 | -0.4 | -0.7 | 0.7  |
| GPS3-GPS6 | 2770065.0           | 0.6      | 0.4  | -0.2 | 0.0  | -0.5 | -0.3 | 0.7  | -1.2 | 0.3  | -0.8 | 1.2  | -0.4 | 0.3  | 0.1  | 0.1  | 0.6  |
| GPS3-GPS7 | 1693397.9           | 0.1      | 0.2  | -0.5 | -1.1 | 1.1  | 0.1  | 1.0  | -0.3 | 0.2  | -0.4 | -0.2 | -0.3 | -0.3 | -0.2 | 0.1  | 0.5  |
| GPS4-GPS5 | 1608741.6           | 0.2      | 0.6  | 0.5  | 0.8  | -0.2 | -0.4 | 0.0  | 1.1  | -0.3 | -0.6 | -0.2 | -0.7 | -0.2 | -0.7 | -0.4 | 0.5  |
| GPS4-GPS6 | 2462388.6           | 0.4      | 0.4  | -0.4 | 0.2  | -0.4 | -0.5 | 0.2  | 1.6  | -0.3 | -1.1 | 0.8  | -0.5 | 0.3  | -0.7 | 0.1  | 0.7  |
| GPS4-GPS7 | 2089326.7           | -0.4     | -0.5 | -0.4 | -1.0 | 1.1  | 0.4  | 0.1  | 0.8  | -0.3 | 0.5  | -1.4 | 0.1  | -0.3 | 0.3  | 0.9  | 0.7  |
| GPS5-GPS6 | 854745.5            | 0.1      | -0.3 | -1.0 | -0.6 | -0.5 | 0.0  | 0.2  | 0.6  | -0.1 | -1.1 | 1.0  | 0.3  | 0.8  | 0.1  | 0.9  | 0.6  |
| GPS5-GPS7 | 1379384.5           | 0.2      | -0.3 | 0.6  | 1.1  | 0.3  | 0.0  | -0.2 | 0.5  | 0.0  | 0.8  | -1.3 | 0.4  | -0.6 | -0.1 | -1.0 | 0.6  |
| GPS6-GPS7 | 1604963.1           | -0.7     | -1.0 | 0.3  | 0.6  | -1.1 | -0.4 | 0.1  | 0.8  | 0.4  | -0.1 | 0.2  | 0.3  | 0.4  | 0.7  | -0.3 | 0.5  |
| Mean:     |                     | 0.0      | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.1  | 0.0  | 0.0  | -0.1 | 0.0  | -0.1 | 0.0  | 0.0  | 0.0  |      |
| St.dev.:  |                     | ±0.6     | 0.5  | 0.5  | 0.7  | 0.7  | 0.4  | 0.5  | 1.1  | 0.4  | 0.7  | 0.9  | 0.4  | 0.4  | 0.5  | 0.8  |      |
| RMS:      |                     | ±0.6     | 0.5  | 0.5  | 0.7  | 0.7  | 0.4  | 0.5  | 1.1  | 0.4  | 0.7  | 0.9  | 0.4  | 0.4  | 0.4  | 0.8  | ±0.6 |

## Appendix VII. Results of the measurements at Kivetty in 2006.

```
=====
Program : GPSEST Bernese GPS Software Version 5.0
Purpose : Parameter estimation
Campaign: ${P}/KIVE06S Default session: 2680 year 2006
Date : 20-Feb-2007 16:51 User name : ja
=====
```

KIVE06S

```

1${P}/KIVE06S PROGRAM GPSEST 20-FEB-07 16:51
KIVE06S BERNESE GPS SOFTWARE VERSION 5.0

```

### TABLE OF CONTENTS

- 
1. CAMPAIGNS
  2. OBSERVATION FILES
  3. GENERAL OPTIONS
  4. STATIONS
  5. SATELLITE ORBITS
  6. ATMOSPHERE
  7. CLOCK PARAMETERS
  8. POLE COORDINATES AND TIME INFORMATION
  9. ANTENNA PHASE CENTERS
  10. CONSTANTS
  11. PARAMETER CHARACTERIZATION LIST
  12. TEST OUTPUT
  13. RESULTS (PART 1)
  14. RESULTS (PART 2)

```

1${P}/KIVE06S PROGRAM GPSEST 20-FEB-07 16:51
KIVE06S BERNESE GPS SOFTWARE VERSION 5.0

```

### INPUT AND OUTPUT FILENAMES

-----

```

Session table : ${P}/KIVE06S\STA\SESSIONS.SES

```

```

General constants : ${X}/GEN\CONST.
Geodetic datum : ${X}/GEN\DATUM.
Station information : ${P}/KIVE06S\STA\KIVE06S.STA
Earth rotation parameters : ${P}/KIVE06S\ORB\C04_2006.ERP
Subdaily pole model : ${X}/GEN\IERS2000.SUB
Nutation model : ${X}/GEN\IAU2000.NUT
Satellite information : ${X}/GEN\SATELLIT.
Receiver information : ${X}/GEN\RECEIVER.
Satellite problems : ${X}/GEN\SAT_2006.CRX
Phase center eccentricities : ${X}/GEN\PHAS_IGS.REL
SINEX general input file : ${X}/GEN\SINEX.
IONEX control file : ${X}/GEN\IONEX.
Difference GPS-UTC : ---
A priori station coordinates: ${P}/KIVE06S\STA\KIVE.CRD
GNSS standard orbits : ${P}/KIVE06S\ORB\KIVE06S.STD
GNSS orbit partials : ---
Ionosphere models : ${P}/KIVE06S\ATM\KIVE06S.ION
Troposphere estimates : ---
Station sigma factors : ---
Station eccentricities : ---
Ocean loading tables : ---
GNSS clock corrections : ---
Differential code biases : ---
Receiver antenna orientation: ---
Kinematic coordinates : ---
Kinematic velocities : ---
Standard orbit(s) : ---
Orbit partials : ---
Attitude data : ---
Precise orbit(s) : ---
LEO orbital elements : ---
Station coordinates : ${P}/KIVE06S\STA\TKIVE06S.CRD
GNSS orbital elements : ---
Troposphere estimates : ---
Troposphere SINEX : ---
Ionosphere models : ---
IONEX : ---
Residuals : ---
Coordinate covariance matrix: ---
Full covariance matrix : ---
Normal equations : ---
Bernese ERP file : ---
IERS ERP file : ---
GNSS clock corrections : ---
Clock RINEX : ---
Kinematic coordinates : ---
Differential code biases : ---
Phase center variations (gri: ---
Phase center variations (har: ---
Scratch file : ${U}/WORK\GPSEST.SCR
Scratch files : ${U}/WORK\GPSEST.SC1
Program output : ${P}/KIVE06S\OUT\GPSEST.L12
Error message : ${U}/WORK\ERROR.MSG

```

1\${P}/KIVE06S  
KIVE06S

PROGRAM GPSEST 20-FEB-07 16:51  
BERNESE GPS SOFTWARE VERSION 5.0

1. CAMPAIGNS

| CAMPAIGN NAME | NUM | STATION NAME | NUM    | STATION NAME | NUM    | STATION NAME | NUM | STATION NAME | NUM | STATION NAME |
|---------------|-----|--------------|--------|--------------|--------|--------------|-----|--------------|-----|--------------|
| \${P}/KIVE06S | :   | 1 GPS1       | 2 GPS2 | 5 GPS5       | 6 GPS6 | 7 GPS7       |     |              |     |              |
|               |     | 3 GPS3       | 4 GPS4 |              |        |              |     |              |     |              |

2. OBSERVATION FILES

\${P}/KIVE06S

MAIN CHARACTERISTICS:

| FILE | OBSERVATION FILE HEADER        | OBSERVATION FILE               | SESS | RECEIVER 1     | RECEIVER 2     |  |  |  |  |  |  |  |  |  |  |
|------|--------------------------------|--------------------------------|------|----------------|----------------|--|--|--|--|--|--|--|--|--|--|
| 1    | \${P}/KIVE06S/OBS/01022670.PSH | \${P}/KIVE06S/OBS/01022670.PSO | 2670 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |  |  |  |  |  |  |  |  |  |  |
| 2    | \${P}/KIVE06S/OBS/01022680.PSH | \${P}/KIVE06S/OBS/01022680.PSO | 2680 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |  |  |  |  |  |  |  |  |  |  |
| 3    | \${P}/KIVE06S/OBS/01052670.PSH | \${P}/KIVE06S/OBS/01052670.PSO | 2670 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |  |  |  |  |  |  |  |  |  |  |
| 4    | \${P}/KIVE06S/OBS/01052680.PSH | \${P}/KIVE06S/OBS/01052680.PSO | 2680 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |  |  |  |  |  |  |  |  |  |  |
| 5    | \${P}/KIVE06S/OBS/01062670.PSH | \${P}/KIVE06S/OBS/01062670.PSO | 2670 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |  |  |  |  |  |  |  |  |  |  |
| 6    | \${P}/KIVE06S/OBS/01062680.PSH | \${P}/KIVE06S/OBS/01062680.PSO | 2680 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |  |  |  |  |  |  |  |  |  |  |
| 7    | \${P}/KIVE06S/OBS/01072670.PSH | \${P}/KIVE06S/OBS/01072670.PSO | 2670 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |  |  |  |  |  |  |  |  |  |  |
| 8    | \${P}/KIVE06S/OBS/01072680.PSH | \${P}/KIVE06S/OBS/01072680.PSO | 2680 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |  |  |  |  |  |  |  |  |  |  |
| 9    | \${P}/KIVE06S/OBS/02032670.PSH | \${P}/KIVE06S/OBS/02032670.PSO | 2670 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |  |  |  |  |  |  |  |  |  |  |
| 10   | \${P}/KIVE06S/OBS/02032680.PSH | \${P}/KIVE06S/OBS/02032680.PSO | 2680 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |  |  |  |  |  |  |  |  |  |  |
| 11   | \${P}/KIVE06S/OBS/02042670.PSH | \${P}/KIVE06S/OBS/02042670.PSO | 2670 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |  |  |  |  |  |  |  |  |  |  |
| 12   | \${P}/KIVE06S/OBS/02042680.PSH | \${P}/KIVE06S/OBS/02042680.PSO | 2680 | ASHTECH Z-XII3 | ASHTECH Z-XII3 |  |  |  |  |  |  |  |  |  |  |

| FILE | TYP | FREQ. | STATION 1 | STATION 2 | SESS | FIRST   | OBSERV.TIME | #EPO | DT | #EF | #CLK | ARC | #SAT | AMB.I.+S. |    | #CLUSTERS |    |    |    | RM |   |
|------|-----|-------|-----------|-----------|------|---------|-------------|------|----|-----|------|-----|------|-----------|----|-----------|----|----|----|----|---|
|      |     |       |           |           |      |         |             |      |    |     |      |     |      | W         | 12 | #AMB      | L1 | L2 | L5 |    |   |
| 1    | P   | L1,L2 | GPS1      | GPS2      | 2670 | 6-09-24 | 9:38:00     | 1724 | 30 | 0   | E E  | 1   | 28   | N         | Y  | Y         | 46 | 13 | 13 | 46 | 0 |
| 2    | P   | L1,L2 | GPS1      | GPS2      | 2680 | 6-09-25 | 0:00:30     | 1456 | 30 | 0   | E E  | 1   | 28   | N         | Y  | Y         | 41 | 15 | 15 | 41 | 0 |
| 3    | P   | L1,L2 | GPS1      | GPS5      | 2670 | 6-09-24 | 11:31:30    | 1497 | 30 | 0   | E E  | 1   | 28   | N         | Y  | Y         | 44 | 16 | 16 | 44 | 0 |

|    |   |       |      |      |      |         |          |      |    |   |   |   |   |    |   |   |   |    |    |    |    |   |
|----|---|-------|------|------|------|---------|----------|------|----|---|---|---|---|----|---|---|---|----|----|----|----|---|
| 4  | P | L1,L2 | GPS1 | GPS5 | 2680 | 6-09-25 | 0:00:30  | 1513 | 30 | 0 | E | E | 1 | 28 | N | Y | Y | 37 | 10 | 10 | 37 | 0 |
| 5  | P | L1,L2 | GPS1 | GPS6 | 2670 | 6-09-24 | 11:14:00 | 1532 | 30 | 0 | E | E | 1 | 28 | N | Y | Y | 41 | 10 | 10 | 41 | 0 |
| 6  | P | L1,L2 | GPS1 | GPS6 | 2680 | 6-09-25 | 0:00:30  | 1496 | 30 | 0 | E | E | 1 | 28 | N | Y | Y | 42 | 12 | 11 | 42 | 0 |
| 7  | P | L1,L2 | GPS1 | GPS7 | 2670 | 6-09-24 | 10:53:00 | 1574 | 30 | 0 | E | E | 1 | 28 | N | Y | Y | 43 | 10 | 10 | 43 | 0 |
| 8  | P | L1,L2 | GPS1 | GPS7 | 2680 | 6-09-25 | 0:00:30  | 1475 | 30 | 0 | E | E | 1 | 27 | N | Y | Y | 36 | 10 | 10 | 36 | 0 |
| 9  | P | L1,L2 | GPS2 | GPS3 | 2670 | 6-09-24 | 10:02:30 | 1675 | 30 | 0 | E | E | 1 | 28 | N | Y | Y | 51 | 17 | 17 | 51 | 0 |
| 10 | P | L1,L2 | GPS2 | GPS3 | 2680 | 6-09-25 | 0:00:30  | 1383 | 30 | 0 | E | E | 1 | 28 | N | Y | Y | 44 | 20 | 20 | 44 | 0 |
| 11 | P | L1,L2 | GPS2 | GPS4 | 2670 | 6-09-24 | 10:27:30 | 1625 | 30 | 0 | E | E | 1 | 28 | N | Y | Y | 44 | 13 | 13 | 44 | 0 |
| 12 | P | L1,L2 | GPS2 | GPS4 | 2680 | 6-09-25 | 0:00:30  | 1426 | 30 | 0 | E | E | 1 | 28 | N | Y | Y | 43 | 18 | 18 | 43 | 0 |

SATELLITES:

-----

FILE #SAT SATELLITES

| FILE | #SAT | SATELLITES |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
|------|------|------------|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|
| 1    | 28   | 1          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |  |  |
| 2    | 28   | 1          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |  |  |
| 3    | 28   | 1          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |  |  |
| 4    | 28   | 1          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |  |  |
| 5    | 28   | 1          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |  |  |
| 6    | 28   | 1          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |  |  |
| 7    | 28   | 1          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |  |  |
| 8    | 27   | 1          | 2 | 3 | 4 | 5 | 7 | 8 | 9 | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |    |  |  |
| 9    | 28   | 1          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |  |  |
| 10   | 28   | 1          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |  |  |
| 11   | 28   | 1          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |  |  |
| 12   | 28   | 1          | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9  | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |  |  |

OBSERVATION SELECTION:

-----

SAMPLING RATE : 30 SEC  
 ELEVATION CUT-OFF ANGLE : 20 DEGREES  
 SATELLITE SYSTEM : GPS  
 SPECIAL DATA SELECTION : NO

1\${P}/KIVE06S  
 KIVE06S

PROGRAM GPSEST 20-FEB-07 16:51  
 BERNESE GPS SOFTWARE VERSION 5.0

3. GENERAL OPTIONS

-----

TIDAL CORRECTION OF STATION COORDINATES : IERS CONVENTIONS 2000

A PRIORI SIGMA OF UNIT WEIGHT:

-----

A PRIORI SIGMA OF UNIT WEIGHT : 0.001 M (SIGMA OF ONE-WAY L1 PHASE OBSERVABLE AT ZENITH)  
 MODEL FOR ELEVATION-DEPENDENT WEIGHTING : 1/COS(Z)

CORRELATIONS AND SESSIONS:

STRATEGY : CORRELATIONS CORRECTLY MODELLED  
 TIME INTERVAL : 0.10000 SEC (TO IDENTIFY EPOCH)

SESS #FILE FILE NUMBERS

-----  
 2670 6 1 3 5 7 9 11  
 2680 6 2 4 6 8 10 12

AMBIGUITY RESOLUTION STRATEGY:

-----  
 AMBIGUITIES PRE-ELIMINATED EVERY 30 SECONDS

SYNCHRONIZATION ERRORS:

-----  
 STRATEGY : SYNCHRONIZATION ERRORS NOT APPLIED

4. STATIONS

-----  
 Local geodetic datum: \${X}/GEN\DATUM.

| Datum name | Ell. param./ Scale                                        | Shifts to WGS-84                                | Rotations to WGS-84                                               |
|------------|-----------------------------------------------------------|-------------------------------------------------|-------------------------------------------------------------------|
| WGS - 84   | A = 6378137.000 m<br>1/F= 298.2572236<br>SC = 0.00000D+00 | DX = 0.0000 m<br>DY = 0.0000 m<br>DZ = 0.0000 m | RX = 0.00000 arcsec<br>RY = 0.00000 arcsec<br>RZ = 0.00000 arcsec |

A priori station coordinates: \${P}/KIVE06S\STA\KIVE.CRD

A priori station coordinates WGS-84                      A priori station coordinates  
 Ellipsoidal in local geodetic datum

| num | Station name | obs e/f/h | X (m)        | Y (m)        | Z (m)        | Latitude        | Longitude       | Height (m) |
|-----|--------------|-----------|--------------|--------------|--------------|-----------------|-----------------|------------|
| 1   | GPS1         | Y ESTIM   | 2632277.3097 | 1266957.3328 | 5651027.6130 | 62 49 11.541281 | 25 42 8.131873  | 216.2605   |
| 2   | GPS2         | Y ESTIM   | 2632668.6713 | 1266433.2178 | 5650946.8226 | 62 49 6.746291  | 25 41 22.804861 | 201.6768   |
| 5   | GPS5         | Y ESTIM   | 2631669.9819 | 1266914.5590 | 5651312.1649 | 62 49 31.995017 | 25 42 24.011125 | 210.9794   |

|   |      |   |       |              |              |              |                 |                 |          |
|---|------|---|-------|--------------|--------------|--------------|-----------------|-----------------|----------|
| 6 | GPS6 | Y | ESTIM | 2631400.1527 | 1267721.3486 | 5651229.2666 | 62 49 27.699096 | 25 43 23.611374 | 186.0792 |
| 7 | GPS7 | Y | ESTIM | 2632837.9413 | 1267275.0647 | 5650672.9413 | 62 48 47.835455 | 25 42 11.178073 | 194.4937 |
| 3 | GPS3 | Y | ESTIM | 2633182.4577 | 1265629.9428 | 5650879.0389 | 62 49 2.443920  | 25 40 15.973856 | 193.8849 |
| 4 | GPS4 | Y | ESTIM | 2632226.4697 | 1265406.6777 | 5651380.4111 | 62 49 37.375281 | 25 40 31.010505 | 202.1775 |

A priori sigma:

Station coordinates a priori sigma  
in local geodetic datum

| num | Station name | N (m)   | E (m)   | U (m)   |
|-----|--------------|---------|---------|---------|
| 1   | GPS1         | 0.00001 | 0.00001 | 0.00001 |

1\${P}/KIVE06S  
KIVE06S

PROGRAM GPSEST 20-FEB-07 16:51  
BERNESE GPS SOFTWARE VERSION 5.0

5. SATELLITE ORBITS

ARC CHARACTERISTICS:

| ARC | START OF ARC      | END OF ARC        | SOURCE     | #SAT | SATELLITES |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
|-----|-------------------|-------------------|------------|------|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|
| 1   | 06-09-24 00:00:00 | 06-09-26 00:00:00 | PR2006.268 | 29   | 1          | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |  |
|     |                   |                   |            |      | 20         | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |    |    |    |    |    |    |    |  |

OSCULATING ELEMENTS:                   \${P}/KIVE06S\ORB\KIVE06S.STD

REFERENCE SYSTEM: J2000.0  
REFERENCE EPOCH : 54002.4013889 MJD (2006 9 24 9 38 0.00)

| SAT | S.MAJ.AXIS | ECCENTRIC. | INCLINAT. | NODE        | PERIGEE     | M. ANOMALY | PER.PASS.TIME |
|-----|------------|------------|-----------|-------------|-------------|------------|---------------|
| 1   | 26561371.4 | 0.00639665 | 56.677832 | 20.527814   | -102.064581 | 67.301952  | 54002.3081712 |
| 2   | 26559403.8 | 0.00880773 | 54.314897 | -102.111083 | -237.182098 | 139.317663 | 54002.2084462 |
| 3   | 26561013.7 | 0.00859860 | 53.086502 | -167.317702 | 39.481857   | 98.327868  | 54002.2652011 |
| 4   | 26559267.2 | 0.00744674 | 54.285759 | -100.991348 | 9.854010    | -75.452042 | 54002.5058825 |
| 5   | 26562280.3 | 0.00751267 | 53.804030 | 133.298223  | 63.527938   | -93.260346 | 54002.5305673 |
| 6   | 26559966.1 | 0.00594311 | 53.514410 | -163.906190 | -101.885136 | -25.689940 | 54002.4369683 |
| 7   | 26562901.3 | 0.01045529 | 53.606151 | -165.392823 | 259.114540  | -82.870729 | 54002.5161802 |
| 8   | 26559637.1 | 0.00988675 | 55.860151 | 80.528018   | 153.471379  | -16.701361 | 54002.4245191 |





-----

Mapping function used for delay estimation: 1/cos(zenith-distance)  
Troposphere gradient estimation : No

| Par | Station name | Reference epoch     | sig_n (m) | sig_e (m) | sig_u (m) | abs/rel |
|-----|--------------|---------------------|-----------|-----------|-----------|---------|
| 1   | GPS2         | 2006 09 24 08 00 00 |           |           | 0.00000   | abs     |
| 2   | GPS2         | 2006 09 24 10 00 00 |           |           | 0.00000   | rel     |
| 3   | GPS2         | 2006 09 24 12 00 00 |           |           | 0.00000   | rel     |
| 4   | GPS2         | 2006 09 24 14 00 00 |           |           | 0.00000   | rel     |
| 5   | GPS2         | 2006 09 24 16 00 00 |           |           | 0.00000   | rel     |
| 6   | GPS2         | 2006 09 24 18 00 00 |           |           | 0.00000   | rel     |
| 7   | GPS2         | 2006 09 24 20 00 00 |           |           | 0.00000   | rel     |
| 8   | GPS2         | 2006 09 24 22 00 00 |           |           | 0.00000   | rel     |
| 9   | GPS2         | 2006 09 25 00 00 00 |           |           | 0.00000   | rel     |
| 10  | GPS2         | 2006 09 25 02 00 00 |           |           | 0.00000   | rel     |
| 11  | GPS2         | 2006 09 25 04 00 00 |           |           | 0.00000   | rel     |
| 12  | GPS2         | 2006 09 25 06 00 00 |           |           | 0.00000   | rel     |
| 13  | GPS2         | 2006 09 25 08 00 00 |           |           | 0.00000   | rel     |
| 14  | GPS2         | 2006 09 25 10 00 00 |           |           | 0.00000   | rel     |
| 15  | GPS2         | 2006 09 25 12 00 00 |           |           | 0.00000   | rel     |
| 16  | GPS2         | 2006 09 25 14 00 00 |           |           | 0.00000   | rel     |
| 17  | GPS5         | 2006 09 24 08 00 00 |           |           | 0.00000   | abs     |
| 18  | GPS5         | 2006 09 24 10 00 00 |           |           | 0.00000   | rel     |
| 19  | GPS5         | 2006 09 24 12 00 00 |           |           | 0.00000   | rel     |
| 20  | GPS5         | 2006 09 24 14 00 00 |           |           | 0.00000   | rel     |
| 21  | GPS5         | 2006 09 24 16 00 00 |           |           | 0.00000   | rel     |
| 22  | GPS5         | 2006 09 24 18 00 00 |           |           | 0.00000   | rel     |
| 23  | GPS5         | 2006 09 24 20 00 00 |           |           | 0.00000   | rel     |
| 24  | GPS5         | 2006 09 24 22 00 00 |           |           | 0.00000   | rel     |
| 25  | GPS5         | 2006 09 25 00 00 00 |           |           | 0.00000   | rel     |
| 26  | GPS5         | 2006 09 25 02 00 00 |           |           | 0.00000   | rel     |
| 27  | GPS5         | 2006 09 25 04 00 00 |           |           | 0.00000   | rel     |
| 28  | GPS5         | 2006 09 25 06 00 00 |           |           | 0.00000   | rel     |
| 29  | GPS5         | 2006 09 25 08 00 00 |           |           | 0.00000   | rel     |
| 30  | GPS5         | 2006 09 25 10 00 00 |           |           | 0.00000   | rel     |
| 31  | GPS5         | 2006 09 25 12 00 00 |           |           | 0.00000   | rel     |
| 32  | GPS5         | 2006 09 25 14 00 00 |           |           | 0.00000   | rel     |
| 33  | GPS6         | 2006 09 24 08 00 00 |           |           | 0.00000   | abs     |
| 34  | GPS6         | 2006 09 24 10 00 00 |           |           | 0.00000   | rel     |
| 35  | GPS6         | 2006 09 24 12 00 00 |           |           | 0.00000   | rel     |
| 36  | GPS6         | 2006 09 24 14 00 00 |           |           | 0.00000   | rel     |
| 37  | GPS6         | 2006 09 24 16 00 00 |           |           | 0.00000   | rel     |
| 38  | GPS6         | 2006 09 24 18 00 00 |           |           | 0.00000   | rel     |
| 39  | GPS6         | 2006 09 24 20 00 00 |           |           | 0.00000   | rel     |
| 40  | GPS6         | 2006 09 24 22 00 00 |           |           | 0.00000   | rel     |
| 41  | GPS6         | 2006 09 25 00 00 00 |           |           | 0.00000   | rel     |
| 42  | GPS6         | 2006 09 25 02 00 00 |           |           | 0.00000   | rel     |
| 43  | GPS6         | 2006 09 25 04 00 00 |           |           | 0.00000   | rel     |
| 44  | GPS6         | 2006 09 25 06 00 00 |           |           | 0.00000   | rel     |
| 45  | GPS6         | 2006 09 25 08 00 00 |           |           | 0.00000   | rel     |

|    |      |                     |         |     |
|----|------|---------------------|---------|-----|
| 46 | GPS6 | 2006 09 25 10 00 00 | 0.00000 | rel |
| 47 | GPS6 | 2006 09 25 12 00 00 | 0.00000 | rel |
| 48 | GPS6 | 2006 09 25 14 00 00 | 0.00000 | rel |
| 49 | GPS7 | 2006 09 24 08 00 00 | 0.00000 | abs |
| 50 | GPS7 | 2006 09 24 10 00 00 | 0.00000 | rel |
| 51 | GPS7 | 2006 09 24 12 00 00 | 0.00000 | rel |
| 52 | GPS7 | 2006 09 24 14 00 00 | 0.00000 | rel |
| 53 | GPS7 | 2006 09 24 16 00 00 | 0.00000 | rel |
| 54 | GPS7 | 2006 09 24 18 00 00 | 0.00000 | rel |
| 55 | GPS7 | 2006 09 24 20 00 00 | 0.00000 | rel |
| 56 | GPS7 | 2006 09 24 22 00 00 | 0.00000 | rel |
| 57 | GPS7 | 2006 09 25 00 00 00 | 0.00000 | rel |
| 58 | GPS7 | 2006 09 25 02 00 00 | 0.00000 | rel |
| 59 | GPS7 | 2006 09 25 04 00 00 | 0.00000 | rel |
| 60 | GPS7 | 2006 09 25 06 00 00 | 0.00000 | rel |
| 61 | GPS7 | 2006 09 25 08 00 00 | 0.00000 | rel |
| 62 | GPS7 | 2006 09 25 10 00 00 | 0.00000 | rel |
| 63 | GPS7 | 2006 09 25 12 00 00 | 0.00000 | rel |
| 64 | GPS7 | 2006 09 25 14 00 00 | 0.00000 | rel |
| 65 | GPS3 | 2006 09 24 08 00 00 | 0.00000 | abs |
| 66 | GPS3 | 2006 09 24 10 00 00 | 0.00000 | rel |
| 67 | GPS3 | 2006 09 24 12 00 00 | 0.00000 | rel |
| 68 | GPS3 | 2006 09 24 14 00 00 | 0.00000 | rel |
| 69 | GPS3 | 2006 09 24 16 00 00 | 0.00000 | rel |
| 70 | GPS3 | 2006 09 24 18 00 00 | 0.00000 | rel |
| 71 | GPS3 | 2006 09 24 20 00 00 | 0.00000 | rel |
| 72 | GPS3 | 2006 09 24 22 00 00 | 0.00000 | rel |
| 73 | GPS3 | 2006 09 25 00 00 00 | 0.00000 | rel |
| 74 | GPS3 | 2006 09 25 02 00 00 | 0.00000 | rel |
| 75 | GPS3 | 2006 09 25 04 00 00 | 0.00000 | rel |
| 76 | GPS3 | 2006 09 25 06 00 00 | 0.00000 | rel |
| 77 | GPS3 | 2006 09 25 08 00 00 | 0.00000 | rel |
| 78 | GPS3 | 2006 09 25 10 00 00 | 0.00000 | rel |
| 79 | GPS3 | 2006 09 25 12 00 00 | 0.00000 | rel |
| 80 | GPS3 | 2006 09 25 14 00 00 | 0.00000 | rel |
| 81 | GPS4 | 2006 09 24 08 00 00 | 0.00000 | abs |
| 82 | GPS4 | 2006 09 24 10 00 00 | 0.00000 | rel |
| 83 | GPS4 | 2006 09 24 12 00 00 | 0.00000 | rel |
| 84 | GPS4 | 2006 09 24 14 00 00 | 0.00000 | rel |
| 85 | GPS4 | 2006 09 24 16 00 00 | 0.00000 | rel |
| 86 | GPS4 | 2006 09 24 18 00 00 | 0.00000 | rel |
| 87 | GPS4 | 2006 09 24 20 00 00 | 0.00000 | rel |
| 88 | GPS4 | 2006 09 24 22 00 00 | 0.00000 | rel |
| 89 | GPS4 | 2006 09 25 00 00 00 | 0.00000 | rel |
| 90 | GPS4 | 2006 09 25 02 00 00 | 0.00000 | rel |
| 91 | GPS4 | 2006 09 25 04 00 00 | 0.00000 | rel |
| 92 | GPS4 | 2006 09 25 06 00 00 | 0.00000 | rel |
| 93 | GPS4 | 2006 09 25 08 00 00 | 0.00000 | rel |
| 94 | GPS4 | 2006 09 25 10 00 00 | 0.00000 | rel |
| 95 | GPS4 | 2006 09 25 12 00 00 | 0.00000 | rel |
| 96 | GPS4 | 2006 09 25 14 00 00 | 0.00000 | rel |

IONOSPHERE MODELS:

\$(P)/KIVE06S\ATM\KIVE06S.ION

TYPE OF IONOSPHERE MODELS : LOCAL  
 RADIUS OF THE EARTH : 6378.14 KM

| MODEL | DEG. OF DEVELOP. |      |       | VALIDITY       |                |                |          |           | ORIGIN OF DEVELOPMENT |          |           | HEIGHT (KM) | NORMAIZATION FACTORS |  |  |
|-------|------------------|------|-------|----------------|----------------|----------------|----------|-----------|-----------------------|----------|-----------|-------------|----------------------|--|--|
|       | TIME             | LAT. | MIXED | START          | END            | LOCAL TIME     | LAT. (D) | LONG. (D) | TIME (H)              | LAT. (D) | ELE.CONT. |             |                      |  |  |
| 2     | 2                | 1    | 2     | 2006 9 24 5.0  | 2006 9 24 13.0 | 2006 9 24 9.0  | 62.81    | 25.70     | 450                   | 2.00     | 6.00      | 0.10D+18    |                      |  |  |
| 3     | 2                | 1    | 2     | 2006 9 24 11.0 | 2006 9 24 19.0 | 2006 9 24 15.0 | 62.81    | 25.70     | 450                   | 2.00     | 6.00      | 0.10D+18    |                      |  |  |
| 4     | 2                | 1    | 2     | 2006 9 24 17.0 | 2006 9 25 1.0  | 2006 9 24 21.0 | 62.81    | 25.70     | 450                   | 2.00     | 6.00      | 0.10D+18    |                      |  |  |
| 5     | 2                | 1    | 2     | 2006 9 24 23.0 | 2006 9 25 7.0  | 2006 9 25 3.0  | 62.81    | 25.70     | 450                   | 2.00     | 6.00      | 0.10D+18    |                      |  |  |
| 6     | 2                | 1    | 2     | 2006 9 25 5.0  | 2006 9 25 13.0 | 2006 9 25 9.0  | 62.81    | 25.70     | 450                   | 2.00     | 6.00      | 0.10D+18    |                      |  |  |
| 7     | 2                | 1    | 2     | 2006 9 25 11.0 | 2006 9 25 19.0 | 2006 9 25 15.0 | 62.81    | 25.70     | 450                   | 2.00     | 6.00      | 0.10D+18    |                      |  |  |

| MODEL | TERM | POL. TIME | DEGREE IN LATIT. | COEFFICIENT   | SIGMA        |
|-------|------|-----------|------------------|---------------|--------------|
| 2     | 1    | 0         | 0                | 0.982064E+00  | 0.571535E-02 |
|       | 2    | 1         | 0                | 0.373183E-01  | 0.140437E-02 |
|       | 3    | 2         | 0                | -0.670541E-01 | 0.128873E-02 |
|       | 4    | 0         | 1                | -0.169896E+00 | 0.212897E-02 |
|       | 5    | 1         | 1                | -0.812402E-02 | 0.229798E-02 |
| 3     | 1    | 0         | 0                | 0.755008E+00  | 0.572047E-02 |
|       | 2    | 1         | 0                | -0.891747E-01 | 0.147453E-02 |
|       | 3    | 2         | 0                | -0.306692E-01 | 0.141167E-02 |
|       | 4    | 0         | 1                | -0.212799E+00 | 0.190150E-02 |
|       | 5    | 1         | 1                | -0.819571E-01 | 0.182147E-02 |
| 4     | 1    | 0         | 0                | 0.350963E+00  | 0.812426E-02 |
|       | 2    | 1         | 0                | -0.385733E-01 | 0.194002E-02 |
|       | 3    | 2         | 0                | 0.716947E-02  | 0.171149E-02 |
|       | 4    | 0         | 1                | -0.134297E+00 | 0.292613E-02 |
|       | 5    | 1         | 1                | 0.508691E-01  | 0.318054E-02 |
| 5     | 1    | 0         | 0                | 0.344203E+00  | 0.490056E-02 |
|       | 2    | 1         | 0                | 0.113018E+00  | 0.123489E-02 |
|       | 3    | 2         | 0                | 0.760622E-01  | 0.113852E-02 |
|       | 4    | 0         | 1                | -0.916435E-01 | 0.168200E-02 |
|       | 5    | 1         | 1                | -0.361386E-01 | 0.175074E-02 |
| 6     | 1    | 0         | 0                | 0.108314E+01  | 0.453183E-02 |
|       | 2    | 1         | 0                | 0.137556E+00  | 0.111548E-02 |
|       | 3    | 2         | 0                | -0.875823E-01 | 0.104179E-02 |
|       | 4    | 0         | 1                | -0.967389E-01 | 0.169536E-02 |
|       | 5    | 1         | 1                | -0.488991E-01 | 0.185013E-02 |
| 7     | 1    | 0         | 0                | 0.745127E+00  | 0.597132E-02 |
|       | 2    | 1         | 0                | -0.103470E+00 | 0.156050E-02 |

|   |   |   |               |              |
|---|---|---|---------------|--------------|
| 3 | 2 | 0 | 0.177274E-01  | 0.148837E-02 |
| 4 | 0 | 1 | -0.192776E+00 | 0.198702E-02 |
| 5 | 1 | 1 | -0.436522E-01 | 0.192915E-02 |

1\${P}/KIVE06S  
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PROGRAM GPSEST 20-FEB-07 16:51  
BERNESE GPS SOFTWARE VERSION 5.0

8. POLE COORDINATES AND TIME INFORMATION

A PRIORI POLE AND TIME INFORMATION FROM THE POLE FILE:

| DATUM    | TIME     | X-POLE ("<br>EP-CPO (" | Y-POLE ("<br>PS-CPO (" | UT1-UTC (S) | GPS-UTC (S) | RMS XP ("<br>RMS EP (" | RMS YP ("<br>RMS PS (" | RMS DT (S) |
|----------|----------|------------------------|------------------------|-------------|-------------|------------------------|------------------------|------------|
| 06-09-24 | 00:00:00 | 0.04716<br>0.00000     | 0.25262<br>0.00000     | 0.152373    | 14.         | 0.00000<br>0.00000     | 0.00000<br>0.00000     | 0.000000   |
| 06-09-25 | 00:00:00 | 0.04511<br>0.00000     | 0.25239<br>0.00000     | 0.151319    | 14.         | 0.00000<br>0.00000     | 0.00000<br>0.00000     | 0.000000   |
| 06-09-26 | 00:00:00 | 0.04333<br>0.00000     | 0.25202<br>0.00000     | 0.150387    | 14.         | 0.00000<br>0.00000     | 0.00000<br>0.00000     | 0.000000   |

NUTATION MODEL: IAU2000  
SUBDAILY POLE MODEL: IERS2000

1\${P}/KIVE06S  
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PROGRAM GPSEST 20-FEB-07 16:51  
BERNESE GPS SOFTWARE VERSION 5.0

12. TEST OUTPUT

MIN. AND MAX. ELEVATION/NADIR ANGLES AND MAX. SYNCHRONIZATION ERRORS:

| SESS | FILE | STATION NAME 1 | STATION NAME 2 | MIN/MAX ELEV. | MIN/MAX NADIR | SYNCH. ERR. (NS) |
|------|------|----------------|----------------|---------------|---------------|------------------|
| 2670 | 1    | GPS1           | GPS2           | 20.0 77.8     | 2.9 13.2      | 0.0              |
| 2680 | 2    | GPS1           | GPS2           | 20.0 82.0     | 1.9 13.1      | 0.0              |
| 2670 | 3    | GPS1           | GPS5           | 20.0 77.8     | 2.9 13.2      | 0.0              |
| 2680 | 4    | GPS1           | GPS5           | 20.0 82.0     | 1.9 13.2      | 0.0              |
| 2670 | 5    | GPS1           | GPS6           | 20.0 77.8     | 2.9 13.2      | 0.0              |
| 2680 | 6    | GPS1           | GPS6           | 20.0 82.0     | 1.9 13.1      | 0.0              |

|      |    |      |      |      |      |     |      |     |
|------|----|------|------|------|------|-----|------|-----|
| 2670 | 7  | GPS1 | GPS7 | 20.0 | 77.8 | 2.9 | 13.2 | 0.0 |
| 2680 | 8  | GPS1 | GPS7 | 20.0 | 82.0 | 1.9 | 13.2 | 0.0 |
| 2670 | 9  | GPS2 | GPS3 | 20.0 | 77.8 | 2.9 | 13.2 | 0.0 |
| 2680 | 10 | GPS2 | GPS3 | 20.0 | 82.0 | 1.9 | 13.1 | 0.0 |
| 2670 | 11 | GPS2 | GPS4 | 20.0 | 77.8 | 2.9 | 13.2 | 0.0 |
| 2680 | 12 | GPS2 | GPS4 | 20.0 | 82.0 | 1.9 | 13.1 | 0.0 |

1\${P}/KIVE06S  
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PROGRAM GPSEST 20-FEB-07 16:51  
BERNESE GPS SOFTWARE VERSION 5.0

13. RESULTS (PART 1)

NUMBER OF PARAMETERS (PART 1):

| PARAMETER TYPE                       | #PARAMETERS | #PRE-ELIMINATED | #SET-UP | #NO-OBS | #REF | #SINGULAR |
|--------------------------------------|-------------|-----------------|---------|---------|------|-----------|
| STATION COORDINATES                  | 21          | 0               | 21      | 0       | 0    | 0         |
| AMBIGUITIES                          | 16          | 16 (BEFORE INV) | 327     | 311     | 0    | 1         |
| SITE-SPECIFIC TROPOSPHERE PARAMETERS | 96          | 0               | 96      | 0       | 0    | 7         |
| TOTAL NUMBER OF PARAMETERS           | 133         | 16              | 444     | 311     | 0    | 8         |

NUMBER OF OBSERVATIONS (PART 1):

| TYPE                         | FREQUENCY | FILE | #OBSERVATIONS |
|------------------------------|-----------|------|---------------|
| PHASE                        | L1        | ALL  | 94249         |
| PHASE                        | L2        | ALL  | 94249         |
| TOTAL NUMBER OF OBSERVATIONS |           |      | 188498        |

A POSTERIORI SIGMA OF UNIT WEIGHT (PART 1):

A POSTERIORI SIGMA OF UNIT WEIGHT : 0.0027 M (SIGMA OF ONE-WAY L1 PHASE OBSERVABLE AT ZENITH)  
 DEGREE OF FREEDOM (DOF) : 188373  
 CHI\*\*2/DOF : 7.23

1\$(P)/KIVE06S  
KIVE06S

PROGRAM GPSEST 20-FEB-07 16:51  
BERNESE GPS SOFTWARE VERSION 5.0

STATION COORDINATES: \$(P)/KIVE06S\STA\TKIVE06S.CRD

| NUM | STATION NAME | PARAMETER | A PRIORI VALUE  | NEW VALUE       | NEW- A PRIORI | RMS ERROR | 3-D ELLIPSOID |      | 2-D ELLIPSE |      |
|-----|--------------|-----------|-----------------|-----------------|---------------|-----------|---------------|------|-------------|------|
| 1   | GPS1         | X         | 2632277.3097    | 2632277.3097    | 0.0000        | 0.0000    |               |      |             |      |
|     |              | Y         | 1266957.3328    | 1266957.3328    | 0.0000        | 0.0000    |               |      |             |      |
|     |              | Z         | 5651027.6130    | 5651027.6130    | 0.0000        | 0.0000    |               |      |             |      |
|     |              | HEIGHT    | 216.2605        | 216.2605        | 0.0000        | 0.0000    | 0.0000        | 0.0  |             |      |
|     |              | LATITUDE  | 62 49 11.541281 | 62 49 11.541281 | 0.0000        | 0.0000    | 0.0000        | 90.0 | 0.0000      | 90.0 |
|     |              | LONGITUDE | 25 42 8.131873  | 25 42 8.131873  | 0.0000        | 0.0000    | 0.0000        | 0.0  | 0.0000      |      |
| 2   | GPS2         | X         | 2632668.6713    | 2632668.6706    | -0.0007       | 0.0003    |               |      |             |      |
|     |              | Y         | 1266433.2178    | 1266433.2141    | -0.0037       | 0.0002    |               |      |             |      |
|     |              | Z         | 5650946.8226    | 5650946.8207    | -0.0019       | 0.0006    |               |      |             |      |
|     |              | HEIGHT    | 201.6768        | 201.6740        | -0.0027       | 0.0007    | 0.0007        | 0.4  |             |      |
|     |              | LATITUDE  | 62 49 6.746291  | 62 49 6.746325  | 0.0011        | 0.0001    | 0.0001        | 90.0 | 0.0001      | 90.0 |
|     |              | LONGITUDE | 25 41 22.804861 | 25 41 22.804648 | -0.0030       | 0.0001    | 0.0001        | 0.0  | 0.0001      |      |
| 5   | GPS5         | X         | 2631669.9819    | 2631669.9783    | -0.0036       | 0.0003    |               |      |             |      |
|     |              | Y         | 1266914.5590    | 1266914.5572    | -0.0018       | 0.0002    |               |      |             |      |
|     |              | Z         | 5651312.1649    | 5651312.1579    | -0.0070       | 0.0006    |               |      |             |      |
|     |              | HEIGHT    | 210.9794        | 210.9714        | -0.0080       | 0.0007    | 0.0007        | 0.3  |             |      |
|     |              | LATITUDE  | 62 49 31.995017 | 62 49 31.995030 | 0.0004        | 0.0001    | 0.0001        | 89.8 | 0.0001      | 89.8 |
|     |              | LONGITUDE | 25 42 24.011125 | 25 42 24.011120 | -0.0001       | 0.0001    | 0.0001        | 0.0  | 0.0001      |      |
| 6   | GPS6         | X         | 2631400.1527    | 2631400.1408    | -0.0119       | 0.0003    |               |      |             |      |
|     |              | Y         | 1267721.3486    | 1267721.3436    | -0.0050       | 0.0002    |               |      |             |      |
|     |              | Z         | 5651229.2666    | 5651229.2436    | -0.0230       | 0.0006    |               |      |             |      |
|     |              | HEIGHT    | 186.0792        | 186.0529        | -0.0264       | 0.0007    | 0.0007        | 0.4  |             |      |
|     |              | LATITUDE  | 62 49 27.699096 | 62 49 27.699128 | 0.0010        | 0.0001    | 0.0001        | 89.7 | 0.0001      | 89.8 |
|     |              | LONGITUDE | 25 43 23.611374 | 25 43 23.611418 | 0.0006        | 0.0001    | 0.0001        | -0.1 | 0.0001      |      |
| 7   | GPS7         | X         | 2632837.9413    | 2632837.9409    | -0.0004       | 0.0003    |               |      |             |      |
|     |              | Y         | 1267275.0647    | 1267275.0644    | -0.0003       | 0.0002    |               |      |             |      |
|     |              | Z         | 5650672.9413    | 5650672.9417    | 0.0004        | 0.0006    |               |      |             |      |
|     |              | HEIGHT    | 194.4937        | 194.4938        | 0.0001        | 0.0007    | 0.0007        | 0.4  |             |      |
|     |              | LATITUDE  | 62 48 47.835455 | 62 48 47.835474 | 0.0006        | 0.0001    | 0.0001        | 89.7 | 0.0001      | 89.7 |
|     |              | LONGITUDE | 25 42 11.178073 | 25 42 11.178067 | -0.0001       | 0.0001    | 0.0001        | 0.0  | 0.0001      |      |
| 3   | GPS3         | X         | 2633182.4577    | 2633182.4586    | 0.0009        | 0.0003    |               |      |             |      |

|           |                 |                 |                 |         |        |        |        |        |      |
|-----------|-----------------|-----------------|-----------------|---------|--------|--------|--------|--------|------|
| Y         | 1265629.9428    | 1265629.9419    | -0.0009         | 0.0002  |        |        |        |        |      |
| Z         | 5650879.0389    | 5650879.0391    | 0.0002          | 0.0006  |        |        |        |        |      |
| HEIGHT    | 193.8849        | 193.8853        | 0.0004          | 0.0007  | 0.0007 | 0.4    |        |        |      |
| LATITUDE  | 62 49 2.443920  | 62 49 2.443912  | -0.0003         | 0.0001  | 0.0001 | 90.2   | 0.0001 | 90.2   |      |
| LONGITUDE | 25 40 15.973856 | 25 40 15.973776 | -0.0011         | 0.0001  | 0.0001 | 0.0    | 0.0001 | 0.0001 |      |
| 4 GPS4    | X               | 2632226.4697    | 2632226.4645    | -0.0052 | 0.0003 |        |        |        |      |
|           | Y               | 1265406.6777    | 1265406.6732    | -0.0045 | 0.0002 |        |        |        |      |
|           | Z               | 5651380.4111    | 5651380.4023    | -0.0088 | 0.0006 |        |        |        |      |
|           | HEIGHT          | 202.1775        | 202.1667        | -0.0108 | 0.0007 | 0.0007 | 0.4    |        |      |
|           | LATITUDE        | 62 49 37.375281 | 62 49 37.375343 | 0.0019  | 0.0001 | 0.0001 | 90.0   | 0.0001 | 90.0 |
|           | LONGITUDE       | 25 40 31.010505 | 25 40 31.010380 | -0.0018 | 0.0001 | 0.0001 | 0.0    | 0.0001 |      |

1\${P}/KIVE06S  
KIVE06S

PROGRAM GPSEST 20-FEB-07 16:51  
BERNESE GPS SOFTWARE VERSION 5.0

SITE-SPECIFIC TROPOSPHERE PARAMETERS: (NOT SAVED)

| REQU. | STATION NAME | CORRECTIONS (M) |      |         | RMS ERRORS (M) |      |         | ZENITH VECTOR (") |     |       |     | ERROR ELLIPSE (M) |         |     |
|-------|--------------|-----------------|------|---------|----------------|------|---------|-------------------|-----|-------|-----|-------------------|---------|-----|
|       |              | NORTH           | EAST | ZENITH  | NORTH          | EAST | ZENITH  | ANGLE             | RMS | RATIO | AZI | MAX RMS           | MIN RMS | AZI |
| 1     | GPS2         |                 |      | 0.00547 |                |      | 0.00704 |                   |     |       |     |                   |         |     |
| 2     | GPS2         |                 |      | 0.00526 |                |      | 0.00051 |                   |     |       |     |                   |         |     |
| 3     | GPS2         |                 |      | 0.00244 |                |      | 0.00046 |                   |     |       |     |                   |         |     |
| 4     | GPS2         |                 |      | 0.00782 |                |      | 0.00042 |                   |     |       |     |                   |         |     |
| 5     | GPS2         |                 |      | 0.00486 |                |      | 0.00048 |                   |     |       |     |                   |         |     |
| 6     | GPS2         |                 |      | 0.00513 |                |      | 0.00051 |                   |     |       |     |                   |         |     |
| 7     | GPS2         |                 |      | 0.00490 |                |      | 0.00039 |                   |     |       |     |                   |         |     |
| 8     | GPS2         |                 |      | 0.00675 |                |      | 0.00043 |                   |     |       |     |                   |         |     |
| 9     | GPS2         |                 |      | 0.00527 |                |      | 0.00045 |                   |     |       |     |                   |         |     |
| 10    | GPS2         |                 |      | 0.00919 |                |      | 0.00044 |                   |     |       |     |                   |         |     |
| 11    | GPS2         |                 |      | 0.00435 |                |      | 0.00044 |                   |     |       |     |                   |         |     |
| 12    | GPS2         |                 |      | 0.00841 |                |      | 0.00045 |                   |     |       |     |                   |         |     |
| 13    | GPS2         |                 |      | 0.00482 |                |      | 0.00042 |                   |     |       |     |                   |         |     |
| 14    | GPS2         |                 |      | 0.00640 |                |      | 0.00043 |                   |     |       |     |                   |         |     |
| 15    | GPS2         |                 |      | 0.00095 |                |      | 0.00054 |                   |     |       |     |                   |         |     |
| 16    | GPS2         |                 |      | 0.02253 |                |      | 0.02709 |                   |     |       |     |                   |         |     |
| 17    | GPS5         |                 |      | 0.00000 |                |      | 0.00000 |                   |     |       |     |                   |         |     |
| 18    | GPS5         |                 |      | 0.01030 |                |      | 0.00365 |                   |     |       |     |                   |         |     |
| 19    | GPS5         |                 |      | 0.00355 |                |      | 0.00053 |                   |     |       |     |                   |         |     |
| 20    | GPS5         |                 |      | 0.00225 |                |      | 0.00042 |                   |     |       |     |                   |         |     |
| 21    | GPS5         |                 |      | 0.00649 |                |      | 0.00047 |                   |     |       |     |                   |         |     |
| 22    | GPS5         |                 |      | 0.00180 |                |      | 0.00051 |                   |     |       |     |                   |         |     |
| 23    | GPS5         |                 |      | 0.00414 |                |      | 0.00039 |                   |     |       |     |                   |         |     |
| 24    | GPS5         |                 |      | 0.00323 |                |      | 0.00042 |                   |     |       |     |                   |         |     |
| 25    | GPS5         |                 |      | 0.00253 |                |      | 0.00045 |                   |     |       |     |                   |         |     |



|    |      |          |         |
|----|------|----------|---------|
| 26 | GPS5 | 0.00368  | 0.00044 |
| 27 | GPS5 | 0.00306  | 0.00044 |
| 28 | GPS5 | 0.00283  | 0.00045 |
| 29 | GPS5 | 0.00525  | 0.00042 |
| 30 | GPS5 | 0.00201  | 0.00042 |
| 31 | GPS5 | 0.00433  | 0.00052 |
| 32 | GPS5 | 0.01367  | 0.00344 |
| 33 | GPS6 | 0.00000  | 0.00000 |
| 34 | GPS6 | 0.01469  | 0.00175 |
| 35 | GPS6 | 0.01228  | 0.00053 |
| 36 | GPS6 | 0.01367  | 0.00044 |
| 37 | GPS6 | 0.01222  | 0.00048 |
| 38 | GPS6 | 0.01674  | 0.00053 |
| 39 | GPS6 | 0.00887  | 0.00040 |
| 40 | GPS6 | 0.01583  | 0.00044 |
| 41 | GPS6 | 0.01007  | 0.00047 |
| 42 | GPS6 | 0.01433  | 0.00045 |
| 43 | GPS6 | 0.01135  | 0.00045 |
| 44 | GPS6 | 0.01498  | 0.00045 |
| 45 | GPS6 | 0.00986  | 0.00043 |
| 46 | GPS6 | 0.01291  | 0.00043 |
| 47 | GPS6 | 0.01408  | 0.00053 |
| 48 | GPS6 | 0.00310  | 0.00484 |
| 49 | GPS7 | 0.00000  | 0.00000 |
| 50 | GPS7 | -0.00730 | 0.00108 |
| 51 | GPS7 | 0.00255  | 0.00050 |
| 52 | GPS7 | 0.00038  | 0.00042 |
| 53 | GPS7 | -0.00006 | 0.00047 |
| 54 | GPS7 | 0.00080  | 0.00051 |
| 55 | GPS7 | 0.00156  | 0.00040 |
| 56 | GPS7 | 0.00049  | 0.00043 |
| 57 | GPS7 | 0.00001  | 0.00045 |
| 58 | GPS7 | 0.00099  | 0.00044 |
| 59 | GPS7 | 0.00001  | 0.00044 |
| 60 | GPS7 | 0.00262  | 0.00045 |
| 61 | GPS7 | -0.00094 | 0.00042 |
| 62 | GPS7 | 0.00336  | 0.00042 |
| 63 | GPS7 | -0.00139 | 0.00053 |
| 64 | GPS7 | 0.01465  | 0.01036 |
| 65 | GPS3 | 0.00000  | 0.00000 |
| 66 | GPS3 | 0.00474  | 0.00057 |
| 67 | GPS3 | 0.00263  | 0.00047 |
| 68 | GPS3 | 0.00259  | 0.00042 |
| 69 | GPS3 | 0.00043  | 0.00048 |
| 70 | GPS3 | 0.00297  | 0.00051 |
| 71 | GPS3 | 0.00232  | 0.00040 |
| 72 | GPS3 | 0.00290  | 0.00043 |
| 73 | GPS3 | -0.00015 | 0.00046 |
| 74 | GPS3 | 0.00293  | 0.00045 |
| 75 | GPS3 | 0.00226  | 0.00044 |
| 76 | GPS3 | 0.00240  | 0.00045 |
| 77 | GPS3 | 0.00219  | 0.00042 |
| 78 | GPS3 | 0.00359  | 0.00044 |

|    |      |          |         |
|----|------|----------|---------|
| 79 | GPS3 | 0.00263  | 0.00065 |
| 80 | GPS3 | 0.00000  | 0.00000 |
| 81 | GPS4 | 0.00000  | 0.00000 |
| 82 | GPS4 | 0.00613  | 0.00075 |
| 83 | GPS4 | 0.00776  | 0.00049 |
| 84 | GPS4 | 0.00945  | 0.00042 |
| 85 | GPS4 | 0.00940  | 0.00048 |
| 86 | GPS4 | 0.00599  | 0.00051 |
| 87 | GPS4 | 0.01163  | 0.00040 |
| 88 | GPS4 | 0.02115  | 0.00043 |
| 89 | GPS4 | -0.00060 | 0.00046 |
| 90 | GPS4 | 0.01398  | 0.00045 |
| 91 | GPS4 | 0.00802  | 0.00044 |
| 92 | GPS4 | 0.00896  | 0.00045 |
| 93 | GPS4 | 0.00593  | 0.00042 |
| 94 | GPS4 | 0.01284  | 0.00043 |
| 95 | GPS4 | 0.00393  | 0.00056 |
| 96 | GPS4 | 0.00000  | 0.00000 |

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PROGRAM GPSEST 20-FEB-07 16:51  
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RMS ERRORS OF ELLIP. COORDINATES AND COORDINATE DIFFER. IN MM (PART 1):  
-----

| NUM |       | 1   | 2   | 5   | 6   | 7   | 3   | 4   |
|-----|-------|-----|-----|-----|-----|-----|-----|-----|
|     | B     | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
|     | 1   L | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
|     | H     | 0.0 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
|     |       |     |     |     |     |     |     |     |
|     | B     | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
|     | 2   L | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
|     | H     | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
|     |       |     |     |     |     |     |     |     |
|     | B     | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
|     | 5   L | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
|     | H     | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
|     |       |     |     |     |     |     |     |     |
|     | B     | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
|     | 6   L | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
|     | H     | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
|     |       |     |     |     |     |     |     |     |
|     | B     | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
|     | 7   L | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
|     | H     | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
|     |       |     |     |     |     |     |     |     |
|     | B     | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
|     | 3   L | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

|   |   |     |     |     |     |     |     |     |     |
|---|---|-----|-----|-----|-----|-----|-----|-----|-----|
|   | H | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
|   | B | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 4 | L | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
|   | H | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |

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PROGRAM GPSEST 20-FEB-07 16:51  
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SLOPE DISTANCES AND RMS ERRORS IN M (PART 1):

| NUM |     | 2 N      | 5 N       | 6 N       | 7 N       | 3 N       | 4 N       |
|-----|-----|----------|-----------|-----------|-----------|-----------|-----------|
| 1   | O   | 659.0808 | 672.0465  | 1180.5883 | 735.5633  | 1613.4842 | 1591.0947 |
|     | N   | 659.0836 | 672.0469  | 1180.5900 | 735.5627  | 1613.4854 | 1591.0973 |
|     | RMS | 0.0001   | 0.0001    | 0.0001    | 0.0001    | 0.0001    | 0.0001    |
| 2   | O   |          | 1167.2810 | 1829.8074 | 901.3154  | 955.9403  | 1198.8852 |
|     | N   |          | 1167.2827 | 1829.8110 | 901.3179  | 955.9386  | 1198.8851 |
|     | RMS |          | 0.0001    | 0.0001    | 0.0001    | 0.0001    | 0.0001    |
| 5   | O   |          |           | 854.7452  | 1379.3840 | 2031.1130 | 1608.7393 |
|     | N   |          |           | 854.7463  | 1379.3837 | 2031.1142 | 1608.7412 |
|     | RMS |          |           | 0.0001    | 0.0001    | 0.0001    | 0.0001    |
| 6   | O   |          |           |           | 1604.9621 | 2770.0630 | 2462.3862 |
|     | N   |          |           |           | 1604.9629 | 2770.0651 | 2462.3888 |
|     | RMS |          |           |           | 0.0001    | 0.0001    | 0.0001    |
| 7   | O   |          |           |           |           | 1693.3971 | 2089.3255 |
|     | N   |          |           |           |           | 1693.3979 | 2089.3276 |
|     | RMS |          |           |           |           | 0.0001    | 0.0001    |
| 3   | O   |          |           |           |           |           | 1102.3314 |
|     | N   |          |           |           |           |           | 1102.3333 |
|     | RMS |          |           |           |           |           | 0.0001    |

**Appendix VIIIa. Results of 15 measurements at Romuvaara. Deviations of the vector lengths from their mean in millimeters. Unscaled observations.**

| Vector    | Mean length<br>[mm] | Time [a] |      |      |      |      |      |      |      |      |      |     |      |      |      |      | RMS  |
|-----------|---------------------|----------|------|------|------|------|------|------|------|------|------|-----|------|------|------|------|------|
|           |                     | 96.3     | 96.8 | 97.3 | 97.8 | 98.3 | 98.8 | 99.3 | 99.8 | 1.3  | 1.8  | 2.8 | 3.8  | 4.8  | 5.8  | 6.8  |      |
| GPS1-GPS2 | 1176417.7           | -0.7     | -1.0 | 1.4  | -1.4 | -0.4 | -0.3 | -0.1 | 1.3  | 0.8  | 0.3  | 2.6 | -0.5 | -0.4 | -1.4 | -0.5 | ±1.1 |
| GPS1-GPS3 | 541205.0            | 1.0      | -0.7 | 0.5  | -0.5 | 0.2  | -0.5 | 0.4  | 0.0  | 0.5  | -0.4 | 1.4 | -0.8 | -0.3 | -0.7 | -0.3 | 0.6  |
| GPS1-GPS4 | 731897.0            | -3.1     | -0.1 | -1.0 | 0.1  | -2.4 | 0.3  | -0.1 | 0.7  | 0.9  | 1.3  | 1.4 | 0.4  | 0.7  | 0.1  | 0.6  | 1.2  |
| GPS1-GPS5 | 614734.4            | 0.8      | -0.2 | 0.2  | -0.6 | 0.0  | -0.5 | 0.2  | -0.3 | 0.1  | 0.4  | 0.3 | 0.1  | -0.1 | -0.1 | 0.0  | 0.3  |
| GPS1-GPS6 | 678196.2            | 0.0      | 1.1  | 0.2  | 0.4  | -0.3 | -0.3 | -1.1 | 0.8  | -0.6 | 0.0  | 1.7 | 0.1  | -0.1 | -1.1 | -0.2 | 0.7  |
| GPS1-GPS7 | 1222388.8           | -0.6     | 0.9  | -0.2 | -0.1 | -0.9 | -1.0 | -0.4 | 1.0  | -0.3 | 0.2  | 1.8 | 0.1  | 0.3  | -0.9 | -0.1 | 0.7  |
| GPS2-GPS3 | 783976.4            | -1.5     | -0.3 | 0.8  | -1.2 | 0.0  | -0.3 | 0.0  | 1.1  | 0.3  | 0.5  | 0.9 | 0.6  | -0.2 | -0.7 | -0.2 | 0.7  |
| GPS2-GPS4 | 692375.1            | -1.8     | -0.3 | 1.6  | 0.1  | -1.6 | -1.2 | -0.5 | 0.8  | 0.2  | 0.2  | 2.4 | 0.2  | 0.2  | -0.6 | 0.1  | 1.1  |
| GPS2-GPS5 | 1397223.6           | -0.5     | -0.2 | 0.1  | -1.7 | -0.7 | -0.9 | -0.1 | 1.7  | 0.4  | 0.9  | 2.0 | 0.1  | 0.1  | -0.8 | -0.4 | 0.9  |
| GPS2-GPS6 | 1686681.7           | -0.5     | -0.5 | 2.1  | -1.3 | -0.8 | -0.7 | -0.8 | 1.8  | 0.7  | -0.1 | 4.6 | -0.6 | -0.8 | -2.6 | -0.7 | 1.7  |
| GPS2-GPS7 | 1940414.1           | -1.1     | -0.4 | 1.9  | -1.1 | -1.4 | -0.8 | -0.5 | 1.7  | 1.0  | -0.3 | 5.3 | -0.5 | -0.5 | -2.3 | -0.7 | 1.8  |
| GPS3-GPS4 | 717507.8            | -3.9     | 0.4  | -0.8 | 0.6  | -2.6 | -1.0 | 0.0  | 0.5  | 0.8  | 1.2  | 1.3 | 1.2  | 1.1  | 0.7  | 1.1  | 1.5  |
| GPS3-GPS5 | 616536.1            | 1.0      | 0.1  | -0.6 | -0.5 | -0.8 | -0.5 | -0.1 | 0.6  | 0.1  | 0.5  | 1.1 | -0.5 | 0.4  | -0.1 | -0.1 | 0.6  |
| GPS3-GPS6 | 1204804.8           | 1.0      | 0.4  | 0.7  | -0.2 | 0.0  | -0.9 | -0.6 | 0.8  | 0.2  | -0.5 | 3.0 | -0.7 | -0.5 | -1.9 | -0.5 | 1.1  |
| GPS3-GPS7 | 1679302.1           | 0.2      | 0.3  | 0.5  | -0.6 | -0.5 | -1.5 | 0.1  | 0.9  | 0.5  | -0.4 | 3.1 | -0.5 | -0.2 | -1.5 | -0.4 | 1.1  |
| GPS4-GPS5 | 1225012.2           | -3.2     | 0.4  | -1.5 | 0.0  | -3.3 | -0.8 | -0.2 | 0.7  | 0.7  | 2.0  | 1.6 | 1.0  | 1.3  | 0.7  | 1.1  | 1.6  |
| GPS4-GPS6 | 1045309.6           | -0.4     | -0.2 | 0.1  | -0.9 | -0.7 | 0.4  | -0.3 | 1.0  | 1.0  | 0.3  | 2.7 | -0.4 | -0.5 | -1.6 | -0.3 | 1.0  |
| GPS4-GPS7 | 1248362.5           | 0.8      | -0.2 | 0.2  | -1.3 | 0.2  | 0.3  | 0.0  | 0.9  | 0.7  | -0.6 | 2.8 | -0.7 | -0.8 | -1.7 | -0.8 | 1.1  |
| GPS5-GPS6 | 1188022.1           | 0.7      | 0.8  | 0.4  | 0.3  | 0.0  | -0.4 | -0.9 | 0.0  | -0.5 | 0.3  | 1.5 | -0.1 | -0.4 | -1.2 | -0.1 | 0.7  |
| GPS5-GPS7 | 1795939.9           | 0.5      | 0.6  | 0.3  | -0.4 | -0.6 | -1.3 | -0.1 | 0.3  | -0.1 | 0.5  | 1.7 | 0.0  | 0.0  | -0.9 | 0.0  | 0.7  |
| GPS6-GPS7 | 636487.9            | -0.1     | -0.2 | 0.1  | -0.7 | -0.4 | -1.0 | 0.8  | 0.3  | 0.5  | 0.3  | 0.3 | -0.1 | 0.2  | 0.1  | 0.3  | 0.5  |
| Mean:     |                     | -0.6     | 0.0  | 0.3  | -0.5 | -0.8 | -0.6 | -0.2 | 0.8  | 0.4  | 0.3  | 2.1 | -0.1 | 0.0  | -0.9 | -0.1 |      |
| St.dev.:  |                     | ±1.5     | 0.5  | 0.9  | 0.6  | 1.0  | 0.5  | 0.4  | 0.6  | 0.5  | 0.6  | 1.3 | 0.5  | 0.6  | 0.9  | 0.5  |      |
| RMS:      |                     | ±1.5     | 0.5  | 1.0  | 0.8  | 1.2  | 0.8  | 0.5  | 1.0  | 0.6  | 0.7  | 2.4 | 0.5  | 0.5  | 1.3  | 0.5  | ±1.1 |

**Appendix VIIIb. Results of 15 measurements at Romuvaara. Deviations of the vector lengths from their mean in millimeters. Scaled observations.**

| Vector    | Mean length<br>[mm] | Time [a] |      |      |      |      |      |      |      |      |      |      |      |      |      |      | RMS  |
|-----------|---------------------|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|           |                     | 96.3     | 96.8 | 97.3 | 97.8 | 98.3 | 98.8 | 99.3 | 99.8 | 1.3  | 1.8  | 2.8  | 3.8  | 4.8  | 5.8  | 6.8  |      |
| GPS1-GPS2 | 1176417.7           | 0.0      | -1.0 | 1.1  | -0.8 | 0.6  | 0.4  | 0.1  | 0.5  | 0.4  | -0.1 | 0.4  | -0.4 | -0.4 | -0.5 | -0.5 | ±0.6 |
| GPS1-GPS3 | 541205.0            | 1.3      | -0.7 | 0.4  | -0.2 | 0.7  | -0.2 | 0.5  | -0.4 | 0.3  | -0.6 | 0.4  | -0.8 | -0.3 | -0.3 | -0.3 | 0.6  |
| GPS1-GPS4 | 731897.0            | -2.7     | -0.1 | -1.2 | 0.5  | -1.8 | 0.8  | 0.0  | 0.2  | 0.6  | 1.0  | 0.0  | 0.4  | 0.7  | 0.6  | 0.6  | 1.0  |
| GPS1-GPS5 | 614734.4            | 1.2      | -0.2 | 0.1  | -0.3 | 0.5  | -0.1 | 0.3  | -0.7 | -0.1 | 0.2  | -0.8 | 0.1  | -0.1 | 0.4  | 0.0  | 0.5  |
| GPS1-GPS6 | 678196.2            | 0.4      | 1.1  | 0.0  | 0.7  | 0.3  | 0.1  | -1.0 | 0.3  | -0.8 | -0.2 | 0.4  | 0.1  | -0.1 | -0.6 | -0.2 | 0.5  |
| GPS1-GPS7 | 1222388.8           | 0.2      | 0.9  | -0.5 | 0.6  | 0.2  | -0.2 | -0.2 | 0.1  | -0.7 | -0.3 | -0.6 | 0.2  | 0.3  | 0.1  | -0.1 | 0.4  |
| GPS2-GPS3 | 783976.4            | -1.0     | -0.3 | 0.6  | -0.8 | 0.7  | 0.2  | 0.1  | 0.5  | 0.0  | 0.2  | -0.6 | 0.6  | -0.2 | -0.1 | -0.2 | 0.5  |
| GPS2-GPS4 | 692375.1            | -1.4     | -0.3 | 1.4  | 0.4  | -1.0 | -0.8 | -0.4 | 0.3  | -0.1 | 0.0  | 1.1  | 0.2  | 0.2  | -0.1 | 0.1  | 0.7  |
| GPS2-GPS5 | 1397223.6           | 0.3      | -0.2 | -0.2 | -1.0 | 0.5  | 0.0  | 0.1  | 0.7  | -0.1 | 0.4  | -0.6 | 0.2  | 0.1  | 0.2  | -0.3 | 0.4  |
| GPS2-GPS6 | 1686681.7           | 0.5      | -0.5 | 1.7  | -0.5 | 0.6  | 0.4  | -0.5 | 0.6  | 0.1  | -0.7 | 1.5  | -0.5 | -0.9 | -1.4 | -0.6 | 0.9  |
| GPS2-GPS7 | 1940414.1           | 0.1      | -0.4 | 1.4  | -0.2 | 0.3  | 0.4  | -0.2 | 0.3  | 0.3  | -1.0 | 1.7  | -0.4 | -0.6 | -0.9 | -0.6 | 0.7  |
| GPS3-GPS4 | 717507.8            | -3.5     | 0.4  | -1.0 | 0.9  | -2.0 | -0.6 | 0.1  | 0.0  | 0.5  | 0.9  | 0.0  | 1.2  | 1.1  | 1.2  | 1.1  | 1.3  |
| GPS3-GPS5 | 616536.2            | 1.4      | 0.1  | -0.9 | -0.3 | -0.4 | -0.2 | -0.1 | 0.2  | -0.2 | 0.3  | -0.1 | -0.6 | 0.4  | 0.4  | -0.2 | 0.5  |
| GPS3-GPS6 | 1204804.8           | 1.7      | 0.4  | 0.4  | 0.4  | 1.0  | -0.1 | -0.4 | 0.0  | -0.2 | -0.9 | 0.8  | -0.6 | -0.5 | -1.0 | -0.5 | 0.7  |
| GPS3-GPS7 | 1679302.1           | 1.2      | 0.3  | 0.1  | 0.2  | 0.9  | -0.4 | 0.4  | -0.3 | -0.1 | -1.0 | 0.0  | -0.4 | -0.3 | -0.3 | -0.3 | 0.5  |
| GPS4-GPS5 | 1225012.2           | -2.5     | 0.4  | -1.8 | 0.6  | -2.2 | 0.0  | 0.0  | -0.2 | 0.3  | 1.6  | -0.7 | 1.1  | 1.3  | 1.6  | 1.1  | 1.3  |
| GPS4-GPS6 | 1045309.6           | 0.2      | -0.2 | -0.2 | -0.4 | 0.2  | 1.1  | -0.1 | 0.3  | 0.6  | -0.1 | 0.8  | -0.3 | -0.5 | -0.8 | -0.3 | 0.5  |
| GPS4-GPS7 | 1248362.5           | 1.6      | -0.2 | -0.1 | -0.7 | 1.3  | 1.1  | 0.2  | 0.0  | 0.2  | -1.0 | 0.5  | -0.6 | -0.8 | -0.8 | -0.8 | 0.8  |
| GPS5-GPS6 | 1188022.1           | 1.4      | 0.8  | 0.1  | 0.9  | 1.0  | 0.3  | -0.7 | -0.8 | -0.9 | -0.1 | -0.7 | 0.0  | -0.4 | -0.3 | -0.1 | 0.7  |
| GPS5-GPS7 | 1795939.9           | 1.6      | 0.6  | -0.1 | 0.5  | 0.9  | -0.2 | 0.2  | -1.0 | -0.8 | -0.1 | -1.6 | 0.1  | -0.1 | 0.4  | 0.1  | 0.8  |
| GPS6-GPS7 | 636487.9            | 0.3      | -0.2 | -0.1 | -0.4 | 0.1  | -0.6 | 0.9  | -0.1 | 0.3  | 0.1  | -0.9 | -0.1 | 0.2  | 0.6  | 0.3  | 0.4  |
| Mean:     |                     | 0.1      | 0.0  | 0.1  | 0.0  | 0.1  | 0.1  | 0.0  | 0.0  | 0.0  | -0.1 | 0.0  | 0.0  | -0.1 | -0.1 | -0.1 |      |
| St.dev.:  |                     | ±1.5     | 0.5  | 0.9  | 0.6  | 1.0  | 0.5  | 0.4  | 0.5  | 0.5  | 0.7  | 0.9  | 0.5  | 0.6  | 0.7  | 0.5  |      |
| RMS:      |                     | ±1.5     | 0.5  | 0.9  | 0.6  | 1.0  | 0.5  | 0.4  | 0.5  | 0.5  | 0.7  | 0.8  | 0.5  | 0.6  | 0.7  | 0.5  | ±0.7 |

## Appendix IX. Results of the measurements at Romuvaara in 2006.

```
=====
Program : GPSEST Bernese GPS Software Version 5.0
Purpose : Parameter estimation
Campaign: ${P}/ROMU06S Default session: 2660 year 2006
Date : 19-Feb-2007 15:29 User name : ja
=====
```

ROMU06S

```
1${P}/ROMU06S PROGRAM GPSEST 19-FEB-07 15:29
ROMU06S BERNESE GPS SOFTWARE VERSION 5.0
=====
```

### TABLE OF CONTENTS

- ```
-----
1. CAMPAIGNS
2. OBSERVATION FILES
3. GENERAL OPTIONS
4. STATIONS
5. SATELLITE ORBITS
6. ATMOSPHERE
7. CLOCK PARAMETERS
8. POLE COORDINATES AND TIME INFORMATION
9. ANTENNA PHASE CENTERS
10. CONSTANTS
11. PARAMETER CHARACTERIZATION LIST
12. TEST OUTPUT
13. RESULTS (PART 1)
14. RESULTS (PART 2)
```

```
1${P}/ROMU06S                                PROGRAM GPSEST  19-FEB-07 15:29
ROMU06S                                       BERNESE GPS SOFTWARE VERSION 5.0
=====
```

INPUT AND OUTPUT FILENAMES

```

Session table           : ${P}/ROMU06S\STA\SESSIONS.SES
General constants      : ${X}/GEN\CONST.
Geodetic datum         : ${X}/GEN\DATUM.
Station information    : ${P}/ROMU06S\STA\ROMU06S.STA
Earth rotation parameters : ${P}/ROMU06S\ORB\C04_2006.ERP
Subdaily pole model   : ${X}/GEN\IERS2000.SUB
Nutation model        : ${X}/GEN\IAU2000.NUT
Satellite information  : ${X}/GEN\SATELLIT.
Receiver information    : ${X}/GEN\RECEIVER.
Satellite problems    : ${X}/GEN\SAT_2006.CRX
Phase center eccentricities : ${X}/GEN\PHAS_IGS.REL
SINEX general input file : ${X}/GEN\SINEX.
IONEX control file    : ${X}/GEN\IONEX.
Difference GPS-UTC     : ---
A priori station coordinates: ${P}/ROMU06S\STA\ROMU.CRD
GNSS standard orbits  : ${P}/ROMU06S\ORB\ROMU06S.STD
GNSS orbit partials   : ---
Ionosphere models     : ${P}/ROMU06S\ATM\ROMU06S.ION
Troposphere estimates : ---
Station sigma factors : ---
Station eccentricities : ---
Ocean loading tables  : ---
GNSS clock corrections : ---
Differential code biases : ---
Receiver antenna orientation: ---
Kinematic coordinates : ---
Kinematic velocities  : ---
Standard orbit(s)     : ---
Orbit partials        : ---
Attitude data         : ---
Precise orbit(s)      : ---
LEO orbital elements  : ---
Station coordinates   : ${P}/ROMU06S\STA\TROMU06S.CRD
GNSS orbital elements : ---
Troposphere estimates : ---
Troposphere SINEX     : ---
Ionosphere models     : ---
IONEX                 : ---
Residuals             : ---
Coordinate covariance matrix: ---
Full covariance matrix : ---
Normal equations      : ---
Bernese ERP file      : ---
IERS ERP file         : ---
GNSS clock corrections : ---
Clock RINEX           : ---
Kinematic coordinates : ---
Differential code biases : ---
Phase center variations (gri: ---
Phase center variations (har: ---
Scratch file          : ${U}/WORK\GPSEST.SCR
Scratch files         : ${U}/WORK\GPSEST.SC1
Program output        : ${P}/ROMU06S\OUT\GPSEST.L12

```

Error message : \${U}/WORK/ERROR.MSG

1\${P}/ROMU06S
ROMU06S

PROGRAM GPSEST 19-FEB-07 15:29
BERNESE GPS SOFTWARE VERSION 5.0

1. CAMPAIGNS

CAMPAIGN NAME	NUM STATION NAME	NUM STATION NAME	NUM STATION NAME	NUM STATION NAME	NUM STATION NAME
1 \${P}/ROMU06S :	1 GPS1	3 GPS3	4 GPS4	5 GPS5	6 GPS6
	2 GPS2	7 GPS7			

2. OBSERVATION FILES

1\${P}/ROMU06S

MAIN CHARACTERISTICS:

FILE	OBSERVATION FILE HEADER	OBSERVATION FILE	SESS	RECEIVER 1	RECEIVER 2
1	\${P}/ROMU06S/OBS/01032650.PSH	\${P}/ROMU06S/OBS/01032650.PSO	2650	ASHTECH Z-XII3	ASHTECH Z-XII3
2	\${P}/ROMU06S/OBS/01032660.PSH	\${P}/ROMU06S/OBS/01032660.PSO	2660	ASHTECH Z-XII3	ASHTECH Z-XII3
3	\${P}/ROMU06S/OBS/01042650.PSH	\${P}/ROMU06S/OBS/01042650.PSO	2650	ASHTECH Z-XII3	ASHTECH Z-XII3
4	\${P}/ROMU06S/OBS/01042660.PSH	\${P}/ROMU06S/OBS/01042660.PSO	2660	ASHTECH Z-XII3	ASHTECH Z-XII3
5	\${P}/ROMU06S/OBS/01052650.PSH	\${P}/ROMU06S/OBS/01052650.PSO	2650	ASHTECH Z-XII3	ASHTECH Z-XII3
6	\${P}/ROMU06S/OBS/01052660.PSH	\${P}/ROMU06S/OBS/01052660.PSO	2660	ASHTECH Z-XII3	ASHTECH Z-XII3
7	\${P}/ROMU06S/OBS/01062650.PSH	\${P}/ROMU06S/OBS/01062650.PSO	2650	ASHTECH Z-XII3	ASHTECH Z-XII3
8	\${P}/ROMU06S/OBS/01062660.PSH	\${P}/ROMU06S/OBS/01062660.PSO	2660	ASHTECH Z-XII3	ASHTECH Z-XII3
9	\${P}/ROMU06S/OBS/03022650.PSH	\${P}/ROMU06S/OBS/03022650.PSO	2650	ASHTECH Z-XII3	ASHTECH Z-XII3
10	\${P}/ROMU06S/OBS/03022660.PSH	\${P}/ROMU06S/OBS/03022660.PSO	2660	ASHTECH Z-XII3	ASHTECH Z-XII3
11	\${P}/ROMU06S/OBS/06072650.PSH	\${P}/ROMU06S/OBS/06072650.PSO	2650	ASHTECH Z-XII3	ASHTECH Z-XII3
12	\${P}/ROMU06S/OBS/06072660.PSH	\${P}/ROMU06S/OBS/06072660.PSO	2660	ASHTECH Z-XII3	ASHTECH Z-XII3

FILE	TYP	FREQ.	STATION 1	STATION 2	SESS	FIRST	OBSERV.TIME	#EPO	DT	#EF	#CLK	ARC	#SAT	AMB.I.+S.		#CLUSTERS						
														W	12	#AMB	L1	L2	L5	RM		
1	P	L1,L2	GPS1	GPS3	2650	6-09-22	9:42:30	1715	30	0	E	E	1	27	N	Y	Y	45	14	14	45	0
2	P	L1,L2	GPS1	GPS3	2660	6-09-23	0:00:30	1433	30	0	E	E	1	27	N	Y	Y	42	17	17	42	0

3	P	L1,L2	GPS1	GPS4	2650	6-09-22	9:57:30	1685	30	0	E	E	1	27	N	Y	Y	41	10	10	41	0
4	P	L1,L2	GPS1	GPS4	2660	6-09-23	0:00:30	1457	30	0	E	E	1	27	N	Y	Y	37	11	11	37	0
5	P	L1,L2	GPS1	GPS5	2650	6-09-22	8:22:30	1875	30	0	E	E	1	27	N	Y	Y	46	13	13	46	0
6	P	L1,L2	GPS1	GPS5	2660	6-09-23	0:00:30	1306	30	0	E	E	1	27	N	Y	Y	38	15	15	38	0
7	P	L1,L2	GPS1	GPS6	2650	6-09-22	10:20:00	1640	30	0	E	E	1	27	N	Y	Y	41	11	11	41	0
8	P	L1,L2	GPS1	GPS6	2660	6-09-23	0:00:30	1475	30	0	E	E	1	27	N	Y	Y	35	9	9	35	0
9	P	L1,L2	GPS3	GPS2	2650	6-09-22	9:42:30	1715	30	0	E	E	1	27	N	Y	Y	54	22	22	54	0
10	P	L1,L2	GPS3	GPS2	2660	6-09-23	0:00:30	1390	30	0	E	E	1	27	N	Y	Y	45	19	20	45	0
11	P	L1,L2	GPS6	GPS7	2650	6-09-22	10:36:00	1608	30	0	E	E	1	27	N	Y	Y	41	11	11	41	0
12	P	L1,L2	GPS6	GPS7	2660	6-09-23	0:00:30	1475	30	0	E	E	1	27	N	Y	Y	39	14	13	39	0

SATELLITES:

 FILE #SAT SATELLITES

1	27	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	25	26	27	28	29	30
2	27	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	25	26	27	28	29	30
3	27	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	25	26	27	28	29	30
4	27	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	25	26	27	28	29	30
5	27	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	25	26	27	28	29	30
6	27	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	25	26	27	28	29	30
7	27	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	25	26	27	28	29	30
8	27	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	25	26	27	28	29	30
9	27	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	25	26	27	28	29	30
10	27	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	25	26	27	28	29	30
11	27	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	25	26	27	28	29	30
12	27	1	2	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	21	22	23	25	26	27	28	29	30

OBSERVATION SELECTION:

 SAMPLING RATE : 30 SEC
 ELEVATION CUT-OFF ANGLE : 20 DEGREES
 SATELLITE SYSTEM : GPS
 SPECIAL DATA SELECTION : NO

1\${P}/ROMU06S
 ROMU06S

PROGRAM GPSEST 19-FEB-07 15:29
 BERNESE GPS SOFTWARE VERSION 5.0

3. GENERAL OPTIONS

 TIDAL CORRECTION OF STATION COORDINATES : IERS CONVENTIONS 2000

A PRIORI SIGMA OF UNIT WEIGHT:

A PRIORI SIGMA OF UNIT WEIGHT : 0.001 M (SIGMA OF ONE-WAY L1 PHASE OBSERVABLE AT ZENITH)
MODEL FOR ELEVATION-DEPENDENT WEIGHTING : 1/COS(Z)

CORRELATIONS AND SESSIONS:

STRATEGY : CORRELATIONS CORRECTLY MODELLED
TIME INTERVAL : 0.10000 SEC (TO IDENTIFY EPOCH)

SESS #FILE FILE NUMBERS

2650 6 1 3 5 7 9 11
2660 6 2 4 6 8 10 12

AMBIGUITY RESOLUTION STRATEGY:

AMBIGUITIES PRE-ELIMINATED EVERY 30 SECONDS

SYNCHRONIZATION ERRORS:

STRATEGY : SYNCHRONIZATION ERRORS NOT APPLIED

4. STATIONS

Local geodetic datum: \${X}/GEN\DATUM.

Datum name	Ell. param./ Scale	Shifts to WGS-84	Rotations to WGS-84
WGS - 84	A = 6378137.000 m 1/F= 298.2572236 SC = 0.00000D+00	DX = 0.0000 m DY = 0.0000 m DZ = 0.0000 m	RX = 0.00000 arcsec RY = 0.00000 arcsec RZ = 0.00000 arcsec

A priori station coordinates: \${P}/ROMU06S\STA\ROMU.CRD

num	Station name	obs e/f/h	A priori station coordinates WGS-84			A priori station coordinates Ellipsoidal in local geodetic datum			
			X (m)	Y (m)	Z (m)	Latitude	Longitude	Height (m)	
1	GPS1	Y ESTIM	2410839.3072	1388069.5136	5720515.2143	64 13 2.630039	29 55 54.118509	241.6600	
3	GPS3	Y ESTIM	2410512.9957	1387690.3887	5720721.8220	64 13 19.254883	29 55 41.827606	222.4407	

4	GPS4	Y	ESTIM	2410183.6629	1388327.7870	5720712.9448	64 13 18.179839	29 56 34.977031	228.6607
5	GPS5	Y	ESTIM	2411065.8443	1387498.1880	5720528.0899	64 13 5.389555	29 55 9.024823	214.6804
6	GPS6	Y	ESTIM	2411071.3051	1388657.9331	5720270.4931	64 12 44.808990	29 56 23.339861	236.4912
2	GPS2	Y	ESTIM	2409792.7492	1387832.0097	5720997.1485	64 13 39.216043	29 56 17.584812	229.6879
7	GPS7	Y	ESTIM	2410852.0692	1389251.9113	5720205.3683	64 12 40.796407	29 57 9.606445	224.2017

A priori sigma:

Station coordinates a priori sigma
in local geodetic datum

num	Station name	N (m)	E (m)	U (m)
1	GPS1	0.00001	0.00001	0.00001

1\${P}/ROMU06S
ROMU06S

PROGRAM GPSEST 19-FEB-07 15:29
BERNESE GPS SOFTWARE VERSION 5.0

5. SATELLITE ORBITS

ARC CHARACTERISTICS:

ARC	START OF ARC	END OF ARC	SOURCE	#SAT	SATELLITES																		
1	06-09-22 00:00:00	06-09-24 00:00:00	PR2006.266	28	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	
					20	21	22	23	25	26	27	28	29	30									

OSCULATING ELEMENTS:

\${P}/ROMU06S\ORB\ROMU06S.STD

REFERENCE SYSTEM: J2000.0
REFERENCE EPOCH : 54000.3489583 MJD (2006 9 22 8 22 30.00)

SAT	S.MAJ.AXIS	ECCENTRIC.	INCLINAT.	NODE	PERIGEE	M. ANOMALY	PER.PASS.TIME
1	26558982.4	0.00632050	56.673543	20.605244	-102.387532	25.713525	54000.3133482
2	26561116.3	0.00875637	54.313931	-102.022721	-236.920245	97.133390	54000.2144241
3	26559004.3	0.00854883	53.084259	-167.232847	39.032418	56.840666	54000.2702408
4	26559003.2	0.00748540	54.283315	-100.901750	9.823539	-117.398002	54000.5115406
5	26560150.7	0.00754268	53.806883	133.384571	63.925674	-135.530234	54000.5366637
6	26562142.3	0.00597907	53.514599	-163.824430	-102.590891	-66.938932	54000.4416772
7	26561097.8	0.01044577	53.603630	-165.311556	259.425784	-125.081610	54000.5222019

3	GPS3	2006 09 22 12 00 00	0.00000	rel
4	GPS3	2006 09 22 14 00 00	0.00000	rel
5	GPS3	2006 09 22 16 00 00	0.00000	rel
6	GPS3	2006 09 22 18 00 00	0.00000	rel
7	GPS3	2006 09 22 20 00 00	0.00000	rel
8	GPS3	2006 09 22 22 00 00	0.00000	rel
9	GPS3	2006 09 23 00 00 00	0.00000	rel
10	GPS3	2006 09 23 02 00 00	0.00000	rel
11	GPS3	2006 09 23 04 00 00	0.00000	rel
12	GPS3	2006 09 23 06 00 00	0.00000	rel
13	GPS3	2006 09 23 08 00 00	0.00000	rel
14	GPS3	2006 09 23 10 00 00	0.00000	rel
15	GPS3	2006 09 23 12 00 00	0.00000	rel
16	GPS3	2006 09 23 14 00 00	0.00000	rel
17	GPS4	2006 09 22 08 00 00	0.00000	abs
18	GPS4	2006 09 22 10 00 00	0.00000	rel
19	GPS4	2006 09 22 12 00 00	0.00000	rel
20	GPS4	2006 09 22 14 00 00	0.00000	rel
21	GPS4	2006 09 22 16 00 00	0.00000	rel
22	GPS4	2006 09 22 18 00 00	0.00000	rel
23	GPS4	2006 09 22 20 00 00	0.00000	rel
24	GPS4	2006 09 22 22 00 00	0.00000	rel
25	GPS4	2006 09 23 00 00 00	0.00000	rel
26	GPS4	2006 09 23 02 00 00	0.00000	rel
27	GPS4	2006 09 23 04 00 00	0.00000	rel
28	GPS4	2006 09 23 06 00 00	0.00000	rel
29	GPS4	2006 09 23 08 00 00	0.00000	rel
30	GPS4	2006 09 23 10 00 00	0.00000	rel
31	GPS4	2006 09 23 12 00 00	0.00000	rel
32	GPS4	2006 09 23 14 00 00	0.00000	rel
33	GPS5	2006 09 22 08 00 00	0.00000	abs
34	GPS5	2006 09 22 10 00 00	0.00000	rel
35	GPS5	2006 09 22 12 00 00	0.00000	rel
36	GPS5	2006 09 22 14 00 00	0.00000	rel
37	GPS5	2006 09 22 16 00 00	0.00000	rel
38	GPS5	2006 09 22 18 00 00	0.00000	rel
39	GPS5	2006 09 22 20 00 00	0.00000	rel
40	GPS5	2006 09 22 22 00 00	0.00000	rel
41	GPS5	2006 09 23 00 00 00	0.00000	rel
42	GPS5	2006 09 23 02 00 00	0.00000	rel
43	GPS5	2006 09 23 04 00 00	0.00000	rel
44	GPS5	2006 09 23 06 00 00	0.00000	rel
45	GPS5	2006 09 23 08 00 00	0.00000	rel
46	GPS5	2006 09 23 10 00 00	0.00000	rel
47	GPS5	2006 09 23 12 00 00	0.00000	rel
48	GPS5	2006 09 23 14 00 00	0.00000	rel
49	GPS6	2006 09 22 08 00 00	0.00000	abs
50	GPS6	2006 09 22 10 00 00	0.00000	rel
51	GPS6	2006 09 22 12 00 00	0.00000	rel
52	GPS6	2006 09 22 14 00 00	0.00000	rel
53	GPS6	2006 09 22 16 00 00	0.00000	rel
54	GPS6	2006 09 22 18 00 00	0.00000	rel
55	GPS6	2006 09 22 20 00 00	0.00000	rel

56	GPS6	2006 09 22 22 00 00	0.00000	rel
57	GPS6	2006 09 23 00 00 00	0.00000	rel
58	GPS6	2006 09 23 02 00 00	0.00000	rel
59	GPS6	2006 09 23 04 00 00	0.00000	rel
60	GPS6	2006 09 23 06 00 00	0.00000	rel
61	GPS6	2006 09 23 08 00 00	0.00000	rel
62	GPS6	2006 09 23 10 00 00	0.00000	rel
63	GPS6	2006 09 23 12 00 00	0.00000	rel
64	GPS6	2006 09 23 14 00 00	0.00000	rel
65	GPS2	2006 09 22 08 00 00	0.00000	abs
66	GPS2	2006 09 22 10 00 00	0.00000	rel
67	GPS2	2006 09 22 12 00 00	0.00000	rel
68	GPS2	2006 09 22 14 00 00	0.00000	rel
69	GPS2	2006 09 22 16 00 00	0.00000	rel
70	GPS2	2006 09 22 18 00 00	0.00000	rel
71	GPS2	2006 09 22 20 00 00	0.00000	rel
72	GPS2	2006 09 22 22 00 00	0.00000	rel
73	GPS2	2006 09 23 00 00 00	0.00000	rel
74	GPS2	2006 09 23 02 00 00	0.00000	rel
75	GPS2	2006 09 23 04 00 00	0.00000	rel
76	GPS2	2006 09 23 06 00 00	0.00000	rel
77	GPS2	2006 09 23 08 00 00	0.00000	rel
78	GPS2	2006 09 23 10 00 00	0.00000	rel
79	GPS2	2006 09 23 12 00 00	0.00000	rel
80	GPS2	2006 09 23 14 00 00	0.00000	rel
81	GPS7	2006 09 22 08 00 00	0.00000	abs
82	GPS7	2006 09 22 10 00 00	0.00000	rel
83	GPS7	2006 09 22 12 00 00	0.00000	rel
84	GPS7	2006 09 22 14 00 00	0.00000	rel
85	GPS7	2006 09 22 16 00 00	0.00000	rel
86	GPS7	2006 09 22 18 00 00	0.00000	rel
87	GPS7	2006 09 22 20 00 00	0.00000	rel
88	GPS7	2006 09 22 22 00 00	0.00000	rel
89	GPS7	2006 09 23 00 00 00	0.00000	rel
90	GPS7	2006 09 23 02 00 00	0.00000	rel
91	GPS7	2006 09 23 04 00 00	0.00000	rel
92	GPS7	2006 09 23 06 00 00	0.00000	rel
93	GPS7	2006 09 23 08 00 00	0.00000	rel
94	GPS7	2006 09 23 10 00 00	0.00000	rel
95	GPS7	2006 09 23 12 00 00	0.00000	rel
96	GPS7	2006 09 23 14 00 00	0.00000	rel

IONOSPHERE MODELS: \${P}/ROMU06S\ATM\ROMU06S.ION

TYPE OF IONOSPHERE MODELS : LOCAL
RADIUS OF THE EARTH : 6378.14 KM

DEG. OF DEVELOP.				ORIGIN OF DEVELOPMENT			HEIGHT	NORMAIZATION FACTORS			
MODEL	TIME	LAT. MIXED	VALIDITY START	VALIDITY END	LOCAL TIME	LAT. (D)	LONG. (D)	(KM)	TIME (H)	LAT. (D)	ELE. CONT.

2	2	1	2	2006	9 22	5.0	2006	9 22	13.0	2006	9 22	9.0	64.21	29.93	450	2.00	6.00	0.10D+18
3	2	1	2	2006	9 22	11.0	2006	9 22	19.0	2006	9 22	15.0	64.21	29.93	450	2.00	6.00	0.10D+18
4	2	1	2	2006	9 22	17.0	2006	9 23	1.0	2006	9 22	21.0	64.21	29.93	450	2.00	6.00	0.10D+18
5	2	1	2	2006	9 22	23.0	2006	9 23	7.0	2006	9 23	3.0	64.21	29.93	450	2.00	6.00	0.10D+18
6	2	1	2	2006	9 23	5.0	2006	9 23	13.0	2006	9 23	9.0	64.21	29.93	450	2.00	6.00	0.10D+18
7	2	1	2	2006	9 23	11.0	2006	9 23	19.0	2006	9 23	15.0	64.21	29.93	450	2.00	6.00	0.10D+18

MODEL	TERM	POL.	DEGREE	IN	TIME	LATIT.	COEFFICIENT	SIGMA
2	1	0	0				0.102233E+01	0.412662E-02
	2	1	0				0.520681E-01	0.986588E-03
	3	2	0				-0.594881E-01	0.861874E-03
	4	0	1				-0.108926E+00	0.147548E-02
	5	1	1				0.142323E-01	0.148669E-02
3	1	0	0				0.873147E+00	0.382726E-02
	2	1	0				-0.675028E-01	0.916377E-03
	3	2	0				-0.514585E-01	0.873394E-03
	4	0	1				-0.108375E+00	0.130934E-02
	5	1	1				-0.526386E-01	0.111004E-02
4	1	0	0				0.454345E+00	0.458138E-02
	2	1	0				-0.784586E-01	0.108679E-02
	3	2	0				0.111571E-01	0.999259E-03
	4	0	1				-0.138850E+00	0.164710E-02
	5	1	1				0.237574E-01	0.173667E-02
5	1	0	0				0.352514E+00	0.396404E-02
	2	1	0				0.156633E+00	0.101524E-02
	3	2	0				0.708196E-01	0.870223E-03
	4	0	1				-0.151105E+00	0.141814E-02
	5	1	1				-0.384550E-01	0.140670E-02
6	1	0	0				0.100671E+01	0.374948E-02
	2	1	0				0.729867E-01	0.892243E-03
	3	2	0				-0.471215E-01	0.791431E-03
	4	0	1				-0.138073E+00	0.134735E-02
	5	1	1				0.309822E-02	0.137032E-02
7	1	0	0				0.806007E+00	0.330748E-02
	2	1	0				-0.101336E+00	0.804372E-03
	3	2	0				-0.358022E-01	0.767692E-03
	4	0	1				-0.141670E+00	0.113954E-02
	5	1	1				-0.502090E-01	0.983244E-03

1\${P}/ROMU06S
ROMU06S

PROGRAM GPSEST 19-FEB-07 15:29
BERNESE GPS SOFTWARE VERSION 5.0

8. POLE COORDINATES AND TIME INFORMATION

A PRIORI POLE AND TIME INFORMATION FROM THE POLE FILE:

DATUM	TIME	X-POLE (") EP-CPO (")	Y-POLE (") PS-CPO (")	UT1-UTC (S)	GPS-UTC (S)	RMS XP (") RMS EP (")	RMS YP (") RMS PS (")	RMS DT (S)
06-09-22	00:00:00	0.05177 0.00000	0.25297 0.00000	0.154775	14.	0.00000 0.00000	0.00000 0.00000	0.000000
06-09-23	00:00:00	0.04930 0.00000	0.25282 0.00000	0.153549	14.	0.00000 0.00000	0.00000 0.00000	0.000000
06-09-24	00:00:00	0.04716 0.00000	0.25262 0.00000	0.152373	14.	0.00000 0.00000	0.00000 0.00000	0.000000

NUTATION MODEL: IAU2000
 SUBDAILY POLE MODEL: IERS2000

1\${P}/ROMU06S
 ROMU06S

PROGRAM GPSEST 19-FEB-07 15:29
 BERNESE GPS SOFTWARE VERSION 5.0

12. TEST OUTPUT

MIN. AND MAX. ELEVATION/NADIR ANGLES AND MAX. SYNCHRONIZATION ERRORS:

SESS	FILE	STATION NAME 1	STATION NAME 2	MIN/MAX ELEV.	MIN/MAX NADIR	SYNCH. ERR. (NS)
2650	1	GPS1	GPS3	20.0 76.0	3.3 13.3	0.0
2660	2	GPS1	GPS3	20.0 80.4	2.3 13.2	0.0
2650	3	GPS1	GPS4	20.0 76.0	3.3 13.3	0.0
2660	4	GPS1	GPS4	20.0 80.4	2.3 13.2	0.0
2650	5	GPS1	GPS5	20.0 76.0	3.3 13.3	0.0
2660	6	GPS1	GPS5	20.0 80.4	2.3 13.2	0.0
2650	7	GPS1	GPS6	20.0 76.1	3.3 13.3	0.0
2660	8	GPS1	GPS6	20.0 80.4	2.3 13.2	0.0
2650	9	GPS3	GPS2	20.0 76.0	3.3 13.3	0.0
2660	10	GPS3	GPS2	20.0 80.4	2.3 13.2	0.0
2650	11	GPS6	GPS7	20.0 76.1	3.3 13.3	0.0
2660	12	GPS6	GPS7	20.0 80.4	2.3 13.2	0.0

1\${P}/ROMU06S
 ROMU06S

PROGRAM GPSEST 19-FEB-07 15:29
 BERNESE GPS SOFTWARE VERSION 5.0

 13. RESULTS (PART 1)

NUMBER OF PARAMETERS (PART 1):

PARAMETER TYPE	#PARAMETERS	#PRE-ELIMINATED	#SET-UP	#NO-OBS	#REF	#SINGULAR
STATION COORDINATES	21	0	21	0	0	0
AMBIGUITIES	12	12 (BEFORE INV)	332	320	0	0
SITE-SPECIFIC TROPOSPHERE PARAMETERS	96	0	96	0	0	5
TOTAL NUMBER OF PARAMETERS	129	12	449	320	0	5

NUMBER OF OBSERVATIONS (PART 1):

TYPE	FREQUENCY	FILE	#OBSERVATIONS
PHASE	L1	ALL	93721
PHASE	L2	ALL	93721
TOTAL NUMBER OF OBSERVATIONS			187442

A POSTERIORI SIGMA OF UNIT WEIGHT (PART 1):

A POSTERIORI SIGMA OF UNIT WEIGHT : 0.0017 M (SIGMA OF ONE-WAY L1 PHASE OBSERVABLE AT ZENITH)
 DEGREE OF FREEDOM (DOF) : 187318
 CHI**2/DOF : 3.05

1\${P}/ROMU06S
 ROMU06S

PROGRAM GPSEST 19-FEB-07 15:29
 BERNESE GPS SOFTWARE VERSION 5.0

STATION COORDINATES: \${P}/ROMU06S\STA\tROMU06S.CRD

NUM	STATION NAME	PARAMETER	A PRIORI VALUE	NEW VALUE	NEW- A PRIORI	RMS ERROR	3-D ELLIPSOID	2-D ELLIPSE
-----	--------------	-----------	----------------	-----------	---------------	-----------	---------------	-------------

1	GPS1	X	2410839.3072	2410839.3072	0.0000	0.0000				
		Y	1388069.5136	1388069.5136	0.0000	0.0000				
		Z	5720515.2143	5720515.2143	0.0000	0.0000				
		HEIGHT	241.6600	241.6600	0.0000	0.0000	0.0000	0.0		
		LATITUDE	64 13 2.630039	64 13 2.630039	0.0000	0.0000	0.0000	90.0	0.0000	90.0
		LONGITUDE	29 55 54.118509	29 55 54.118509	0.0000	0.0000	0.0000	0.0	0.0000	
3	GPS3	X	2410512.9957	2410512.9941	-0.0016	0.0002				
		Y	1387690.3887	1387690.3878	-0.0009	0.0001				
		Z	5720721.8220	5720721.8198	-0.0022	0.0004				
		HEIGHT	222.4407	222.4379	-0.0028	0.0005	0.0005	0.5		
		LATITUDE	64 13 19.254883	64 13 19.254906	0.0007	0.0001	0.0000	90.3	0.0000	90.3
		LONGITUDE	29 55 41.827606	29 55 41.827607	0.0000	0.0000	0.0001	0.0	0.0001	
4	GPS4	X	2410183.6629	2410183.6649	0.0020	0.0002				
		Y	1388327.7870	1388327.7910	0.0040	0.0001				
		Z	5720712.9448	5720712.9520	0.0072	0.0004				
		HEIGHT	228.6607	228.6689	0.0081	0.0005	0.0005	0.5		
		LATITUDE	64 13 18.179839	64 13 18.179832	-0.0002	0.0001	0.0000	90.1	0.0000	90.1
		LONGITUDE	29 56 34.977031	29 56 34.977212	0.0024	0.0000	0.0001	0.0	0.0001	
5	GPS5	X	2411065.8443	2411065.8479	0.0036	0.0002				
		Y	1387498.1880	1387498.1891	0.0011	0.0001				
		Z	5720528.0899	5720528.0959	0.0060	0.0004				
		HEIGHT	214.6804	214.6874	0.0070	0.0005	0.0005	0.4		
		LATITUDE	64 13 5.389555	64 13 5.389531	-0.0007	0.0001	0.0000	90.5	0.0000	90.4
		LONGITUDE	29 55 9.024823	29 55 9.024762	-0.0008	0.0000	0.0001	0.0	0.0001	
6	GPS6	X	2411071.3051	2411071.3098	0.0047	0.0002				
		Y	1388657.9331	1388657.9351	0.0020	0.0001				
		Z	5720270.4931	5720270.5006	0.0075	0.0004				
		HEIGHT	236.4912	236.5001	0.0090	0.0005	0.0005	0.5		
		LATITUDE	64 12 44.808990	64 12 44.808947	-0.0013	0.0001	0.0000	90.0	0.0000	89.9
		LONGITUDE	29 56 23.339861	29 56 23.339816	-0.0006	0.0000	0.0001	0.0	0.0001	
2	GPS2	X	2409792.7492	2409792.7441	-0.0051	0.0002				
		Y	1387832.0097	1387832.0086	-0.0011	0.0001				
		Z	5720997.1485	5720997.1424	-0.0061	0.0004				
		HEIGHT	229.6879	229.6802	-0.0077	0.0005	0.0005	0.5		
		LATITUDE	64 13 39.216043	64 13 39.216101	0.0018	0.0001	0.0000	90.3	0.0000	90.3
		LONGITUDE	29 56 17.584812	29 56 17.584929	0.0016	0.0000	0.0001	0.0	0.0001	
7	GPS7	X	2410852.0692	2410852.0726	0.0034	0.0002				
		Y	1389251.9113	1389251.9140	0.0027	0.0001				
		Z	5720205.3683	5720205.3746	0.0063	0.0004				

HEIGHT		224.2017		224.2092	0.0075	0.0005	0.0005	0.5		
LATITUDE	64 12	40.796407	64 12	40.796369	-0.0011	0.0001	0.0000	90.0	0.0000	90.0
LONGITUDE	29 57	9.606445	29 57	9.606491	0.0006	0.0000	0.0001	0.0	0.0001	

1\$(P)/ROMU06S
ROMU06S

PROGRAM GPSEST 19-FEB-07 15:29
BERNESE GPS SOFTWARE VERSION 5.0

SITE-SPECIFIC TROPOSPHERE PARAMETERS: (NOT SAVED)

REQU.	STATION NAME	CORRECTIONS (M)			RMS ERRORS (M)			ZENITH VECTOR (")				ERROR ELLIPSE (M)		
		NORTH	EAST	ZENITH	NORTH	EAST	ZENITH	ANGLE	RMS	RATIO	AZI	MAX RMS	MIN RMS	AZI
1	GPS3			-0.05183			0.00580							
2	GPS3			0.00408			0.00031							
3	GPS3			0.00274			0.00030							
4	GPS3			0.00182			0.00028							
5	GPS3			0.00003			0.00032							
6	GPS3			0.00151			0.00035							
7	GPS3			0.00096			0.00027							
8	GPS3			0.00051			0.00029							
9	GPS3			0.00354			0.00029							
10	GPS3			0.00406			0.00029							
11	GPS3			0.00248			0.00030							
12	GPS3			0.00394			0.00029							
13	GPS3			0.00018			0.00027							
14	GPS3			0.00324			0.00027							
15	GPS3			0.00316			0.00035							
16	GPS3			0.00000			0.00000							
17	GPS4			-0.42089			0.08254							
18	GPS4			-0.00363			0.00032							
19	GPS4			-0.00412			0.00030							
20	GPS4			-0.00400			0.00028							
21	GPS4			-0.00666			0.00032							
22	GPS4			-0.00433			0.00035							
23	GPS4			-0.00466			0.00027							
24	GPS4			-0.00556			0.00028							
25	GPS4			-0.00369			0.00029							
26	GPS4			-0.00368			0.00029							
27	GPS4			-0.00489			0.00030							
28	GPS4			-0.00248			0.00029							
29	GPS4			-0.00481			0.00027							
30	GPS4			-0.00494			0.00027							
31	GPS4			-0.00331			0.00034							
32	GPS4			0.02092			0.01508							
33	GPS5			-0.00662			0.00051							
34	GPS5			0.00093			0.00028							
35	GPS5			-0.00240			0.00029							

36	GPS5	-0.00034	0.00028
37	GPS5	-0.00278	0.00032
38	GPS5	-0.00084	0.00035
39	GPS5	-0.00188	0.00027
40	GPS5	-0.00057	0.00029
41	GPS5	-0.00083	0.00030
42	GPS5	0.00009	0.00029
43	GPS5	-0.00052	0.00030
44	GPS5	-0.00171	0.00029
45	GPS5	-0.00294	0.00027
46	GPS5	-0.00022	0.00029
47	GPS5	-0.00751	0.00097
48	GPS5	0.00000	0.00000
49	GPS6	0.00000	0.00000
50	GPS6	-0.00144	0.00044
51	GPS6	-0.00210	0.00031
52	GPS6	-0.00293	0.00028
53	GPS6	-0.00553	0.00032
54	GPS6	-0.00305	0.00035
55	GPS6	-0.00331	0.00027
56	GPS6	-0.00606	0.00028
57	GPS6	0.00162	0.00029
58	GPS6	-0.00358	0.00029
59	GPS6	-0.00439	0.00030
60	GPS6	-0.00183	0.00029
61	GPS6	-0.00424	0.00027
62	GPS6	-0.00524	0.00027
63	GPS6	-0.00027	0.00033
64	GPS6	-0.04134	0.00709
65	GPS2	0.01941	0.00590
66	GPS2	0.01547	0.00032
67	GPS2	0.00251	0.00030
68	GPS2	0.00632	0.00029
69	GPS2	0.00781	0.00032
70	GPS2	0.00351	0.00035
71	GPS2	0.00517	0.00028
72	GPS2	0.00583	0.00029
73	GPS2	0.00485	0.00029
74	GPS2	0.00878	0.00029
75	GPS2	0.00540	0.00030
76	GPS2	0.01279	0.00030
77	GPS2	0.00114	0.00027
78	GPS2	0.01206	0.00028
79	GPS2	0.00166	0.00041
80	GPS2	0.00000	0.00000
81	GPS7	0.00000	0.00000
82	GPS7	-0.00153	0.00052
83	GPS7	-0.00307	0.00032
84	GPS7	-0.00181	0.00028
85	GPS7	-0.00536	0.00032
86	GPS7	-0.00260	0.00035
87	GPS7	-0.00329	0.00028
88	GPS7	-0.00493	0.00029

89	GPS7	-0.00197	0.00029
90	GPS7	-0.00216	0.00029
91	GPS7	-0.00463	0.00030
92	GPS7	-0.00163	0.00029
93	GPS7	-0.00374	0.00027
94	GPS7	-0.00439	0.00027
95	GPS7	-0.00278	0.00033
96	GPS7	-0.00844	0.00708

1\$(P)/ROMU06S
ROMU06S

PROGRAM GPSEST 19-FEB-07 15:29
BERNESE GPS SOFTWARE VERSION 5.0

RMS ERRORS OF ELLIP. COORDINATES AND COORDINATE DIFFER. IN MM (PART 1):

NUM		1	3	4	5	6	2	7
1	B	0.0	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.0	0.5	0.5	0.5	0.5	0.5	0.5
3	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.5	0.5	0.5	0.5	0.5	0.5	0.5
4	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.5	0.5	0.5	0.5	0.5	0.5	0.5
5	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.5	0.5	0.5	0.5	0.5	0.5	0.5
6	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.5	0.5	0.5	0.5	0.5	0.5	0.5
7	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	L	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	H	0.5	0.5	0.5	0.5	0.5	0.5	0.5

1\$(P)/ROMU06S
ROMU06S

PROGRAM GPSEST 19-FEB-07 15:29
BERNESE GPS SOFTWARE VERSION 5.0

 SLOPE DISTANCES AND RMS ERRORS IN M (PART 1):

NUM		3 N	4 N	5 N	6 N	2 N	7 N
1	O	541.2039	731.8961	614.7339	678.1954	1176.4150	1222.3877
	N	541.2046	731.8977	614.7343	678.1961	1176.4173	1222.3888
	RMS	0.0001	0.0000	0.0000	0.0001	0.0001	0.0000
3	O		717.5064	616.5345	1204.8026	783.9746	1679.2999
	N		717.5090	616.5360	1204.8043	783.9764	1679.3016
	RMS		0.0000	0.0000	0.0001	0.0001	0.0000
4	O			1225.0101	1045.3079	692.3730	1248.3616
	N			1225.0134	1045.3095	692.3752	1248.3618
	RMS			0.0000	0.0001	0.0001	0.0001
5	O				1188.0213	1397.2201	1795.9383
	N				1188.0219	1397.2234	1795.9398
	RMS				0.0000	0.0001	0.0000
6	O					1686.6780	636.4870
	N					1686.6811	636.4882
	RMS					0.0001	0.0000
2	O						1940.4111
	N						1940.4135
	RMS						0.0001
