GRASSE ITRF CO-LOCATION SURVEY

Reports and results

Surveyed on August 2009
Reported on October 2009

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INTRODUCTION

The ITRF is the result of a combination of the different terrestrial reference frames provided by the four main space geodesy techniques GPS, VLBI, SLR and DORIS. To perform this combination between independent reference frames, it is necessary to have some co-location sites where the various techniques are observing and whose ties have been surveyed in three dimensions. Many co-location sites have been identified and some of them have missing or inconsistent ties.

In this frame of work, it has been decided by Dr Zuheir Altamimi in charge of the IERS realization at IGN, to survey the Grasse co-location site (France) as a matter of priority. Indeed, this site is one of the few in the world, which possesses references from the four different space geodesy techniques (two Lasers, two GPS, one experimental DORIS station for the T2L2 Project and one former VLBI). The temporary ITRF2008 computation from Dr Altamimi has shown some vertical speed differences and some biases between the GPS and the Lasers. Thus a new local tie survey had to be performed as soon as possible with the purpose to see if there is some difference with the 1999 survey results.

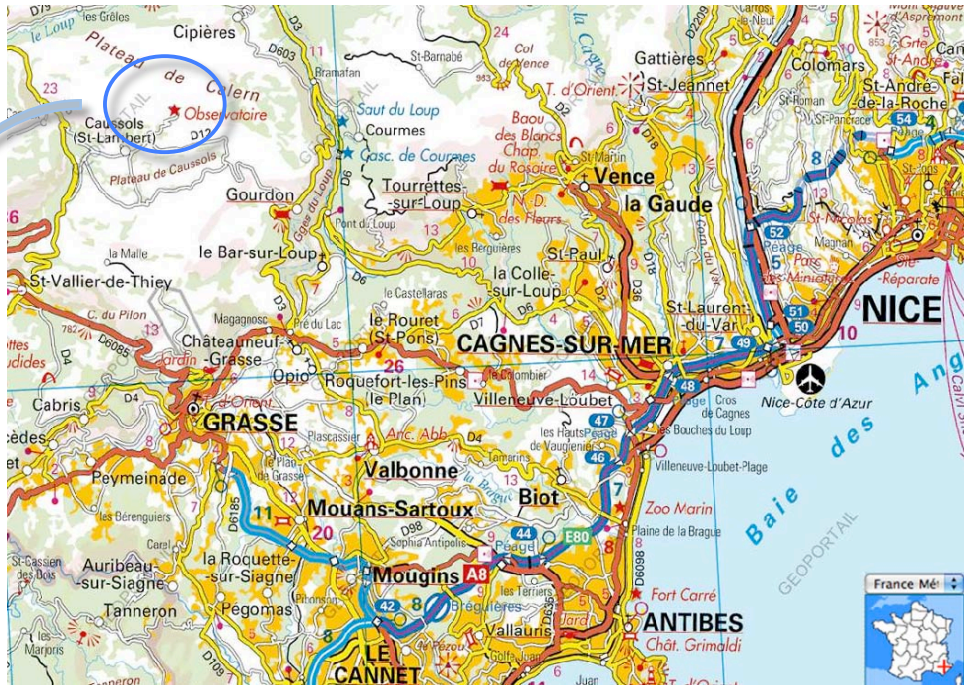
This document presents the Grasse ("Plateau de Calern") local tie survey which took place in august 2009, from the observations on site to the computation, with as many details as necessary to fully understand what the resulting SINEX file means.

ACKNOWLEDGEMENTS

We would like to express our thanks to all the people working on the "Plateau de Calern", with our sincere gratitude to the Laser teams. Their nice welcome, their understanding of our need to immobilize the telescopes and their cooperative work on a technical point of view contributed for a great part to the success of this work.
And also a special thank for all the “extras” which made us really enjoy our stay in this lovely part of "Côte d’Azur".

1. CO-LOCATION SITE DESCRIPTION

Although this co-location site is located at Caussols on the "Plateau de Calern", it is also often called Grasse. However, this site hosted by "Observatoire de la Côte d'Azur" (OCA) is about 10 km north of Grasse and 30 km west of Nice (see above an extract of the Geoportail website).

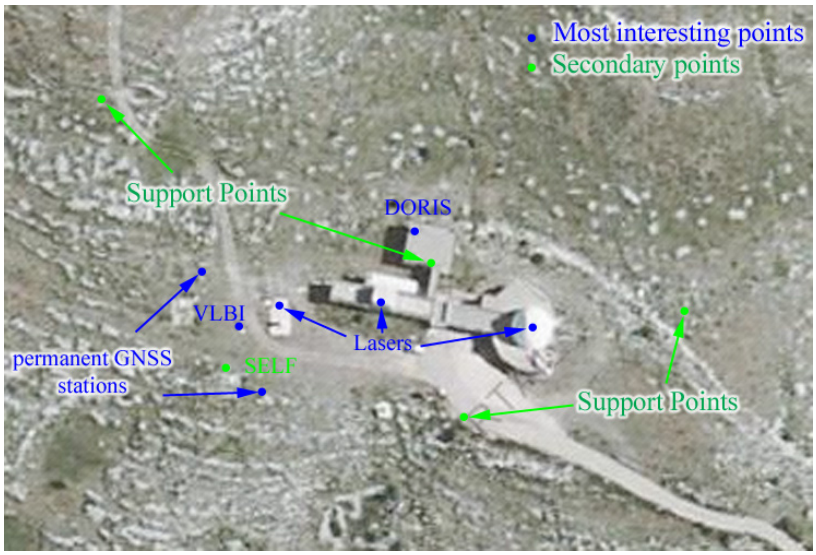


On a geodetic point of view, this observatory site is of an huge interest ; indeed there are :

- two Laser ranging stations contributing to the ILRS called « GRSM », a 154 cm aperture telescope and « GRAF », the mobile Laser station.
- one IGS and one RGP permanently operating Global Navigation Satellite System stations : these are GRAS (GPS) and GRAC (GPS/GLONASS) which are about 32 m apart.

Furthermore, the importance of the site is complemented by :

- one recently installed DORIS station, taking part in the T2L2 project.
- one former VLBI station marker.



Several surveys had been conducted at Grasse over the last decades, particularly in 1994 and 1999, but restoring the local tie, after the big changes on the mechanics of the telescope MeO (Laser Moon), was crucial. The purpose of the 2009 survey was to see if the comparison with the 1999 survey gives understanding of the vertical speed differences and biases shown by the temporary ITRF2008 solution.

2. CO-LOCATED SPACE GEODESY INSTRUMENTS

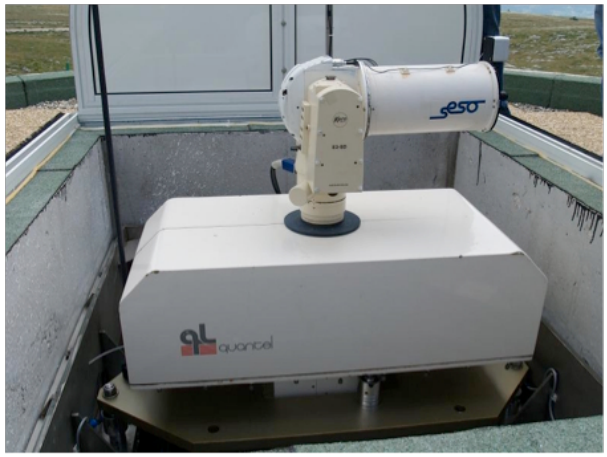
2.1. Laser stations

2.1.1. Grasse LLR station

GRSM	DOMES number 10002S002 - CDP 7845
 Global view	 Detail view
Description : intersection of the Azimuth and Elevation rotation axes	

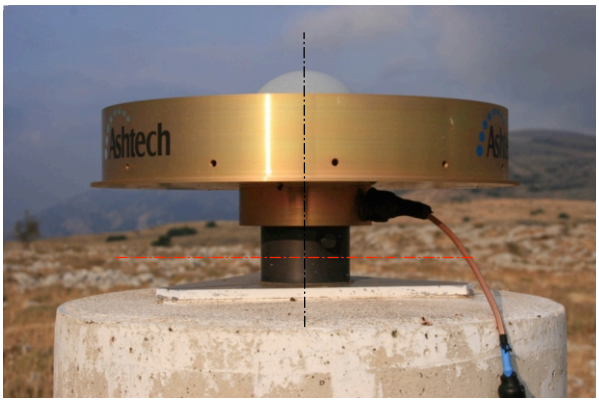
The LLR measurements refer to a point in the telescope where the two rotation axes intersect. Of course, the Ranging System Reference Point (SRP) can't be materialized.
This telescope formerly called « Laser Lune » is now called « Laser MeO » because not only implicated as Laser Moon station but also in research and development in Optical Metrology activities.
The site log is given in annex 6.1.

2.1.2. Grasse FTLRS station

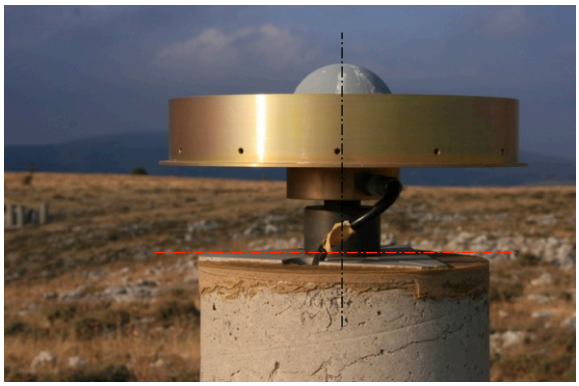
GRAF	DOMES number 10002S017 - CDP 7829
 Global view	 Detail view
Description : intersection of the Azimuth and Elevation rotation axes	

When it isn't operating outside, the FTLRS is set up in an one storey building, on a dedicated platform with a sliding roof (see above). The FTLRS measurements refer to a point in the telescope where the two rotation axes intersect. As for all Laser stations, the Ranging System Reference Point (SRP) can't be materialized.
The site log is given in annex 6.2.

2.2. Permanent GNSS stations

GRAS	DOMES number 10002M006
 Global view	 Detail view (reference point)
Description : the bass mark reference point is **0.0350 m under the Antenna Reference Point (ARP).**	

GRAS is part of « Réseau GPS Permanent » (RGP) and « International GNSS Service » (IGS) networks since 1996.

GRAC	DOMES number 10002M010
 Global view	 Detail view (reference point)
Description : the reference point is **0.0586 m under the ARP**.	

GRAC is part of RGP since 2001.

The site logs are given in annexes 6.3 and 6.4.

2.3.DORIS station

Experimental T2L2 Project DORIS Antenna installed by the end of 2008.

GR3B	DOMES number 10002S018
 Global view	 Detail view (reference point)
Description : DORIS Antenna reference point.	

2.4.Former mobile VLBI station

VLBI	DOMES number 10002M003 – CDP 7605
 Global view (GPS on the VLBI marker)	 Detail view (precise centring operation)
Description : 1989 mobile VLBI campaign main reference mark.	

2.5.Other points of interest

GRAC and VLBI main markers already described.

SELF 2 mark
DOMES number 10002M008

Former mobile Laser station GRSF
DOMES number 10002M004 – CDP 7846

This concrete slab / 25 mm brass mark is also a benchmark and a point observed with a Micro-g A10 absolute gravimeter. His NGF – IGN1969 value above the mean sea level is 1268,064 m and the adjusted gravimetric value is 980216.3 mGal (see identification sheets in annex 6.5).

3. SURVEY DESCRIPTION

3.1. Organization

The local ties survey of Grasse co-location site has been carried out by Thomal Donal, Jean-Claude Poyard and Jérôme Saunier, with the friendly cooperation of the Lasers team. They're all three with the geodesy and levelling department of « Institut Géographique National » (IGN). The survey took place from the 25th to the 28th of August. The weather conditions were ideal during the survey. This was particularly important for our observations on the Lasers since these instruments had to be protected from rain or humidity by closing the roofs. This good weather allowed us to achieve most of the work within three days. No Laser observations were planned during these days so that we could leave our translation stage and Survey equipment in place.

3.2. Equipment

All the topometric survey instruments and equipments belong to IGN and were brought with us for the purpose of the survey.

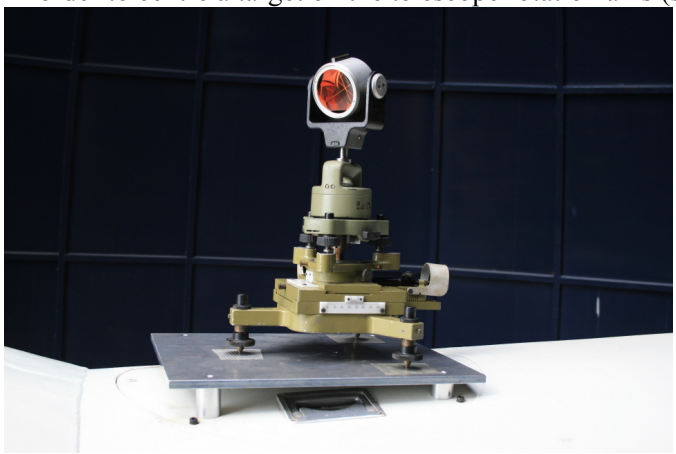
3.2.1. Instruments

Two Leica tacheometers (TCA2003 and TDA5005) were used for this work. These instruments, which are regularly calibrated by IGN's equipment control unit, were associated with six Leica accurate prisms. They have a standard deviation of 0.15 mgon for horizontal and vertical angles and 1 mm + 1 ppm for distances. The altimetric observations were performed with a Leica electronic level (DNA03) linked with invar bar code levelling rods. This equipment, also regularly calibrated, has a resolution of 0.01 mm. Finally, the GPS observations were performed with Leica GX1230 receivers and Leica AT504 choke ring antennas. Concerning the permanent GNSS stations, the Ashtech choke ring antennas in place were used.
All these instruments allowed the observations to be recorded electronically on memory cards or storage devices and were then downloaded to a laptop PC for checkings and processing.

3.2.2. Equipment and accessories

Several very useful accessories have been also brought for this kind of work, among which :

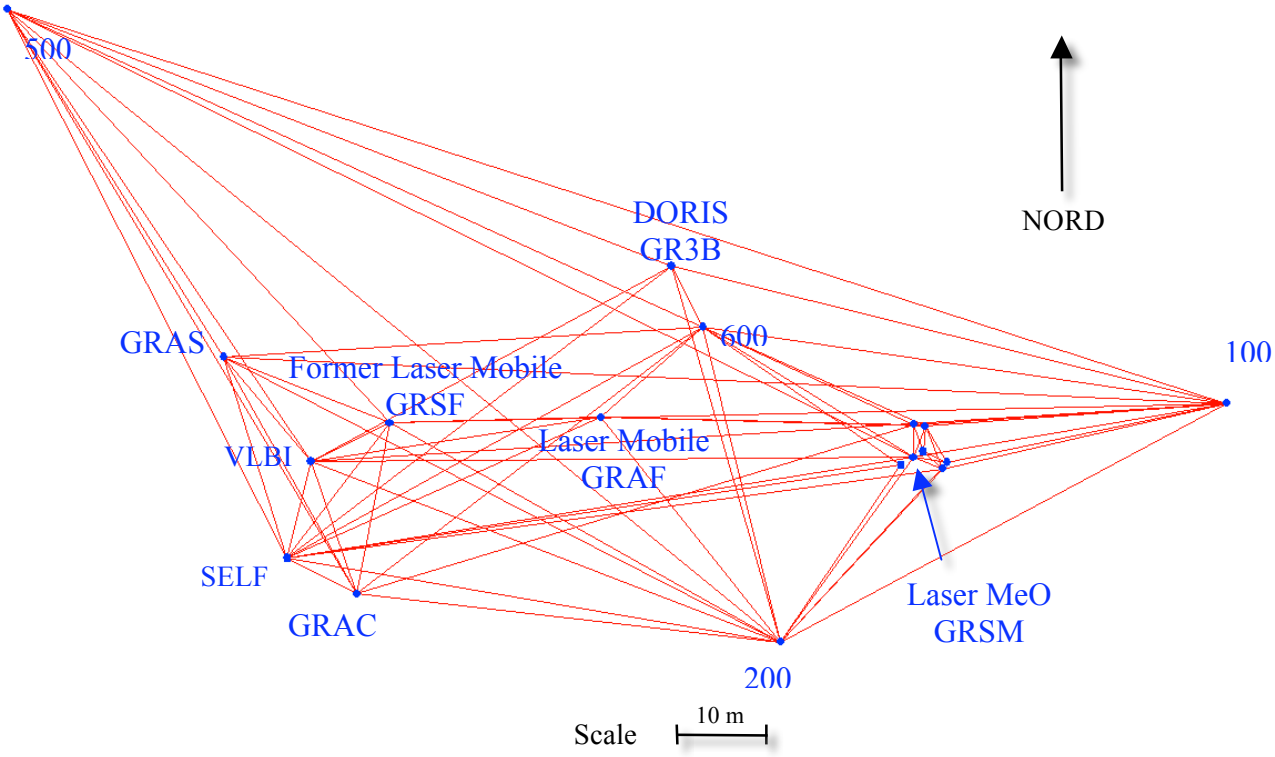
- heavy tripods, in order to ensure the stability of temporary stations
- a translation stage in order to centre a target on the telescope rotation axis (see picture hereafter)



- 0.5 m, 1.8 m and 3.0 m long invar staffs that are all calibrated and associated to each other
- calibrated trefoil targets and prisms
- regularly calibrated tribrachs

3.3. Calern observations polygon

All the survey was conducted in order to provide the highest accuracy in the determination of the 3D vectors between the observing instruments. During the survey, we were not faced with any particular difficulties. Hereafter is the Grasse observation sketch.



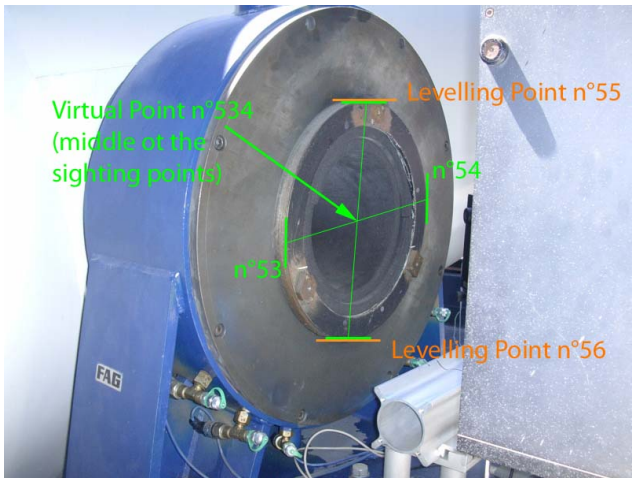
3.4. Survey method

All the visible lines of sight were observed with the tacheometers. Horizontal directions and zenith angles were observed in data sets, each set consisting in one reading in both direct and reverse theodolite positions. Any observed angle was rejected if the difference between the two measurements was greater than 1.5 mgon. Distance measurements were observed over each line once in both direct and reverse positions. Meteorological data (atmospheric pressure and temperature) used to correct the distances, were recorded at the beginning of each station occupation.
As far as direct levelling is concerned, forward and backward runs were observed between each benchmark. At the beginning of the spirit levelling, the instrument collimation was checked. The electronic level instrument was set to perform two readings on a bar code staff, and measurements were repeated if the difference between the two readings was inconsistent (i.e. greater than 0.1 mm). In the same way, we checked the difference between two runs, and a third run was completed if the difference between two runs was greater than 0.4 mm.
The strategy has been to mix GPS and conventional observations.

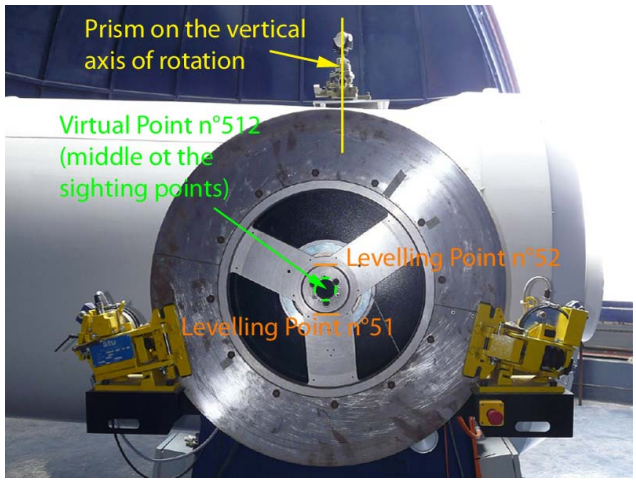
3.4.1. Laser MeO reference point

The reference point has been determined in two successive steps : the first one to materialize its planimetric position, the second one to get the height difference between the reference point and the planimetric materialization.

- At first, the MeO vertical axis had to be determined. The position of the target set up on the two axis translation stage was sighted from one theodolite and the corresponding horizontal angle recorded. The MeO was then rotated 180° around the vertical axis, and the target rotated towards the theodolite. The target was then again sighted and its angle noticed. At last, the theodolite was beared towards the mean angle and the target shifted using the translation stage micrometric screw, until its correct position. The same thing was done with the MeO telescope oriented at 90° from the original position. Finally, we checked that the target didn't move, when sighted with the theodolite, as the telescope rotated around its vertical axis.
- Subsequently, the elevation (horizontal) rotation axis has been determined by two virtual points (n°512 and n°534). These points, in the middle of the circular pieces on the two pillars, allow us to check if the two axis really intersect.



Nasmyth pillar side



Motor pillar side

3.4.2. Permanent GNSS stations reference point

As we could not remove GRAC and GRAS GNSS antennas, their reference point had to be determined indirectly.
For the planimetric position, from each survey station aiming at the antennas, the right and left sides of the choke ring theoretically centred on the phase centre of the antenna were observed. This element was chosen so that it is well defined for the operator, and in the adjustment, horizontal angle observations were simply averaged to get its planimetric position.
As far as the altimetric position is concerned, the vertical angles have been measured on a well defined element of the antenna. Then, the resulting position has been reduced to the reference point using the manufacturer values.

3.4.3. Levelling

Double-run spirit levelling operations were carried out on the most interesting points (i.e. except on the temporary markers 100, 200, 500 and 600).
About the GNSS antennas the top of rings was levelled and reduced to the markers using the manufacturer values and the antenna heights. The DORIS reference point has been deducted from the DORIS plate using the manufacturer value. Finally, concerning the Lasers some well defined elements were levelled allowing to determine the SRP height (see § 3.4.1 MeO).

3.4.4. GPS observations

GPS observations have been carried out during many sessions, in order to orientate and reinforce the survey. For GRAS, we used the IGS data. As GRAC was out of order since august 2008 we disconnected the antenna and used our own cable and receiver. The other points were observed with our GPS equipment. The receivers sampling was set to 30 seconds.

The following table sums up the GPS observations.

Point	Start (UT)	End (UT)	Ant. Height (m)	Ant. Type
GRAC	DOY 237 09 : 40	DOY 238 17 : 24	0.0586	ASH700936F_C
GRAS	Daily RINEX file DOY 237 to 240		0.035	ASH701945E_M
100 Temporary point	DOY 237 15 : 19	DOY 238 06 : 43	0.000	LEIAT504
200 Temporary point	DOY 239 14 : 28	DOY 240 14 : 47	0.000	LEIAT504
VLBI marker	DOY 238 17 : 30	DOY 239 13 : 43	1.429	LEIAT504
GRSF marker	DOY 238 17 : 33	DOY 239 13 : 25	1.478	LEIAT504
500 marker	DOY 239 14 : 35	DOY 240 15 : 07	1.422	LEIAT504

All antenna heights are related to the antenna reference point and none of these antennas were equiped with radome.

4. COMPUTATIONS

4.1. On-site validation

The theodolite observations were checked on site and pre processed in a local coordinate system in order to point out any problems in the observations. The levelling observations were also checked on site and validated by a global adjustment. Outliers were detected and precisions were set in order to estimate the survey global accuracy.

4.2. GPS network

The GPS baselines were not processed on site but at the office with the scientific Bernese version 5.0 software of the University of Berne. This software incorporates the movements of the poles, information on satellites, the ocean overload FES2004 model, as well as specific changes in the position of the phase centres and reference points of antennas and satellite receivers. In addition, this software models precisely tropospheric parameters from closest permanent GNSS stations. In our case, the GPS observations of the eight nearest stations from the french permanent GNSS network (RGP) were used.

The corresponding Bernese report files are given in annex 6.6.

4.3. Global Adjustment

Back at the office, the final computation has been carried out by a 3D Least Squares Adjustment with the Microsearch GeoLab 2001 version 9.20.0 software. The input files were developed from :

- All the terrestrial observations : horizontal and zenith angles, distances, spirit levelling, planimetric and altimetric centrings.
- The geoid model EGM96 (geoid slope in this area is about 6 cm/km).
- An extracted covariance matrix of the GPS baselines (also used for orientation). Note : GRAC coordinates were inconsistent with the topometric survey (i.e. 3 cm in planimetry and 2 cm in height) and have been kicked out of the global adjustment.
- GRAS coordinates have been constrained at 1 mm to his ITRF2005 (epoch 2009:238) values (see annex 6.8).

The a priori standard deviations used for the different observations with tacheometers are :

- Between 0.6 mgon and 1 mgon for horizontal angles, depending on the tripod stability
- 1 mgon for vertical angles
- 1mm for distances on prism

(These are the values used for most of the targets in our Microsearch GeoLab computation input file).

This adjustment provided coordinates and a covariance matrix of all points of the Grasse network (annex 6.9).

5. RESULTS

5.1. Station name translation table

The following list sums up the most interesting points used in the Microsearch GeoLab input file. In bold, the main points, description, used name or code and computation name.

Point Description	Used name or code	Computation name
GNSS permanent station • **GRAS IGS reference point** • Antenna ARP	**10002M006**	**GRAS** GRAS_ARP
GNSS permanent station • **GRAC RGP reference point** • Antenna ARP	**10002M010**	**GRAC** GRAC_ARP
LASER MeO station • **System Reference Point (SRP)** • Prism on the translation stage	**10002S002 / (CDP n°7845)**	**GRSM** GRSM_PRI
Mobile LASER station • **System Reference Point (SRP)**	**10002S017 / (CDP n°7829)**	**GRAF**
Former Mobile LASER station • Reference Point (marker)	10002M004 / (CDP n°7846)	GRSF
DORIS station • Antenna Reference Point • Nail below the DORIS antennas	10002S018	GR3B DORIS_mark
Former DORIS station • Antenna Reference Point	10002S016	GR2B
Former mobile VLBI station • Reference Point (main marker)	10002M003	VLBI

5.2. Adjusted coordinates and confidence regions

The results of the adjustment are the coordinates of all points as well as their confidence ellipsoids in the ITRF2005 at the mean epoch of the observations (i.e. epoch 2009 : 238).
Here is a table with the 3D coordinates and confidence region at 95% of the 8 points of interest.

```
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0            WGS 84      UNITS: m,GRAD Page 0007
================================================================================
Adjusted XYZ Coordinates:
                           X-COORDINATE       Y-COORDINATE       Z-COORDINATE
 CODE FFF STATION               STD DEV            STD DEV            STD DEV
 ---- --- ------------ ------------------ ------------------ ------------------
 XYZ      GR2B              4581680.3029        556166.3665       4389371.4512 m       0
                                0.0030             0.0039             0.0031
 XYZ      GR3B              4581680.4026        556166.3786       4389371.5474 m       0
```

		0.0029	0.0037	0.0029		
XYZ	**GRAC**	4581708.2882	556132.7189	4389341.3294	m	0
		0.0015	0.0013	0.0015		
XYZ	**GRAF**	4581692.3994	556159.5514	4389357.7687	m	0
		0.0015	0.0013	0.0015		
XYZ	**GRAS**	4581690.8411	556114.9230	4389360.8509	m	0
		0.0011	0.0011	0.0011		
XYZ	GRSF	4581693.2910	556134.7858	4389354.8817	m	0
		0.0013	0.0013	0.0013		
XYZ	**GRSM**	4581692.0141	556196.2658	4389355.2287	m	0
		0.0016	0.0013	0.0015		
XYZ	VLBI	4581697.4774	556125.9995	4389351.6144	m	0
		0.0012	0.0012	0.0012		

```
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0             WGS 84      UNITS: m,GRAD Page 0042
================================================================================
```

2-D and 1-D Station Confidence Regions (95.000 and 95.000 percent):

STATION	MAJOR SEMI-AXIS	AZ	MINOR SEMI-AXIS	VERTICAL
GR2B	0.0097	150	0.0094	0.0032
GR3B	0.0093	150	0.0090	0.0032
GRAC	0.0033	146	0.0031	0.0032
GRAF	0.0033	152	0.0033	0.0032
GRAS	0.0027	0	0.0027	0.0022
GRSF	0.0033	171	0.0032	0.0023
GRSM	0.0035	1	0.0033	0.0032
VLBI	0.0030	160	0.0029	0.0023

```
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0             WGS 84      UNITS: m,GRAD Page 0044
================================================================================
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3D Station Confidence Regions (95.000 percent):

STATION	MAJ-SEMI (AZ,VANG)	MED-SEMI (AZ,VANG)	MIN-SEMI (AZ,VANG)
GR2B	0.0111 (150, 0)	0.0108 (240, 0)	0.0046 (353, 90)
GR3B	0.0106 (150, 0)	0.0103 (240, 0)	0.0045 (353, 90)
GRAC	0.0045 (206, 89)	0.0037 (326, 0)	0.0035 (56, 1)
GRAF	0.0046 (182, 90)	0.0038 (332, 0)	0.0037 (62, 0)
GRAS	0.0031 (187, 88)	0.0031 (0, 2)	0.0031 (90, 0)
GRSF	0.0037 (171, 0)	0.0036 (261, 0)	0.0033 (12, 90)
GRSM	0.0046 (184, 90)	0.0040 (1, 0)	0.0037 (91, 0)
VLBI	0.0034 (160, 2)	0.0034 (250, 4)	0.0033 (44, 86)

The whole covariance matrix was computed, then it was possible to extract from it the covariance submatrix for the 4 main points of interest i.e. GRAC, GRAF, GRAS and GRSM, for the ITRF2008 computation. Finally, this covariance submatrix has been converted into the SINEX format using the « geotosnx » tool provided by Z. Altamimi. The resulting SINEX file (10002_IGN_2009-238.SNX) is presented in annex 6.11.

5.3. Vectors comparison

We get the coordinates of the following points of interest from the Microsearch GeoLab adjustment.

- GRAC reference point 10002M010
- GRAF reference point 10002S017
- GRAS reference point 10002M006
- GRSM reference point 10002S002
- GRSF reference point 10002M018

This allows us to compare some vectors elements. Indeed, the vectors between the « laser Lune » reference point (DOMES 10002S002) and some other points of interest from the former and 2009 campaigns have been compared :

		Before Lunar station renovation work		After Lunar station renov. work
Vector		jul 94	oct 99	aug 09
	DX	-1,278	-1,277	-1,277
GRSF → GRSM	DY	61,482	61,482	61,480
	DZ	0,347	0,350	0,347

(Comparisons in meters)

Vector		1999 Report	2009 Report
	DX	1.1737	1.1730
GRAS → GRSM	DY	81.3481	81.3428
	DZ	-5.6201	-5.6222

Vectors Differences (X, Y, Z)	Local Differences (E, N, U)
0.001	0.005
0.005	0.001
0.002	0.002

(Comparisons in meters)

Since these differences between the positions before and after the renovation work are not significant (~5 mm) ; we can consider that the Laser MeO is set up in its previous position and that therefore the DOMES and CDP numbers remain the same.

5.4. Telescope MeO axes intersection

The horizontal telescope axis is deducted from the two points 512 and 534 and the vertical axis is also indicated by the two points GRSM_PRI and GRSM_plumb. Our computation shows that on the one hand the telescope elevation axis is really horizontal, on the other hand the axes strictly intersect (no offset). Furthermore the Laser MeO reference point GRSM is 0,921 m below the telescope device (GRSM_plate) when the telescope vertical angle is set to 3°.

6. ANNEXES

6.1. GRSM site log (extract)

Note : only the points most relevant to this survey were retained in the following extract.
The complete version of the site log is available at :
http://ilrs.gsfc.nasa.gov/stations/sitelist/GRSM_sitelog.html

```
---------------------------------------------------------------------------------------------------
ILRS Site and System Information Form
       International Laser Ranging Service

  0.   Form

       Prepared by (Full Name)    : Etienne Samain,Francis Pierron
       Preparer E-mail            : etienne.samain@obs-azur.fr
       Date Prepared              : 2009-05-13
       Report Type                : UPDATE
       Format Version             : 2.0

  1.   Identification of the Ranging System Reference Point (SRP)

       Site Name                  : Grasse MeO
       IERS DOMES Number          : 10002S002
       CDP Pad ID                 : 7845
       Subnetwork                 : EUROLAS
       Description                : AZ EL INTERSECT
       Monument Description       : N.A.
       Monument Inscription       : N.A.
       Mark Description           : N.A.
       Date Installed             : 1980-09-01
       Date Removed               : (yyyy-mm-dd)
       Geologic Characteristic    : BEDROCK
       Additional Information     : Referenced by 3 CHISELLED CROSSES
                                    around the telescope.

  2.   Site Location Information

       City or Town               : Caussols
       State or Province          : Alpes-Maritimes
       Country                    : France
       Tectonic Plate             : Eurasian
       Approximate Position
         X coordinate          [m]: 4581692.1
         Y coordinate          [m]: 556196.0
         Z coordinate          [m]: 4389355.1
         Latitude           [deg]: 43.7546 N
         Longitude          [deg]: 6.9216 E
         Elevation             [m]: 1323.1
       Additional Information     : Coordinate system is ITRF 97,
                                    Ellipsoid GRS80

  3.   General System Information

  3.01 System Name                : GRASLL
       4-Character Code           : GRSM
       CDP System Number          : 78
       CDP Occupation Number      : 01
       Eccentricity to SRP (if Not Identical With SRP)
         North                 [m]: 0.
         East                  [m]: 0.
         Up                    [m]: 0.
         Date Measured             : (yyyy-mm-dd)
       Date Installed             : 1980-09-01
       Date Removed               : (yyyy-mm-dd)
       Additional Information     : (multiple lines)

  4.   Telescope Information

  4.01 Receiving Telescope Type   : CASSEGRAIN COUDE
         Aperture              [m]: 1.54
         Mount                    : AZ-EL
       Xmitting Telescope Type    : CASSEGRAIN COUDE
```

```
        Aperture              [m]: 1.54
      Tracking Camera Type       : CCD / Intensified CCD
        Model                    : TM526A / P46936/A
        Manufacturer             : Pulnix / EEV
        Field of View       [deg]: narrow: 20" / wide: 150"
        Minimum Magnitude   [mag]: 6 / 14
      Transmit/Receive Path      : COMMON
      Transmit/Receive Switch    : ROTATING MIRROR
      Max Slew Rate Az    [deg/s]: 5
      Max Slew Rate El    [deg/s]: 5
      Max Used Tracking Rate Az  : 5
      Max Used Tracking Rate El  : 5
      Telescope Shelter          : DOME
      Daylight Filter Type       : FABRY-PEROT
      Dayl. Filt. Bandwidth  [nm]: 0.12
      Adjustable Attenuation     : BOTH
      Transmit Efficiency        : 0.45
      Receive Efficiency         : 0.22
      Date Installed             : 1980-09-01
      Date Removed               : (yyyy-mm-dd)
      Additional Information     : (multiple lines)

  5.   Laser System Information

  5.01 Primary Laser Type                 : ND:YAG
      Number of Amplifiers       : 3
      Primary Wavelength     [nm]: 1064
      Primary Maximum Energy [mJ]: 50
      Secondary Wavelength   [nm]: 532
      Secondary Max. Energy  [mJ]: 30
      Xmit Energy Adjustable     : YES
      Pulse Width (FWHM)     [ps]: 20
      Max. Repetition Rate   [Hz]: 10
      Fullw. Beam Divergence  ["]: 1-10
      Final Beam Diameter     [m]: 1.54
      Eyesafe                    : NO
      Eyesafe Standard           : ANSI 136.1
      Date Installed             : 2009-01-01
      Date Removed               : (yyyy-mm-dd)
      Additional Information     : (multiple lines)

 5.02 Secondary Laser Type                : ND:YAG
      Number of Amplifiers       : 4
      Primary Wavelength     [nm]: 1064
      Primary Maximum Energy [mJ]: 200
      Secondary Wavelength   [nm]: 532
      Secondary Max. Energy  [mJ]: 150
      Xmit Energy Adjustable     : YES
      Pulse Width (FWHM)     [ps]: 200
      Max. Repetition Rate   [Hz]: 10
      Fullw. Beam Divergence  ["]: 1-10
      Final Beam Diameter     [m]: 1.54
      Eyesafe                    : NO
      Eyesafe Standard           : ANSI 136.1
      Date Installed             : 2009-01-01
      Date Removed               : (yyyy-mm-dd)
      Additional Information     : (multiple lines)

  6.   Receiver System
(…)
  7.   Tracking Capabilities

  7.01 Satellites
        Very Low Alt (<400 km)   : YES
        Low Altitude (400-2000)  : YES
        Lageos                   : YES
        GLONASS                  : YES
        Etalon                   : YES
        GPS                      : YES
        Moon                     : YES
      Avge Pass Switch Time   [s]: 600
      Average values for Lageos
        Single Shot RMS      [mm]: 13
        # of Obs per NP          : 60
        Use of Semi-trains       : NO
        # of Semi-train Tracks   : N.A.
      Range Gate Width       [ns]: 100 to 3200
      Beam Pointing Accuracy  ["]: 1
```

```
       Angle Encoder Resolution["]: 0.1
       Min. Tracking Elev.   [deg]: 5
       Operation
         Months per Year          : 12
         Days per Week            : 5
         Hours per Day            : 24
         Staff per Shift          : 1
         System Shared With       : NOTHING
         Time Allocated to SLR [%]: 100
         Remotely Controllable    : NO
       Date First Applicable      : 1980-09-01
       Date Last Applicable       : (yyyy-mm-dd)
       Additional Information     : High priority on the Moon targets

  8.   Calibration
(…)
 9.   Time and Frequency Standards
(…)
 10.   Preprocessing Information
(…)
11.   Aircraft Detection
(…)
 12.   Meteorological Instrumentation
(…)

 13.   Local Ties, Eccentricities, and Collocation Information

 13.01 Collocated Permanent Geodetic Systems

      GPS                        : IGS
         Date Installed          : 1996-08-01
         Date Removed            :
         Additional Information  : (multiple lines)

       GLONASS                   : IGEX
         Date Installed          : 2000-01-01
         Date Removed            :
         Additional Information  : (multiple lines)

       DORIS                     : YES
         Date Installed          : 2009-04-001
         Date Removed            :
         Additional Information  : (multiple lines)

       VLBI                      :  YES
         Date Installed          : 1989-01-01
         Date Removed            : 1989-12-01
         Additional Information  :

       Gravimeter                :  ABSOLUTE / Mobile
         Date Installed          :  every 6/12 months from 1998
         Date Removed            :
         Additional Information  : (multiple lines)

       SLR                    :  YES
         Date Installed          :  1978
         Date Removed            :  2005
         Additional Information  : 7835 Station

       SLR                    :  YES
         Date Installed          :  1998
         Date Removed            :
         Additional Information  :  Ftlrs Mobile Station

 13.02 Collocated Permanent Geodetic Systems

       GPS                       : IGS+EUREF
         Date Installed          : 1995-02-22
         Date Removed            : 1996-05-07
         Additional Information  : (multiple lines)
       GLONASS                   : IGLOS
         Date Installed          : 2000
         Date Removed            : (yyyy-mm-dd)
         Additional Information  : (multiple lines)
       DORIS                     : Mobile
         Date Installed          : 1997
         Date Removed            : 1997
         Additional Information  : (multiple lines)
```

```
       PRARE                       : NO
         Date Installed            : (yyyy-mm-dd)
         Date Removed              : (yyyy-mm-dd)
         Additional Information    : (multiple lines)
       VLBI                        : YES
         Date Installed            : 1989
         Date Removed              : 1989
         Additional Information    : (multiple lines)
       Gravimeter                  : ABSOLUTE / Mobile
         Date Installed            : temporary
         Date Removed              : (yyyy-mm-dd)
         Additional Information    : twice a year since 1998

 13.02.01 Local Ties from the SRP to Other Monuments or Systems on Site

          Monument Name            : GRASSE
          Instrumentation Type     : SLR
          Instrumentation Status   : PERMANENT
          DOMES Number             : 10002S001
          CDP Number               : 7835
          Differential Components (ITRS)
            dx                [m]: -0.5414 +- 0.001
            dy                [m]: -36.4889 +- 0.001
            dz                [m]: 4.4197 +- 0.001
            Date Measured          : 1995, 1999
            Determined by          : terrestrial geodetic measurements
          Date Installed           : 1976-05-01
          Date Removed             : (yyyy-mm-dd)
          Additional Information   : 3 years colocated observations
                                     dx = -0.5303 dy = -36.4869 dz = 4.417

 14.   Local Events Possibly Affecting Computed Position
(…)

 15.   On-Site, Point of Contact Agency Information

       Agency                      : Observatoire de la Cote d'Azur
       Mailing Address             : 2130 route de l'observatoire F06460 Caussols
       Primary Contact
         Contact Name              : Etienne Samain
         Telephone (primary)       : ++33-0493405429
         Telephone (secondary)     : ++33-0493405427
         Fax                       : ++33-0493405433
         E-mail                    : etienne.samain@obs-azur.fr
       Secondary Contact
         Contact Name              : Francis Pierron
         Telephone (primary)       : ++33-0493405420
         Telephone (secondary)     :
         Fax                       : ++33-0493092614
         E-mail                    : francis.pierron@obs-azur.fr
       Additional Information      : 3rd contact is Jean-Marie Torre
         Telephone (primary)   : ++33-0493405427
         Telephone (secondary)     : ++33-0493405351
         Fax                   : ++33-0493405333
         E-mail                      : jean-marie.torre@obs-azur.fr

 16.   Responsible Agency (if different from 15.)
(…)

 17.   More Information

       URL for More Information    : http://www.oca.eu
       Hardcopy on File
         Site Map                  : NO
         Site Diagram              : NO
         Horizon Mask              : NO
         Monument Description      : YES
         Site Pictures             : YES
       Additional Information      : (multiple lines)
```

6.2.GRAF site log (extract)

The complete version of the site log is available at :
http://ilrs.gsfc.nasa.gov/stations/sitelist/GRAF_sitelog.html

```
-------------------------------------------------------------------------------------------------
       ILRS Site and System Information Form
       International Laser Ranging Service

  0.   Form

       Prepared by (Full Name)    : Francis Pierron
       Preparer E-mail            : francis.pierron@obs-azur.fr
       Date Prepared              : 2009-04-16
       Report Type                : UPDATE
       Format Version             : 1.0

  1.   Identification of the Ranging System Reference Point (SRP)

       Site Name                  : Grasse, France (mobile slr system )
       IERS DOMES Number          : 10002S017
       CDP Pad ID                 : 7829
       Subnetwork                 : EUROLAS
       Description                : AZ EL Intersect
       Monument Description       : N.A.
       Monument Inscription       : N.A.
       Mark Description           : N.A.
       Date Installed             : 2007-03-20
       Date Removed               : (yyyy-mm-dd)
       Geologic Characteristic    : BEDROCK
       Additional Information     : (multiple lines)

  2.   Site Location Information

       City or Town               : Grasse
       State or Province          : Alpes Maritime
       Country                    : France
       Tectonic Plate             : Eurasian
       Approximate Position
         X coordinate          [m]: 4581692.416
         Y coordinate          [m]:  556159.512
         Z coordinate          [m]: 4389357.755
         Latitude           [deg]: 43.75468 N
         Longitude          [deg]: 6.92112  E
         Elevation             [m]: 1321.3
       Additional Information     : XYZ coordinate system is ITRF2005 (epoc june 2007)

  3.   General System Information

  3.01 System Name                : FTLRS
       4-Character Code           : GRAF
       CDP System Number          : 69
       CDP Occupation Number      : 01
       Eccentricity to SRP
         North                [m]: 0.000 +- 0.001
         East                 [m]: 0.000 +- 0.001
         Up                   [m]: 0.000 +- 0.001
         Date Measured           : 2007-03-20
       Date Installed            : 2007-03-20
       Date Removed              : 2007-09-01
       Additional Information    :

  3.02 System Name                : FTLRS
       4-Character Code           : GRAF
       CDP System Number          : 69
       CDP Occupation Number      : 02
       Eccentricity to SRP
         North                [m]: 0.000 +- 0.001
         East                 [m]: 0.000 +- 0.001
         Up                   [m]: 0.000 +- 0.001
         Date Measured           : 2008-05-01
       Date Installed            : 2008-05-01
```

```
      Date Removed               : 2008-07-05
      Additional Information     :

  3.03 System Name               : FTLRS
      4-Character Code           : GRAF
      CDP System Number          : 69
      CDP Occupation Number      : 03
      Eccentricity to SRP
        North                [m]: 0.000 +- 0.001
        East                 [m]: 0.000 +- 0.001
        Up                   [m]: 0.000 +- 0.001
        Date Measured            : 2009-03-01
      Date Installed             : 2009-03-01
      Date Removed               :
      Additional Information     :


  4.   Telescope Information

  4.01 Receiving Telescope Type   : CASSEGRAIN
        Aperture              [m]: .13
        Mount                    : AZ-EL
      Xmitting Telescope Type    : CASSEGRAIN
        Aperture              [m]: 0.13
      Tracking Camera Type       : CCD
        Model                    : SV0500
        Manufacturer             : Digital vison technologie
        Field of View       [deg]: .066
        Minimum Magnitude   [mag]: 3
      Transmit/Receive Path      : COMMON
      Transmit/Receive Switch    : POLARIZER
      Max Slew Rate Az    [deg/s]:  30
      Max Slew Rate El    [deg/s]:  10
      Max Used Tracking Rate Az  :  20
      Max Used Tracking Rate El  :  10
      Telescope Shelter          :  TENT
      Daylight Filter Type       :  Interferential filter oven controled
      Dayl. Filt. Bandwidth  [nm]:  1.00
      Adjustable Attenuation     :  RECEIVE
      Transmit Efficiency        :  0.45
      Receive Efficiency         :  0.20
      Date Installed             :  1996-09-01
      Date Removed               :  NA
      Additional Information     : (multiple lines)

  5.   Laser System Information

  5.01 Laser Type                 : ND:YAG
(…)

  5.02 Laser Type                 : ND:YAG
      Number of Amplifiers       : 1
      Primary Wavelength     [nm]: 532
      Primary Maximum Energy [mJ]: 20
      Secondary Wavelength   [nm]: NA
      Secondary Max. Energy  [mJ]: NA
      Xmit Energy Adjustable     : YES
      Pulse Width (FWHM)     [ps]: 35
      Max. Repetition Rate   [Hz]: 10
      Fullw. Beam Divergence  ["]: 30
      Final Beam Diameter     [m]: .10
      Eyesafe                    : NO
      Eyesafe Standard           : ANSI 136.1
      Date Installed             : 2001-07-01
      Date Removed               : NA
      Additional Information     : On calibration, attenuated via
                                   amplifier delay and neutral density
                                   Amplifier is double pass.

  6.   Receiver System
(…)
  7.   Tracking Capabilities

  7.01 Satellites
        Very Low Alt (<400 km)   : YES
        Low Altitude (400-2000)  : YES
        Lageos                   : NO
        GLONASS                  : NO
```

```
        Etalon                    : NO
        GPS                       : NO
        Moon                      : NO
      Avge Pass Switch Time   [s]: 60
      Average values for ERS
        Single Shot RMS      [mm]: 15
        # of Obs per NP          : 50
        Use of Semi-trains       : YES
        # of Semi-train Tracks   : 3-4
      Range Gate Width       [ns]: 200-50000
      Beam Pointing Accuracy  ["]: 15
      Angle Encoder Resolution["]: 0.5
      Min. Tracking Elev.   [deg]: 10
      Operation
        Months per Year          :  4
        Days per Week            :  7
        Hours per Day            :  18
        Staff per Shift          :  1
        System Shared With       :
        Time Allocated to SLR [%]: 100
        Remotely Controllable    : NO
      Date First Applicable      : 1995-09-01
      Date Last Applicable       : (yyyy-mm-dd)
      Additional Information     : (multiple lines)

 7.02 Satellites
        Very Low Alt (<400 km)   : YES
        Low Altitude (400-2000)  : YES
        Lageos                   : YES
        GLONASS                  : NO
        Etalon                   : NO
        GPS                      : NO
        Moon                     : NO
      Avge Pass Switch Time   [s]: 60
      Average values for Lageos
        Single Shot RMS      [mm]: 17
        # of Obs per NP          : 50
        Use of Semi-trains       : YES
        # of Semi-train Tracks   : 3-4
      Range Gate Width       [ns]: 200-500000
      Beam Pointing Accuracy  ["]: 15
      Angle Encoder Resolution["]: 0.5
      Min. Tracking Elev.   [deg]: 10
      Operation
        Months per Year          :  4
        Days per Week            :  7
        Hours per Day            :  14
        Staff per Shift          :  1
        System Shared With       :
        Time Allocated to SLR [%]: 100
        Remotely Controllable    : NO
      Date First Applicable      : 2001-07-01
      Date Last Applicable       : (yyyy-mm-dd)
      Additional Information     : Tracking Lageos with clear sky only

  8.   Calibration
(…)
  9.   Time and Frequency Standards
(…)
 10.   Preprocessing Information
(…)
 11.   Aircraft Detection
(…)
 12.   Meteorological Instrumentation
(…)
 13.   Local Ties, Eccentricities, and Collocation Information

 13.01 Collocated Permanent Geodetic Systems

     GPS                          : IGS
        Date Installed            : 1996-08-01
        Date Removed              :
        Additional Information    : (multiple lines)

      GLONASS                     : IGEX
        Date Installed            : 2000-01-01
        Date Removed              :
        Additional Information    : (multiple lines)
```

```
       DORIS                       : YES
         Date Installed            : 2009-04-001
         Date Removed              :
         Additional Information    : (multiple lines)

       VLBI                        :  YES
         Date Installed            : 1989-01-01
         Date Removed              : 1989-12-01
         Additional Information    :

       Gravimeter                  :  ABSOLUTE / Mobile
         Date Installed            :  every 6/12 months from 1998
         Date Removed              :
         Additional Information    : (multiple lines)

       LLR                    :  YES
         Date Installed            :  1982
         Date Removed              :
         Additional Information    : (multiple lines)


 13.02.01 Local Ties from the SRP to Other Monuments or Systems on Site
          Monument Name            :  Grasse LLR
          Instrumentation Type     : Grasse Lunar Laser Ranging
          Instrumentation Status   : Fixed
          DOMES Number             : 10002S002
          CDP Number               : 7845
          Differential Components (ITRS)
            dx                [m]:
            dy                [m]:
            dz                [m]:
            Date Measured          :
            Determined by          :
          Date Removed             :
          Additional Information   :

(…)
 14.   Local Events Possibly Affecting Computed Position

(…)

 15.   On-Site, Point of Contact Agency Information

       Agency                      : Observatoire de la côte d'Azur, CNES/GRGS
        Mailing Address            : Avenue N. Copernic, 06130 Grasse - France
       Primary Contact
         Contact Name              : Francis Pierron
         Telephone (primary)       : 33 493405420
         Telephone (secondary)     : 33 493405454
         Fax                       : 33 493092614
         E-mail                    : francis.pierron@obs-azur.fr
       Secondary Contact
         Contact Name              : Pascal Bonnefond
         Telephone (primary)       : 33 493405363
         Telephone (secondary)     : 33 493405353
         Fax                       : 33 493405333
         E-mail                    : pascal.bonnefond@obs-azur.fr

       Additional Information      : Third contact- Pierre Exertier
                                     phone 33 493405382
                                     fax 33 493405333
                                     email pierre.exertier@obs-azur.fr

 16.   Responsible Agency (if different from 15.)
(…)
 17.   More Information

       URL for More Information    : http://www.obs-azur.fr
       Hardcopy on File
         Site Map                  : NO
         Site Diagram              : NO
         Horizon Mask              : NO
         Monument Description      : NO
         Site Pictures             : NO
       Additional Information      :
```

6.3.GRAS site log (extract)

The complete version of the site log is available at :
http://igscb.jpl.nasa.gov/igscb/station/log/gras_20070913.log

```
---------------------------------------------------------------------------------------------------------------------
GRAS Site Information Form
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Jean-Paul Cardaliaguet
     Date Prepared            : 2007-09-19
     Report Type              : UPDATE
     If Update:
      Previous Site Log       : gras_20070611.log
      Modified/Added Sections : 3.7,3.8

1.   Site Identification of the GNSS Monument

     Site Name                : Observatoire de Calern - OCA
     Four Character ID        : GRAS
     Monument Inscription     : none
     IERS DOMES Number        : 10002M006
     CDP Number               : (A4)
     Monument Description     : PILLAR
       Height of the Monument : 1
       Monument Foundation    : CONCRETE BLOCK
       Foundation Depth       : (m)
     Marker Description       : BRASS NAIL
     Date Installed           : 1995-02-10
     Geologic Characteristic  : BEDROCK
       Bedrock Type           : (IGNEOUS/METAMORPHIC/SEDIMENTARY)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/10-50 cm/50-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : (multiple lines)
                              : Monument is a concrete pillar on bedrock
                              : with forced centering plate.

2.   Site Location Information

     City or Town             : Caussols
     State or Province        : Alpes-Maritimes
     Country                  : France
     Tectonic Plate           : Eurasia
     Approximate Position (ITRF)
       X coordinate (m)       : 4581693.6808
       Y coordinate (m)       : 556114.7130
       Z coordinate (m)       : 4389363.3719
       Latitude (N is +)      : +434516.92
       Longitude (E is +)     : +0065514.16
       Elevation (m,ellips.)  : 01320.3
     Additional Information   : Observatory located at Caussols, on plateau
                              : de Calern, 10 Km NW of Grasse.

3.   GNSS Receiver Information
(…)

4.   GNSS Antenna Information

4.1  Antenna Type             : AOAD/M_T        NONE
(…)

4.2  Antenna Type             :  AOAD/M_T        NONE
(…)

4.3  Antenna Type             : TRM29659.00     NONE
(…)
```

```
4.4  Antenna Type             : ASH701945E_M    NONE
     Serial Number            : 24222
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  : 000.0350
     Marker->ARP North Ecc(m) : 000.0000
     Marker->ARP East Ecc(m)  : 000.0000
     Alignment from True N    : 0
     Antenna Radome Type      : NONE
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH
     Antenna Cable Length     : 60
     Date Installed           : 2004-10-21T09:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Cable with line amplifier at 30m

(…)

5.   Surveyed Local Ties

5.1  Tied Marker Name         : SLR
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : 7835
     Tied Marker DOMES Number : 10002S001
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : +0.632
       dy (m)                 : +44.858
       dz (m)                 : -1.199
     Accuracy (mm)            : 2
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : 1995-02-17
     Additional Information   : (multiple lines)

5.2  Tied Marker Name         : Mobile VLBI marker
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : 7605
     Tied Marker DOMES Number : 10002M003
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : +0.639
       dy (m)                 : +11.081
       dz (m)                 : -9.235
     Accuracy (mm)            : 1
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : 1995-02-17
     Additional Information   : (multiple lines)

(…)

6.   Frequency Standard
 (…)

7.   Collocation Information

7.1  Instrumentation Type     : SLR
       Status                 : PERMANENT
       Effective Dates        : 1995-02-17
       Notes                  : (multiple lines)

7.2  Instrumentation Type     : VLBI
       Status                 : MOBILE
       Effective Dates        : 1995-02-17
       Notes                  : (multiple lines)

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation
 (…)

9.   Local Ongoing Conditions Possibly Affecting Computed Position
 (…)

10.  Local Episodic Effects Possibly Affecting Data Quality
 (…)
```

11. On-Site, Point of Contact Agency Information

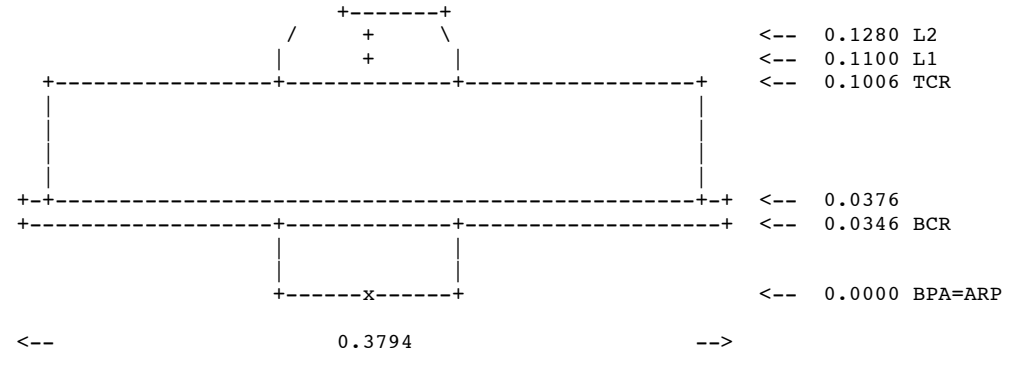
```
     Agency                     : Observatoire de la cote d'Azur
     Preferred Abbreviation     : OCA
     Mailing Address            : Observatoire de la Cote d'Azur
                                : Avenue Nicolas Copernic
                                : 06130 GRASSE - France
     Primary Contact
       Contact Name             : Maurice LAPLANCHE
       Telephone (primary)      : (33) 4 93 40 54 20
       Telephone (secondary)    :
       Fax                      :
       E-mail                   : maurice.laplanche@obs-azur.fr
     Secondary Contact
       Contact Name             : Francis PIERRON
       Telephone (primary)      : (33) 4 93 40 54 20
       Telephone (secondary)    :
       Fax                      :
       E-mail                   : Francis.Pierron@obs-azur.fr
     Additional Information     : (multiple lines)
```

12. Responsible Agency (if different from 11.)

```
     Agency                     : Centre National d'Etudes Spatiales
     Preferred Abbreviation     : CNES
     Mailing Address            : CNES - DCT/OP/EM
                                : 18, avenue Edouard Belin
                                : 31401 TOULOUSE CEDEX 09 - France
     Primary Contact
       Contact Name             : Jean-Paul Cardaliaguet
       Telephone (primary)      : (33) 5 61 27 31 98
       Telephone (secondary)    :
       Fax                      : (33) 5 61 28 15 36
       E-mail                   : jean-paul.cardaliaguet@cnes.fr
     Secondary Contact
       Contact Name             :
       Telephone (primary)      :
       Telephone (secondary)    :
       Fax                      :
       E-mail                   :
     Additional Information     : (multiple lines)
```

13. More Information

```
     Primary Data Center        : IGN
     Secondary Data Center      : CDDIS
     URL for More Information   :
       Hardcopy on File
       Site Map                 : (Y or URL)
       Site Diagram             : X
       Horizon Mask             : (Y)
       Monument Description     : (Y)
       Site Pictures            : X
     Additional Information     : (multiple lines)
     Antenna Graphics with Dimensions
```



ARP: Antenna Reference Point
L1 : L1 Phase Center L2 : L2 Phase Center

6.4.GRAC site log (extract)

The complete version of the site log is available at :
http://rgp.ign.fr/logsheet/grac_20050610.log

```
-------------------------------------------------------------------------------------------------------
GRAC Site Information Form
     French GPS permanent network (RGP)
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Equipe RGP
     Date Prepared            : 2005-06-10
     Report Type              : UPDATE
     If Update:
      Previous Site Log       : grac_20021003.log
      Modified/Added Sections : 3.3,12,13

1.   Site Identification of the GNSS Monument

     Site Name                : GRASSE
     Four Character ID        : GRAC
     Monument Inscription     : NONE
     IERS DOMES Number        : 10002M010
     CDP Number               : NONE
     Monument Description     : CONCRETE PILLAR WITH BRASS ADAPTATOR
       Height of the Monument : (m)
       Monument Foundation    : CONCRETE BLOCK
       Foundation Depth       : (m)
     Marker Description       : BASE AND CENTRE OF BRASS ADAPTATOR
     Date Installed           : 1998-11-27T10:00Z
     Geologic Characteristic  : BEDROCK
       Bedrock Type           : (SEDIMENTARY)Limestone
       Bedrock Condition      : FRESH
       Fracture Spacing       : 10-50 cm
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : (multiple lines)

2.   Site Location Information

     City or Town             : Caussols
     State or Province        : Alpes-Maritimes
     Country                  : France
     Tectonic Plate           : Eurasia
     Approximate Position (ITRF)
       X coordinate (m)       : 4581708.41
       Y coordinate (m)       :  556132.58
       Z coordinate (m)       : 4389341.21
       Latitude (N is +)      : +434516.16
       Longitude (E is +)     : +0065514.76
       Elevation (m,ellips.)  : 01319.87
     Additional Information   : Observatory located at Caussols, on plateau
                              : de Calern, 10 Km NW of Grasse.

3.   GNSS Receiver Information

(…)

4.   GNSS Antenna Information

4.1  Antenna Type             : 701023(B) L1
(…)

4.2  Antenna Type             : ASH701073.3
(…)

4.3  Antenna Type             : ASH701073.3
(…)
```

```
4.4  Antenna Type             : ASH700936F_C
     Serial Number            : CR1998390128
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  : 000.0586
     Marker->ARP North Ecc(m) : 000.0000
     Marker->ARP East Ecc(m)  : 000.0000
     Alignment from True N    : 0
     Antenna Radome Type      : NONE
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH
     Antenna Cable Length     : 30 m
     Date Installed           : 2002-10-03T09:00Z
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)

(…)

5.   Local Site Ties

5.1  Tied Marker Name         : IGS Station (GRAS)
     Tied Marker Usage        : GPS
     Tied Marker CDP Number   : none
     Tied Marker DOMES Number : 10002M006
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : - 17.4488
       dy (m)                 : - 17.8019
       dz (m)                 : + 19.5219
     Accuracy (mm)            : 1
     Survey method            : TRIANGULATION
     Date Measured            : 1999-10-10T10:00Z
     Additional Information   : (multiple lines)

(…)

6.   Frequency Standard

(…)

7.   Collocation Information

7.1  Instrumentation Type     : SLR
       Status                 : PERMANENT
       Effective Dates        : CCYY-MM-DD/CCYY-MM-DD
       Notes                  : (multiple lines)

7.2  Instrumentation Type     : VLBI
       Status                 : MOBILE
       Effective Dates        : CCYY-MM-DD/CCYY-MM-DD
       Notes                  : (multiple lines)

7.3  Instrumentation Type     : GPS
       Status                 : PERMANENT
       Effective Dates        : 1995-02-10/CCYY-MM-DD
       Notes                  : (multiple lines)

(…)

8.   Meteorological Instrumentation
 (…)

9.   Local Ongoing Conditions Possibly Affecting Computed Position
 (…)

10.  Local Episodic Effects Possibly Affecting Data Quality
 (…)

11.  On-Site, Point of Contact Agency Information

     Agency                   : Observatoire de Calern - Service Lasersat
     Preferred Abbreviation   : OCA
     Mailing Address          : Observatoire de la Cote d'Azur
                              : Avenue Nicolas Copernic
                              : 06100 GRASSE - France
     Primary Contact
       Contact Name           : Maurice LAPLANCHE
       Telephone (primary)    : 00 33 (0)4 93 40 54 20
       Telephone (secondary)  : 00 33 (0)4 93 40 54 21
       Fax                    : 00 33 (0)4 93 09 26 14
```

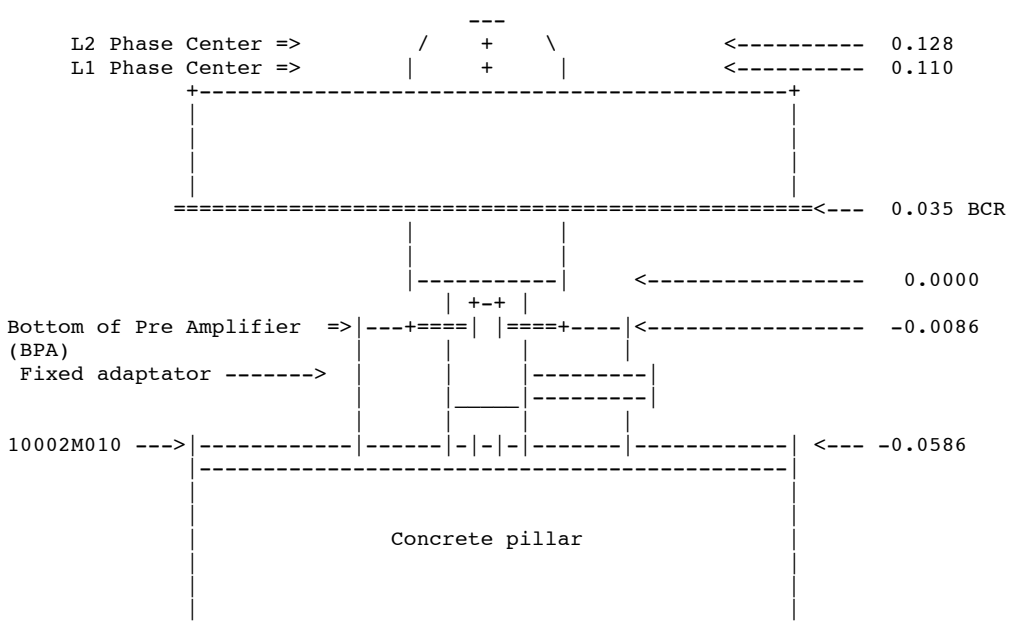
```
  E-mail                  : maurice.laplanche@obs-azur.fr
Secondary Contact
  Contact Name            : Jocelyn PARIS
  Telephone (primary)     : 00 33 (0)4 93 40 54 20
  Telephone (secondary)   : 00 33 (0)4 93 40 54 21
  Fax                     : 00 33 (0)4 93 09 26 14
  E-mail                  : Jocelyn.Paris@obs-azur.fr
Additional Information    : (multiple lines)
```

12. Responsible Agency (if different from 11.)

```
Agency                    : Institut Geographique National
Preferred Abbreviation    : IGN
Mailing Address           : SGN department
                          : 2 Avenue Pasteur
                          : 94165 Saint-Mandé CEDEX France
Primary Contact
  Contact Name            : Equipe RGP
  Telephone (primary)     : 00 33 (0)1 43 98 83 39
  Telephone (secondary)   :
  Fax                     : 00 33 (0)1 43 98 84 50
  E-mail                  : rgpadmin@ign.fr
Secondary Contact
  Contact Name            : Dominique Bocher
  Telephone (primary)     : 00 33 (0)1 43 98 83 39
  Telephone (secondary)   :
  Fax                     : 00 33 (0)1 43 98 84 50
  E-mail                  : dominique.bocher@ign.fr
Additional Information    : (multiple lines)
```

13. More Information

```
Primary Data Center       : RGPCO-LAREG
Secondary Data Center     : RGPCO-SGN
URL for More Information  : http://rgp.ign.fr
Hardcopy on File
  Site Map                : http://rgp.ign.fr
  Site Diagram            : (Y)
  Horizon Mask            : (Y)
  Monument Description    : (Y)
  Site Pictures           : http://rgp.ign.fr
Additional Information    : (multiple lines)
Antenna Graphics with Dimensions
```




```
 BPA: Bottom of Pre Amplifier          BCR : Bottom of Choke ring
 L1 : L1 Phase Center                   L2 : L2 Phase Center
```

6.5.Identification sheets

6.5.1. Geodetic logsheet

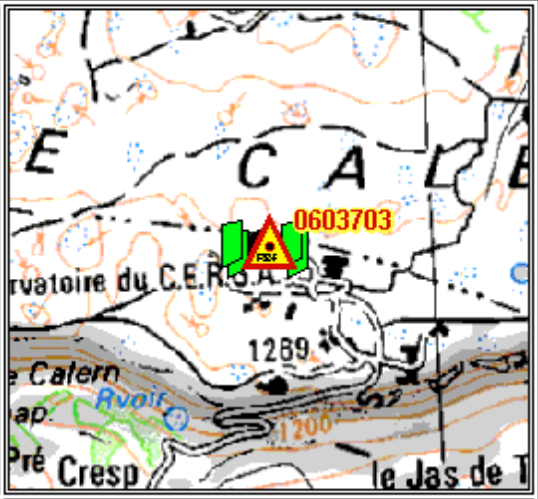
Réseau Géodésique Français

Service Géodésie Nivellement
Site géodésique

CAUSSOLS III

Département :	ALPES-MARITIMES (06)	*N° Site:* **0603703**
Commune :	CAUSSOLS	
Lieu-dit :	Observatoire du C.E.R.G.A	site RBF

Azimut de la prise de vue : 385 gr

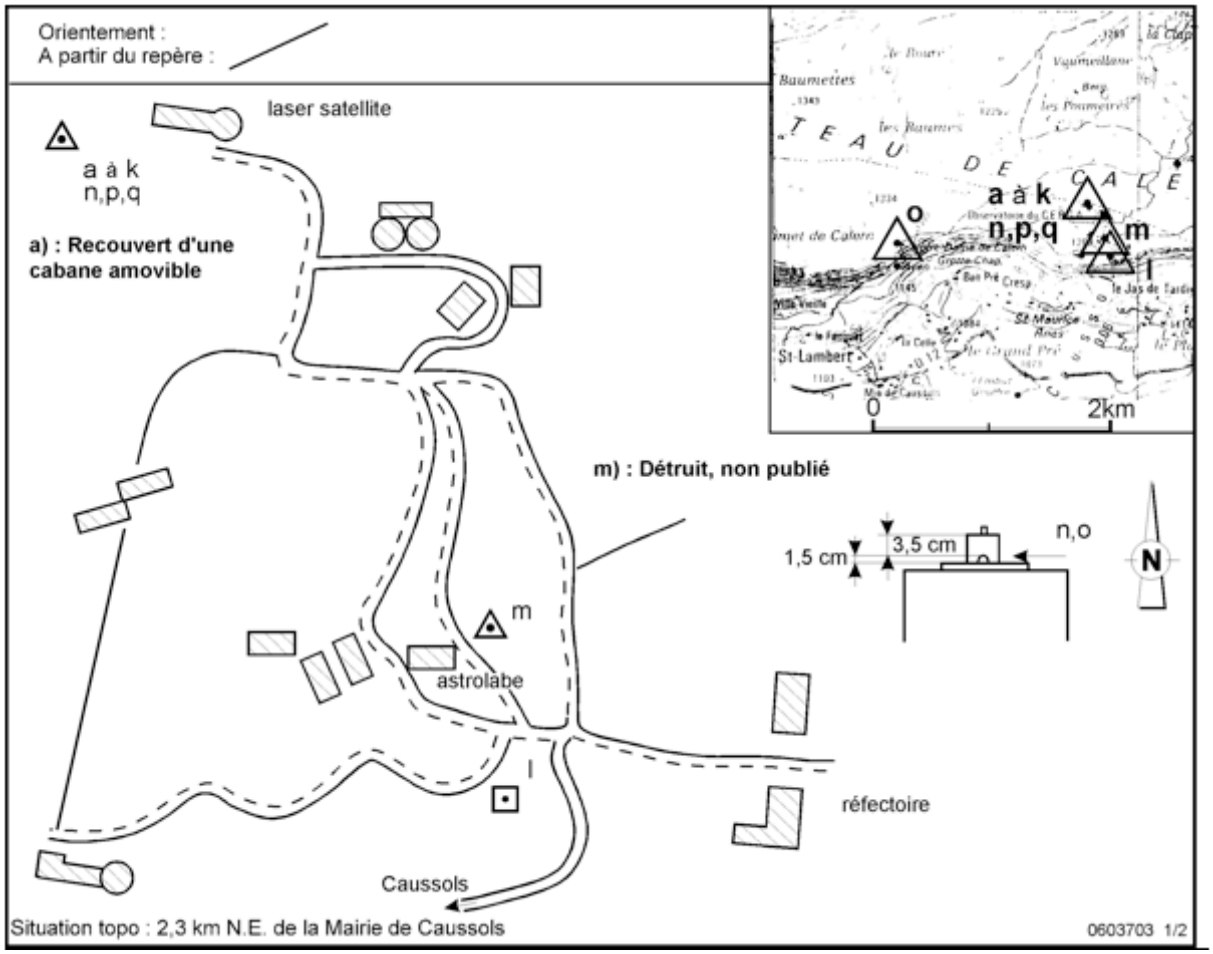


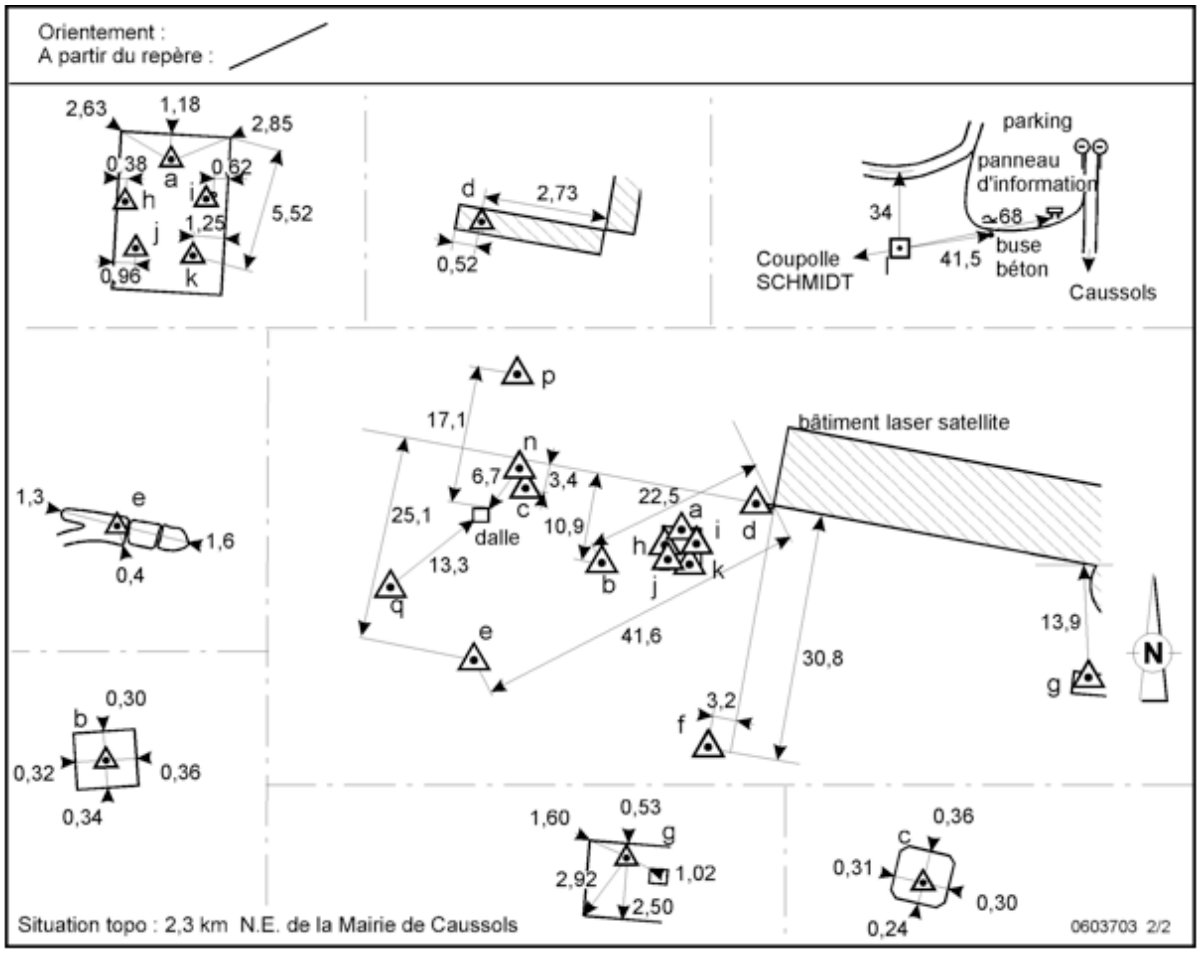
Extrait de la carte n° 3642
ROQUESTERON

Points du site : *(Cliquez sur la désignation des points ci-dessous pour obtenir les coordonnées)*

( )	Borne en granit gravee IGN (Point détruit)
( )	Croix gravee dans une dalle rocheuse. (Point détruit)
( )	Antenne Doppler : Axe et sommet. (Point détruit)
(A)	Repere bronze de diametre 4.5 cm scelle dans une plaque de beton. Station Laser Satellite Mobile
(B)	Repere bronze GM scelle dans un bloc de beton. Repere VLBI Mobile principal.
(C)	Repere bronze PM scelle dans un bloc de beton. Repere VLBI auxiliaire.
(D)	Repere bronze PM scelle dans un muret. Repere VLBI auxiliaire
(E)	Plaquette geodesique scellee dans un rocher. Repere VLBI auxiliaire.

(F)	Plaquette geodesique scellee dans un rocher. Repere EUREF.
(G)	Plaque de beton : Repere bronze PM scelle.
(H)	Repere bronze de diametre 4.5 cm Nord-Ouest scelle dans une plaque de beton. Repere auxiliaire Laser Satellite Mobile
(I)	Repere bronze de diametre 4.5 cm Nord-Est scelle dans une plaque de beton. Repere auxiliaire Laser Satellite Mobile
(J)	Repere bronze de diametre 4.5 cm Sud-Ouest scelle dans une plaque de beton. Repere auxiliaire Laser Satellite Mobile.
(K)	Repere bronze de 4.5 cm Sud-Est scelle dans une plaque de beton. Repere auxiliaire Laser Satellite Mobile.
(L)	Borne IGN 1975 : Repere 1995 hemispherique en laiton de 12 mm de diametre scelle a l'axe et au sommet
(M)	Astrolabe : Croix gravee dans le socle en beton. (Point détruit)
(N)	Pilier 1995 : Tige hemispherique filetee au pas Wild scellee a l'axe et au sommet. Station GPS permanente.
(O)	Pilier 1995 : Tige hemispherique filetee au pas Wild scellee a l'axe et au sommet. Pilier GPS d'azimut. (Point détruit)
(P)	Repere 1995 hemispherique en laiton de 25mm de diametre scelle sur un rocher
(Q)	Repere 1995 hemispherique en laiton de 25mm de diametre scelle sur un rocher





6.5.2. Gravimetric logsheet

Réseau Géodésique Français

CAUSSOLS III

Valeur de pesanteur - Ajustement de mesures gravimétriques absolues et relatives (2000 - 2009)

Point	g (mGal)	Précision (mGal)	g (m.s -2)	Précision
a	980216.3	0,1	9.802163	10 - 6

(Point « a » is the concrete slab / 25 mm brass mark)

6.5.3. Levelling benchmark logsheet

Nivellement Général de la France - Réseau Français de Nivellement de Précision

Service Géodésie Nivellement
Repère de nivellement

Matricule :	I'.C.B3 - 386-II	Système d'altitude : NGF - IGN1969 - Altitude normale 1 268,068 m
Type :	R RIVET	Année de détermination : 2005

Coordonnées du repère

Système RGF93 - Ellipsoïde : IAG GRS80 - Méridien origine : Greenwich

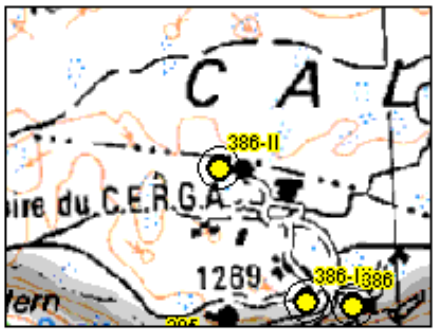
Longitude :	6 ° 55 ' 14,9 " E	Latitude :	43 ° 45 ' 16,8 " N

Système RGF93 - Projection LAMBERT - 93

E (km) :	1 015,70	N(km) :	6 302,91

Système NTF - Projection LAMBERT - 3

E(km) :	968,97	N(km) :	171,91



Département : ALPES-MARITIMES

Commune : CAUSSOLS — Numéro INSEE : 06037

Feuille : ROQUESTERON — Numéro : 3642 — Quart :

Voie suivie : ROUTE PRIVEE

de D.12 à OBSERVATOIRE — Côté : Gauche

Distance : 0.67 km du repère I'.C.B3 - 386 — PK :

Localisation : A LA STATION LASER SATELLITE MOBILE

Support : PLAQUE DE BETON

FACE SUPERIEURE

Repèrement : A 2.85 M DE L'ANGLE NORD-EST ET A 2.63 M DE L'ANGLE NORD-OUEST

AU SOMMET

6.6. Bernese Version5.0. report files

(GRASSE Output File)

```
================================================================================================================================
 Program : ADDNEQ2                                                                    Bernese GPS Software Version 5.0
 Purpose : Combination of normal equations
 Campaign: ${P}\ONLINE                                                                Default session: 0710 year 2009
 Date    : 28-Sep-2009 17:36                                                               User name      : jcpoyard
================================================================================================================================

INPUT AND OUTPUT FILENAMES
 --------------------------

 --------------------------------------------------------------------------------------------------------------------------------
 Session table               : ${P}\ONLINE\STA\SESSIONS.SES
 Variance rescaling factors  :  ---
 Station coordinates         : ${P}\ONLINE\STA\grasse.CRD
 Station velocities          :  ---
 Station information         : ${P}\ONLINE\STA\RGP1DOME.STA
 Troposphere estimates       :  ---
 Ionosphere master file      :  ---
 Differential code biases    :  ---
 Earth rotation parameters   :  ---
 Geocenter coordinates       :  ---
 Var-covar wrt coord.        :  ---
 Full var-covar matrix       :  ---
 General constants           : ${X}/GEN\CONST.
 Geodetic datum              : ${X}/GEN\DATUM.
 Phase center variations     : ${X}/GEN\PHAS_COD.I05
 Satellite information       : ${X}/GEN\SATELLIT.I01
 Satellite problems          : ${X}/GEN\SAT_2009.CRX
 Subdaily pole model         : ${X}/GEN\IERS2000.SUB
 Nutation model              : ${X}/GEN\IAU2000.NUT
 SINEX general input file    : ${X}/GEN\SINEX.
 IONEX control file          : ${X}/GEN\IONEX.
 Scratch file                : ${U}/WORK\ADDNEQ2___.SCR
 Program output              : ${P}\ONLINE\OUT\ADD4GRAS.OUT
 Error message               : ${U}/WORK\ERROR.MSG
 Resulting normal equations  :  ---
 SINEX                       : ${P}\ONLINE\SOL\ADD4GRAS.SNX
 Station coordinate results  : ${P}\ONLINE\STA\ADD4GRAS.CRD
 Station velocity results    :  ---
 Troposphere estimates       :  ---
 Troposphere SINEX           :  ---
 Ionosphere models           :  ---
 IONEX                       :  ---
 Code bias results           :  ---
 Orbital elements            :  ---
 Bernese ERP file            :  ---
 IERS ERP file               :  ---
 Geocenter coordinates       :  ---
 Station residuals           :  ---
 Weekly summary file         :  ---
 --------------------------------------------------------------------------------------------------------------------------------

 INPUT NORMAL EQUATION FILES
 ---------------------------

 --------------------------------------------------------------------------------------------------------------------------------
 File  Name
 --------------------------------------------------------------------------------------------------------------------------------
    1  ${P}\ONLINE\SOL\xxxx2370.NQ0
    2  ${P}\ONLINE\SOL\xxxx2380.NQ0
    3  ${P}\ONLINE\SOL\xxxx2390.NQ0
    4  ${P}\ONLINE\SOL\xxxx2400.NQ0
 --------------------------------------------------------------------------------------------------------------------------------

 Main characteristics of normal equation files:
 ----------------------------------------------

 File  From                To                  Number of observations / parameters / degree of freedom
 --------------------------------------------------------------------------------------------------------------------------------
    1  2009-08-25 00:00:00  2009-08-25 23:59:30                47488          767        46721
    2  2009-08-26 00:00:00  2009-08-26 23:59:30                48254          841        47413
    3  2009-08-27 00:00:00  2009-08-27 23:59:30                51058          879        50179
    4  2009-08-28 00:00:00  2009-08-28 23:59:30                47899          802        47097
 --------------------------------------------------------------------------------------------------------------------------------
 Total 2009-08-25 00:00:00  2009-08-28 23:59:30               194699
 Number of parameters:
 ---------------------
```

Parameter type	1	2	3	4
Station coordinates	33	39	39	33
Total number of explicit parameters	33	39	39	33
Total number of implicit parameters	734	802	840	769
Total number of adjusted parameters	767	841	879	802

A PRIORI INFORMATION

Number of parameters in combined NEQ less than: 3000

A priori sigma of unit weight: 0.0010 m

Check comparison of individual solutions:

Maximum residuals accepted in north: 15.0 mm
Maximum residuals accepted in east: 15.0 mm
Maximum residuals accepted in up: 30.0 mm

Maximum component rms accepted in north: 10.0 mm
Maximum component rms accepted in east: 10.0 mm
Maximum component rms accepted in up: 20.0 mm

A PRIORI INFORMATION

A priori sigma of unit weight: 0.0010 m

Station coordinates and velocities:

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

Datum name	Ell. param./ Scale	Shifts to WGS-84	Rotations to WGS-84
ITRF2005	A = 6378137.000 m	DX = 0.0000 m	RX = 0.00000 arcsec
	1/F= 298.2572221	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}\ONLINE\STA\grasse.CRD

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	GRAS 10002M006	Y ESTIM	4581690.8410	556114.9230	4389360.8510	43 45 17.058520	6 55 14.067822	1319.3151
2	100_ 100_____	Y ESTIM	4581681.6027	556231.9035	4389358.1578	43 45 16.885148	6 55 19.307492	1321.0105
3	AXPV 10057M001	Y ESTIM	4614666.8653	430786.5833	4367411.6018	43 29 28.373933	5 19 59.509325	229.3961
4	CNNS 10089M001	Y ESTIM	4595116.2855	565489.6486	4372420.5479	43 33 16.495956	7 0 56.615014	89.8661
5	ESAB 10075M001	Y ESTIM	4477793.0919	375846.0466	4511564.8997	45 18 25.578487	4 47 52.464310	207.7508
6	GRAC GRAC_____	Y ESTIM	4581708.3453	556132.7000	4389341.3171	43 45 16.164172	6 55 14.762248	1319.9046
7	MARS 10073M008	Y ESTIM	4630532.7201	433946.3997	4350142.7905	43 16 43.573559	5 21 13.638275	61.8291
8	MODA 10096M001	Y ESTIM	4470757.5347	525991.2356	4504955.5622	45 12 49.600821	6 42 36.311760	1182.2733
9	MTPL 10097M001	Y ESTIM	4612940.4838	311635.0614	4379108.6319	43 38 14.778807	3 51 53.429914	120.3528
10	NICA 10012M002	Y ESTIM	4581808.9752	581032.1136	4384492.9636	43 42 11.753215	7 13 38.144531	256.5048
11	PQRL 10084M001	Y ESTIM	4645913.7692	505207.7880	4326220.1215	42 58 59.824401	6 12 21.941120	112.4151
12	300_ 300_____	Y ESTIM	4581697.4762	556125.9933	4389351.6131	43 45 16.664916	6 55 14.523233	1318.6477
13	400_ 400_____	Y ESTIM	4581693.2907	556134.7840	4389354.8765	43 45 16.810629	6 55 14.935778	1318.6684
14	200_ 200_____	Y ESTIM	4581706.6010	556182.4387	4389337.7299	43 45 15.984754	6 55 16.978324	1320.5023
15	500_ 500_____	Y ESTIM	4581664.1016	556086.2054	4389388.2226	43 45 18.371178	6 55 12.937729	1316.5720

A priori sigma:

		Station coordinates a priori sigma in local geodetic datum			Station velocities a priori sigma in local geodetic datum		
num	Station name	N (m)	E (m)	U (m)	N (m/year)	E (m/year)	U (m/year)

```
-------------------------------------------------------------------------------------------------------------------
  1  GRAS 10002M006        0.00100      0.00100      0.00100

SUMMARY OF RESULTS
------------------

Number of parameters:
---------------------

Parameter type                    Adjusted   explicitly / implicitly (pre-eliminated)        Deleted     Singular
-------------------------------------------------------------------------------------------------------------------
Station coordinates / velocities          120           18          102  (before stacking)         0            0
-------------------------------------------------------------------------------------------------------------------
Previously pre-eliminated parameters     3145                      3145
-------------------------------------------------------------------------------------------------------------------
Total number                             3265           18         3247                           0            0

Statistics:
-----------

Total number of explicit parameters             18
Total number of implicit parameters           3247

Total number of adjusted parameters           3265
Total number of observations                194699
Degree of freedom (DOF)                     191434


A posteriori RMS of unit weight            0.00151 m
Chi**2/DOF                                    2.28

Total number of observation files                44
Total number of stations                          6
Total number of satellites                        0

Station coordinates and velocities:
-----------------------------------

 Sol  Station name              Typ  Correction  Estimated value   RMS error   A priori value     Unit       From
To
 -------------------------------------------------------------------------------------------------------------------
   1 100_ 100______             X     -0.0075     4581681.5952     0.0019     4581681.6027 meters  2009-08-25 00:00:00
2009-08-26 23:59:30
   1 100_ 100______             Y     -0.0005      556231.9030     0.0016      556231.9035 meters  2009-08-25 00:00:00
2009-08-26 23:59:30
   1 100_ 100______             Z     -0.0056     4389358.1522     0.0019     4389358.1578 meters  2009-08-25 00:00:00
2009-08-26 23:59:30
   1 200_ 200______             X     -0.0080     4581706.5930     0.0018     4581706.6010 meters  2009-08-27 00:00:00
2009-08-28 23:59:30
   1 200_ 200______             Y     -0.0034      556182.4353     0.0015      556182.4387 meters  2009-08-27 00:00:00
2009-08-28 23:59:30
   1 200_ 200______             Z     -0.0041     4389337.7258     0.0018     4389337.7299 meters  2009-08-27 00:00:00
2009-08-28 23:59:30
   1 300_ 300______             X     -0.0036     4581697.4726     0.0019     4581697.4762 meters  2009-08-26 00:00:00
2009-08-27 23:59:30
   1 300_ 300______             Y      0.0014      556125.9947     0.0015      556125.9933 meters  2009-08-26 00:00:00
2009-08-27 23:59:30
   1 300_ 300______             Z     -0.0009     4389351.6122     0.0018     4389351.6131 meters  2009-08-26 00:00:00
2009-08-27 23:59:30
   1 400_ 400______             X     -0.0030     4581693.2877     0.0019     4581693.2907 meters  2009-08-26 00:00:00
2009-08-27 23:59:30
   1 400_ 400______             Y      0.0009      556134.7849     0.0015      556134.7840 meters  2009-08-26 00:00:00
2009-08-27 23:59:30
   1 400_ 400______             Z     -0.0001     4389354.8764     0.0018     4389354.8765 meters  2009-08-26 00:00:00
2009-08-27 23:59:30
   1 500_ 500______             X     -0.0085     4581664.0931     0.0018     4581664.1016 meters  2009-08-27 00:00:00
2009-08-28 23:59:30
   1 500_ 500______             Y     -0.0026      556086.2028     0.0015      556086.2054 meters  2009-08-27 00:00:00
2009-08-28 23:59:30
   1 500_ 500______             Z     -0.0056     4389388.2170     0.0018     4389388.2226 meters  2009-08-27 00:00:00
2009-08-28 23:59:30
   1 GRAS 10002M006             X      0.0007     4581690.8417     0.0015     4581690.8410 meters  2009-08-25 00:00:00
2009-08-28 23:59:30
   1 GRAS 10002M006             Y      0.0001      556114.9231     0.0015      556114.9230 meters  2009-08-25 00:00:00
2009-08-28 23:59:30
   1 GRAS 10002M006             Z     -0.0008     4389360.8502     0.0015     4389360.8510 meters  2009-08-25 00:00:00
2009-08-28 23:59:30

 Station coordinates and velocities:
 -----------------------------------
 Reference epoch: 2009-08-27 00:00:00

 Station name          Typ      A priori value     Estimated value   Correction    RMS error       3-D ellipsoid
2-D ellipse
 -------------------------------------------------------------------------------------------------------------------
 100_ 100______        X       4581681.6027       4581681.5952       -0.0075      0.0019
                       Y        556231.9035        556231.9030       -0.0005      0.0016
                       Z       4389358.1578       4389358.1522       -0.0056      0.0019

                       U          1321.0105          1321.0012       -0.0093      0.0022      0.0022    2.4
```

```
                    N       43 45 16.885148     43 45 16.885184       0.0011       0.0016       0.0015    88.2
0.0015   89.0
                    E        6 55 19.307492      6 55 19.307511       0.0004       0.0015       0.0016    -0.7
0.0016
 200_ 200_____      X      4581706.6010       4581706.5930       -0.0080      0.0018
                    Y       556182.4387        556182.4353       -0.0034      0.0015
                    Z      4389337.7299       4389337.7258       -0.0041      0.0018

                    U         1320.5023          1320.4934       -0.0089      0.0020      0.0020     2.5
                    N       43 45 15.984754     43 45 15.984846       0.0028       0.0016       0.0015    91.6
0.0015   92.1
                    E        6 55 16.978324      6 55 16.978214      -0.0024       0.0015       0.0016    -0.6
0.0016
 300_ 300_____      X      4581697.4762       4581697.4726       -0.0036      0.0019
                    Y       556125.9933        556125.9947        0.0014      0.0015
                    Z      4389351.6131       4389351.6122       -0.0009      0.0018

                    U         1318.6477          1318.6445       -0.0031      0.0021      0.0021     2.3
                    N       43 45 16.664916     43 45 16.664971       0.0017       0.0016       0.0015    89.3
0.0015   89.5
                    E        6 55 14.523233      6 55 14.523313       0.0018       0.0015       0.0016    -0.2
0.0016
 400_ 400_____      X      4581693.2907       4581693.2877       -0.0030      0.0019
                    Y       556134.7840        556134.7849        0.0009      0.0015
                    Z      4389354.8765       4389354.8764       -0.0001      0.0018

                    U         1318.6684          1318.6663       -0.0021      0.0021      0.0021     1.9
                    N       43 45 16.810629     43 45 16.810693       0.0020       0.0016       0.0015    91.0
0.0015   91.2
                    E        6 55 14.935778      6 55 14.935834       0.0012       0.0015       0.0016    -0.3
0.0016
 500_ 500_____      X      4581664.1016       4581664.0931       -0.0085      0.0018
                    Y       556086.2054        556086.2028       -0.0026      0.0015
                    Z      4389388.2226       4389388.2170       -0.0056      0.0018

                    U         1316.5720          1316.5619       -0.0102      0.0020      0.0020     2.8
                    N       43 45 18.371178     43 45 18.371243       0.0020       0.0016       0.0015    89.2
0.0015   89.1
                    E        6 55 12.937729      6 55 12.937661      -0.0015       0.0015       0.0016    -0.2
0.0016
 GRAS 10002M006     X      4581690.8410       4581690.8417        0.0007      0.0015
                    Y       556114.9230        556114.9231        0.0001      0.0015
                    Z      4389360.8510       4389360.8502       -0.0008      0.0015

                    U         1319.3151          1319.3150       -0.0001      0.0015      0.0015     2.8
                    N       43 45 17.058520     43 45 17.058485      -0.0011       0.0015       0.0015    90.2
0.0015   90.2
                    E        6 55 14.067822      6 55 14.067823       0.0000       0.0015       0.0015    -0.2
0.0015

 Comparison of Individual Solutions:
 ----------------------------------

 100_ N    1.14     -1.14   -0.03
 100_ E    1.02      0.94   -0.39
 100_ U    6.22      4.22   -4.57

 200_ N    1.15                    -0.95   -0.64
 200_ E    1.11                     0.58   -0.94
 200_ U    2.05                     1.52   -1.39

 300_ N    1.40             -1.37   -0.27
 300_ E    2.20              2.04   -0.83
 300_ U    2.44              2.27   -0.91

 400_ N    1.20             -1.11   -0.47
 400_ E    1.67              1.57   -0.57
 400_ U    2.69              2.48   -1.04

 500_ N    1.81                    -1.81   -0.04
 500_ E    2.05                     1.40   -1.50
 500_ U    0.90                     0.84   -0.30

 GRAS N    0.95     -0.77   -0.51   -0.84   -1.08
 GRAS E    0.16      0.18    0.12   -0.13   -0.12
 GRAS U    0.10     -0.15    0.03   -0.08   -0.05
```

(GRASSE Sinex Output File)

```
%=SNX 1.00 IGN 09:271:63418 RGP 09:237:00000 09:240:86370 P 00018 0 X
*-------------------------------------------------------------------------------
+FILE/REFERENCE
*INFO_TYPE_________ INFO_____________________________________________________
 DESCRIPTION        IGN
 OUTPUT             One-session solution generated by RGPH BPE
 CONTACT            rgpadmin@ign.fr
 SOFTWARE           Bernese GPS Software Version 5.0
 HARDWARE           Pentium 4
 INPUT              RGP GNSS tracking data
-FILE/REFERENCE
*-------------------------------------------------------------------------------
+INPUT/ACKNOWLEDGMENTS
*AGY DESCRIPTION_____________________________________________________________
 IGN IGN France Sevice de Geodesie et Nivellement
 IGS International GPS Service
-INPUT/ACKNOWLEDGMENTS
*-------------------------------------------------------------------------------
+SOLUTION/STATISTICS
*_STATISTICAL PARAMETER________ __VALUE(S)____________
 NUMBER OF OBSERVATIONS                      194699
 NUMBER OF UNKNOWNS                            3265
 NUMBER OF DEGREES OF FREEDOM                191434
 SAMPLING INTERVAL (SECONDS)                    120
 PHASE MEASUREMENTS SIGMA                   0.00100
 VARIANCE FACTOR                2.275895445287477
-SOLUTION/STATISTICS
*-------------------------------------------------------------------------------
+SITE/ID
*CODE PT __DOMES__ T _STATION DESCRIPTION__ APPROX_LON_ APPROX_LAT_ _APP_H_
 100_  A 100______ P 100_ 100______           6 55 19.3  43 45 16.9  1321.0
 200_  A 200______ P 200_ 200______           6 55 17.0  43 45 16.0  1320.5
 300_  A 300______ P 300_ 300______           6 55 14.5  43 45 16.7  1318.6
 400_  A 400______ P 400_ 400______           6 55 14.9  43 45 16.8  1318.7
 500_  A 500______ P 500_ 500______           6 55 12.9  43 45 18.4  1316.6
 GRAS  A 10002M006 P GRAS 10002M006          6 55 14.1  43 45 17.1  1319.3
-SITE/ID
*-------------------------------------------------------------------------------
+SITE/RECEIVER
*SITE PT SOLN T DATA_START__ DATA_END____ DESCRIPTION_________ S/N__ FIRMWARE___
 100_  A 0001 P 09:237:00000 09:238:86370 LEICA GX1230GG       ----- -----------
 200_  A 0001 P 09:239:00000 09:240:86370 LEICA GX1230GG       ----- -----------
 300_  A 0001 P 09:238:00000 09:239:86370 LEICA GX1230GG       ----- -----------
 400_  A 0001 P 09:238:00000 09:239:86370 LEICA GX1230GG       ----- -----------
 500_  A 0001 P 09:239:00000 09:240:86370 LEICA GX1230GG       ----- -----------
 GRAS  A 0001 P 09:237:00000 09:240:86370 ASHTECH UZ-12        ----- -----------
-SITE/RECEIVER
*-------------------------------------------------------------------------------
+SITE/ANTENNA
*SITE PT SOLN T DATA_START__ DATA_END____ DESCRIPTION_________ S/N__
 100_  A 0001 P 09:237:00000 09:238:86370 LEIAT504         NONE -----
 200_  A 0001 P 09:239:00000 09:240:86370 LEIAT504         NONE -----
 300_  A 0001 P 09:238:00000 09:239:86370 LEIAT504         NONE -----
 400_  A 0001 P 09:238:00000 09:239:86370 LEIAT504         NONE -----
 500_  A 0001 P 09:239:00000 09:240:86370 LEIAT504         NONE -----
 GRAS  A 0001 P 09:237:00000 09:240:86370 ASH701945E_M     NONE -----
-SITE/ANTENNA
*-------------------------------------------------------------------------------
+SITE/GPS_PHASE_CENTER
*                        UP____ NORTH_ EAST__ UP____ NORTH_ EAST__
*DESCRIPTION_________ S/N__ L1->ARP(M)_____ L2->ARP(M)_____
 ASH701945E_M     NONE ----- 0.0912 0.0006 -.0005 0.1201 -.0001 -.0006 IGS05_1545
 LEIAT504         NONE ----- 0.0912 0.0001 -.0003 0.1173 -.0001 0.0001 IGS05_1545
-SITE/GPS_PHASE_CENTER
*-------------------------------------------------------------------------------
+SITE/ECCENTRICITY
*                                          UP______ NORTH___ EAST____
*SITE PT SOLN T DATA_START__ DATA_END____ AXE ARP->BENCHMARK(M)_____
 100_  A 0001 P 09:237:00000 09:238:86370 UNE   0.0000   0.0000   0.0000
 200_  A 0001 P 09:239:00000 09:240:86370 UNE   0.0000   0.0000   0.0000
 300_  A 0001 P 09:238:00000 09:239:86370 UNE   1.4290   0.0000   0.0000
 400_  A 0001 P 09:238:00000 09:239:86370 UNE   1.4780   0.0000   0.0000
 500_  A 0001 P 09:239:00000 09:240:86370 UNE   1.4220   0.0000   0.0000
 GRAS  A 0001 P 09:237:00000 09:240:86370 UNE   0.0350   0.0000   0.0000
```

```
-SITE/ECCENTRICITY
*-------------------------------------------------------------------------------
+SOLUTION/EPOCHS
*CODE PT SOLN T _DATA_START_ __DATA_END__ _MEAN_EPOCH_
 100_  A 0001 P 09:237:00000 09:238:86370 09:237:86385
 200_  A 0001 P 09:239:00000 09:240:86370 09:239:86385
 300_  A 0001 P 09:238:00000 09:239:86370 09:238:86385
 400_  A 0001 P 09:238:00000 09:239:86370 09:238:86385
 500_  A 0001 P 09:239:00000 09:240:86370 09:239:86385
 GRAS  A 0001 P 09:237:00000 09:240:86370 09:238:86385
-SOLUTION/EPOCHS
*-------------------------------------------------------------------------------
+SOLUTION/ESTIMATE
*INDEX TYPE__ CODE PT SOLN _REF_EPOCH__ UNIT S __ESTIMATED VALUE____ _STD_DEV___
     1 STAX   100_  A 0001 09:237:86385 m    0 0.458168159522331E+07 .194464E-02
     2 STAY   100_  A 0001 09:237:86385 m    0 0.556231903015073E+06 .155790E-02
     3 STAZ   100_  A 0001 09:237:86385 m    0 0.438935815216646E+07 .187165E-02
     4 STAX   200_  A 0001 09:239:86385 m    0 0.458170659298624E+07 .184269E-02
     5 STAY   200_  A 0001 09:239:86385 m    0 0.556182435263930E+06 .153881E-02
     6 STAZ   200_  A 0001 09:239:86385 m    0 0.438933772581365E+07 .178555E-02
     7 STAX   300_  A 0001 09:238:86385 m    0 0.458169747256624E+07 .186774E-02
     8 STAY   300_  A 0001 09:238:86385 m    0 0.556125994664175E+06 .154363E-02
     9 STAZ   300_  A 0001 09:238:86385 m    0 0.438935161215623E+07 .180831E-02
    10 STAX   400_  A 0001 09:238:86385 m    0 0.458169328767701E+07 .188671E-02
    11 STAY   400_  A 0001 09:238:86385 m    0 0.556134784896237E+06 .154503E-02
    12 STAZ   400_  A 0001 09:238:86385 m    0 0.438935487644794E+07 .183152E-02
    13 STAX   500_  A 0001 09:239:86385 m    0 0.458166409310004E+07 .183235E-02
    14 STAY   500_  A 0001 09:239:86385 m    0 0.556086202835865E+06 .153926E-02
    15 STAZ   500_  A 0001 09:239:86385 m    0 0.438938821702635E+07 .177212E-02
    16 STAX   GRAS  A 0001 09:238:86385 m    0 0.458169084167482E+07 .150694E-02
    17 STAY   GRAS  A 0001 09:238:86385 m    0 0.556114923102264E+06 .150091E-02
    18 STAZ   GRAS  A 0001 09:238:86385 m    0 0.438936085017142E+07 .150677E-02
-SOLUTION/ESTIMATE
*-------------------------------------------------------------------------------
+SOLUTION/APRIORI
*INDEX TYPE__ CODE PT SOLN _REF_EPOCH__ UNIT S __APRIORI VALUE______ _STD_DEV___
     1 STAX   100_  A 0001 09:237:86385 m    0 0.458168160270000E+07 .477063E+01
     2 STAY   100_  A 0001 09:237:86385 m    0 0.556231903500000E+06 .477063E+01
     3 STAZ   100_  A 0001 09:237:86385 m    0 0.438935815780000E+07 .477063E+01
     4 STAX   200_  A 0001 09:239:86385 m    0 0.458170660100000E+07 .477063E+01
     5 STAY   200_  A 0001 09:239:86385 m    0 0.556182438700000E+06 .477063E+01
     6 STAZ   200_  A 0001 09:239:86385 m    0 0.438933772990000E+07 .477063E+01
     7 STAX   300_  A 0001 09:238:86385 m    0 0.458169747620000E+07 .477063E+01
     8 STAY   300_  A 0001 09:238:86385 m    0 0.556125993300000E+06 .477063E+01
     9 STAZ   300_  A 0001 09:238:86385 m    0 0.438935161310000E+07 .477063E+01
    10 STAX   400_  A 0001 09:238:86385 m    0 0.458169329070000E+07 .477063E+01
    11 STAY   400_  A 0001 09:238:86385 m    0 0.556134784000000E+06 .477063E+01
    12 STAZ   400_  A 0001 09:238:86385 m    0 0.438935487650000E+07 .477063E+01
    13 STAX   500_  A 0001 09:239:86385 m    0 0.458166410160000E+07 .477063E+01
    14 STAY   500_  A 0001 09:239:86385 m    0 0.556086205400000E+06 .477063E+01
    15 STAZ   500_  A 0001 09:239:86385 m    0 0.438938822260000E+07 .477063E+01
    16 STAX   GRAS  A 0001 09:238:86385 m    0 0.458169084100000E+07 .150876E-02
    17 STAY   GRAS  A 0001 09:238:86385 m    0 0.556114923000000E+06 .150386E-02
    18 STAZ   GRAS  A 0001 09:238:86385 m    0 0.438936085100000E+07 .150885E-02
-SOLUTION/APRIORI
*-------------------------------------------------------------------------------
+SOLUTION/MATRIX_ESTIMATE L COVA
*PARA1 PARA2 ____PARA2+0__________ ____PARA2+1__________ ____PARA2+2__________
     1     1  0.37816225962004E-05
     2     1  0.14847791473076E-06  0.24270479663986E-05
     3     1  0.11625451427649E-05  0.12193500998252E-06  0.35030767617426E-05
     4     1  0.22838710959122E-05  0.33918953780140E-08  0.11704756476287E-07
     4     4  0.33954940509163E-05
     5     1  0.27944585002083E-08  0.22536341978228E-05  0.24929434672145E-09
     5     4  0.10954008347776E-06  0.23679482325143E-05
     6     1  0.12926828149925E-07  0.83184340055255E-09  0.22790406142842E-05
     6     4  0.85642407237240E-06  0.92602224407002E-07  0.31881736980700E-05
     7     1  0.23503659470082E-05  0.10505462676791E-07  0.59967723575418E-07
     7     4  0.24049497675660E-05  0.17009950380653E-07  0.10219714423492E-06
     7     7  0.34884520516701E-05
     8     1  0.10115812981333E-07  0.22599237806217E-05  0.57657033548714E-08
     8     4  0.16845614430269E-07  0.22676321726980E-05  0.11798396110493E-07
     8     7  0.13120095287833E-06  0.23827907684514E-05
     9     1  0.60674970985599E-07  0.67554723347675E-08  0.23309287941517E-05
     9     4  0.10113784366214E-06  0.12256524447498E-07  0.23749227807814E-05
     9     7  0.93073045590565E-06  0.10702343187875E-06  0.32699776813363E-05
    10     1  0.23509077283856E-05  0.99285086757903E-08  0.59944290591838E-07
    10     4  0.24061401296123E-05  0.17784061639653E-07  0.10296505360751E-06
```

```
    10     7  0.26373537567508E-05  0.41771640100005E-07  0.28065293466378E-06
    10    10  0.35596928696268E-05
    11     1  0.95406537122630E-08  0.22598995113537E-05  0.53161594392799E-08
    11     4  0.17495759505557E-07  0.22676871091612E-05  0.12304123469310E-07
    11     7  0.41173921802097E-07  0.22926493107543E-05  0.34355969251327E-07
    11    10  0.13460059896622E-06  0.23871282566546E-05
    12     1  0.61295688933818E-07  0.63865355639185E-08  0.23312629943692E-05
    12     4  0.10212696877129E-06  0.12988737879391E-07  0.23756777517685E-05
    12     7  0.28095569557509E-06  0.35079119835649E-07  0.25676107864769E-05
    12    10  0.99696371759244E-06  0.11478378743942E-06  0.33544833892453E-05
    13     1  0.22827668453392E-05  0.30921870762828E-08  0.11291222418048E-07
    13     4  0.26145906031055E-05  0.39170668572232E-07  0.26214321472720E-06
    13     7  0.23984838175321E-05  0.15030930239491E-07  0.95421805567795E-07
    13    10  0.23995613490331E-05  0.15660902472821E-07  0.96323855683391E-07
    13    13  0.33575031646412E-05
    14     1  0.25913597105666E-08  0.22535386298439E-05  0.17558715989893E-09
    14     4  0.38957132469982E-07  0.22900715495288E-05  0.32357938799276E-07
    14     7  0.15550171777076E-07  0.22666997891484E-05  0.10673179969489E-07
    14    10  0.16290934360152E-07  0.22667464181505E-05  0.11368766174177E-07
    14    13  0.12737327333785E-06  0.23693149473727E-05
    15     1  0.12089328818609E-07  0.66690465262994E-09  0.22786398353896E-05
    15     4  0.26152602456520E-06  0.32145845586472E-07  0.25477728072238E-05
    15     7  0.96370129203351E-07  0.10082541429299E-07  0.23690833579601E-05
    15    10  0.97035886829575E-07  0.10567156479714E-07  0.23697457147315E-05
    15    13  0.82179032093139E-06  0.10302344972216E-06  0.31404264912960E-05
    16     1  0.22704195997440E-05  0.20865869033469E-08  0.30174080283534E-08
    16     4  0.22708040307905E-05  0.20509844432982E-08  0.33887402073004E-08
    16     7  0.22705354233314E-05  0.20783146488148E-08  0.30880674254615E-08
    16    10  0.22706208192993E-05  0.20746564332463E-08  0.31905579995497E-08
    16    13  0.22702723417983E-05  0.19777792719033E-08  0.30718857111101E-08
    16    16  0.22708593225249E-05
    17     1  0.12774103333301E-08  0.22525899235134E-05 -0.62923822676299E-09
    17     4  0.19343474324932E-08  0.22524800495369E-05 -0.36008957527691E-10
    17     7  0.19894577384288E-08  0.22526766115631E-05  0.24072407465246E-09
    17    10  0.20296259384548E-08  0.22527266723260E-05  0.35670675181675E-09
    17    13  0.17806195153546E-08  0.22524625640009E-05 -0.53290451437354E-10
    17    16  0.20988100292569E-08  0.22527375970206E-05
    18     1  0.34086999062070E-08  0.14403262756629E-09  0.22701583690133E-05
    18     4  0.27153057878981E-08  0.16434646350257E-09  0.22695210144612E-05
    18     7  0.32448700345495E-08  0.28136146005279E-09  0.22701111734026E-05
    18    10  0.31662339345598E-08  0.23941117088488E-09  0.22699341324360E-05
    18    13  0.28355273050527E-08  0.24035332114202E-09  0.22696670708850E-05
    18    16  0.31165234456461E-08  0.36990181925127E-09  0.22703478081896E-05
-SOLUTION/MATRIX_ESTIMATE L COVA
*-------------------------------------------------------------------------------
+SOLUTION/MATRIX_APRIORI L COVA
*PARA1 PARA2 ____PARA2+0__________ ____PARA2+1__________ ____PARA2+2__________
     1     1  0.22758954452875E+02
     2     1  0.00000000000000E+00  0.22758954452875E+02
     3     1  0.00000000000000E+00  0.00000000000000E+00  0.22758954452875E+02
     4     4  0.22758954452875E+02
     5     4  0.00000000000000E+00  0.22758954452875E+02
     6     4  0.00000000000000E+00  0.00000000000000E+00  0.22758954452875E+02
     7     7  0.22758954452875E+02
     8     7  0.00000000000000E+00  0.22758954452875E+02
     9     7  0.00000000000000E+00  0.00000000000000E+00  0.22758954452875E+02
    10    10  0.22758954452875E+02
    11    10  0.00000000000000E+00  0.22758954452875E+02
    12    10  0.00000000000000E+00  0.00000000000000E+00  0.22758954452875E+02
    13    13  0.22758954452875E+02
    14    13  0.00000000000000E+00  0.22758954452875E+02
    15    13  0.00000000000000E+00  0.00000000000000E+00  0.22758954452875E+02
    16    16  0.22763468564865E-05
    17    16  0.18174509138664E-08  0.22615939339185E-05
    18    16 -0.69699591231723E-09 -0.84599734369014E-10  0.22766285314157E-05
-SOLUTION/MATRIX_APRIORI L COVA
%ENDSNX
```

6.7.ITRF05 Coordinates and Discontinuities

Extract of coordinates (at epoch 2009 :238) from the ITRF website.

DATA SET EXPRESSED IN ITRF2005 FRAME
STATION POSITIONS AND VELOCITIES AT EPOCH 2009/08/26

DOMES NB	SITE NAME	ID	SOLN	X/Vx	Y/Vy	Z/Vz	SIGMA x/vx	SIGMA y/vy	SIGMA z/vz
				m-m/y	m-m/y	m-m/y	m-m/y	m-m/y	m-m/y
10002M006	Grasse (OCA)	GRAS	1	4581690.835	556114.917	4389360.843	0.002	0.001	0.002
				-0.0139	0.0186	0.0116	0.0002	0.0001	0.0002
10002M006	Grasse (OCA)	GRAS	2	4581690.841	556114.920	4389360.846	0.001	0.001	0.001
				-0.0139	0.0186	0.0116	0.0002	0.0001	0.0002
10002M006	Grasse (OCA)	GRAS	3	4581690.841	556114.923	4389360.851	0.001	0.001	0.001
				-0.0139	0.0186	0.0116	0.0002	0.0001	0.0002

We used the following extract of the IGS-Discontinuities for the choice of the GRAS constrained coordinates in the computation input file according to our observation period (solution number 3).

```
GRAS  A    1 P 00:000:00000 03:113:00000 P - Antenna & Receiver Change
GRAS  A    2 P 03:113:00000 04:295:43200 P - Antenna & Receiver Change
GRAS  A    3 P 04:295:43200 00:000:00000 P -
```

6.8.Grasse/Calern network adjustment input file

```
 TITL  GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
 COMP ADJ
 ELIP WGS 84             6378137.000  6356752.3142   0.0000   0.0000   0.0000 m
 MAXI         10
 CONF YES YES YES YES NO
 PSOL NO  YES
 PMIS NO  NO
 PRES YES NO
 PGEO YES
 PADJ NO  NO  YES NO  YES NO
 VARF YES YES NO
 RTST TAU MAX
 LUNT m    1.000000000000
 CONV    0.00010
 CLEV     95.000
 ANGT GRD
 LDEC 4


*****************************************************************************************
*                              ITRF ACRONYMS  and  POINTS DESCRIPTION                   *
*****************************************************************************************

*LASER stations
*GRSM : (DOMES 10002S002) = LLR IAR = (CDP number 7845)
*GRAF : (DOMES 10002S017) = FTLRS = Telescope axis intersection ref point = (CDP number 7829)

*PERMANENT GPS
*GRAC  : (DOMES  10002M010)  =  CONCRETE  PILLAR  WITH  BRASS  ANTENNA  BASE  /  GLONASS  MARKER   (=  RGP
reference point)
*GRAC_ARP : ANTENNA AXIS AT ARP (i.e. 0.0586 m above marker)
*GRAC_TCR : TOP OF CHOKE RING
*GRAS : (DOMES 10002M006) = GPS PILLAR BRASS MARK (= IGS reference point)
*GRAS_ITRF :
*GRAS_GPS  :
*GRAS_ARP : ANTENNA AXIS AT ARP (i.e. 0.0350 m above marker)
*GRAS_TCR : TOP OF CHOKE RING

*POINTS OF INTEREST
*VLBI : (DOMES 10002M003) = VLBI Mobile mark 1989 = (CDP number 7605)
*GRSF : (DOMES 10002M004) = concrete Slab /25 mm brass mark = (CDP number 7846)
*SELF : (DOMES 10002M008) = SELF 2 mark
*GR3B : (DOMES 10002S018) = DORIS (T2L2 project Ant. Starec Ref. Pt.)

*FORMER POINTS
*GRSL : (DOMES 10002S001) = SLR IAR (CDP number 7835) = int. of the rot. axis of the telescope (=
System Ref. Pt.)
*GRAA : (DOMES 10002S014) = DORIS Ant. Ref. Pt. (Alcatel type)
*GR2B : (DOMES 10002S016) = DORIS antenna ref. pt. (Starec type)

*MARKERS
*DORIS_mark : nail below the DORIS antennas
*500  : geodetic marker


*TEMPORARY MARKS (or TEMPORARY STATIONS)

*GRAF_PRI : prism on the FTLRS telescope base (different height than GRAF)

*GRSM_plate : horizontal special Laser MeO device used as support of our translation stage
*GRSM_L   : top of a special device for levelling (2 cm half sphere) on the GRSM plate
*GRSM_PRI : prism on the translation stage centred on the Laser MeO vertical axis

*100_ARP : AXIS at ARP of the GPS Leica AT504 CHOKE RING Antenna
*100_ITA : theodolite (Intersection of the Theodolite rotation Axes)
*100_PRI : prism (same PRIsm height than theodolite)
*200_ARP : AXIS at ARP of the GPS Leica AT504 CHOKE RING Antenna
*200_ITA : theodolite (Intersection of the Theodolite rotation Axes)
*200_PRI : prism (same PRIsm height than theodolite)
*VLBI_ITA : theodolite (Intersection of the Theodolite rotation Axes)
*VLBI_PRI : prism (same PRIsm height than theodolite)
*GRSF_ITA : theodolite (Intersection of the Theodolite rotation Axes)
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*GRSF_PRI : prism (same PRIsm height than theodolite)
*500_ITA : theodolite (Intersection of the Theodolite rotation Axes)
*500_PRI : prism (same PRIsm height than theodolite)
*600_ITA : theodolite (Intersection of the Theodolite rotation Axes)
*600_PRI : prism (same PRIsm height than theodolite)
*SELF_ITA : theodolite (Intersection of the Theodolite rotation Axes)
*SELF_PRI : prism (same PRIsm height than theodolite)
*10_ITA : theodolite (Intersection of the Theodolite rotation Axes)
*10_PRI : prism (same PRIsm height than theodolite)
*11_ITA : theodolite (Intersection of the Theodolite rotation Axes)
*11_PRI : prism (same PRIsm height than theodolite)
*12_ITA : theodolite (Intersection of the Theodolite rotation Axes)
*12_PRI : prism (same PRIsm height than theodolite)
*13_ITA : theodolite (Intersection of the Theodolite rotation Axes)
*13_PRI : prism (same PRIsm height than theodolite)

*GR3B/2GHz   : DORIS at 2 GHz phase centre
*GR3B/400MHz : DORIS at 400 MHz phase centre


*******LEVELLING POINTS DESCRIPTIONS*********
*VLBI_L : top of a special device for levelling (2 cm half sphere) on the VLBI marker
*GRSM_L : top of a special device for levelling (2 cm half sphere) on the special plate on top of
the Laser MeO
*GRAF_L : top of SPIGOT on the FTLRS telescope base
*GR3B_plate : top of the DORIS (GR3B) antenna triangular base plate (= antenna base)
*3000 and 20000 : temporary levelling markers



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 GFIL C:\Program Files\Microsearch\GeoLab\EGM96.gsp



***********************************POINTS COORDINATES***************************************

*FORCED ITRF2005 EPOCH 2009:238 COORDINATES

 3DC
 XYZ  000 GRAS                4581690.841         556114.923        4389360.851 m  0
 COV  CT DIAG
 ELEM                0.000001                0.000001                0.000001


***********************************CENTRING EQUATIONS*****************************************

*GRAC_ARP centred and 0.0586 m above GRAC
*GRAC_TCR centred and 0.1008 m above GRAC_ARP with ASHTECH700936F_C
 3DD
 PLH  000 GRAC_TCR     N 43 45  16.16424 E  6 55  14.76230    1319.9594 m       0
 PLH  000 GRAC_ARP     N 43 45  16.16424 E  6 55  14.76230    1319.8586 m       0
 COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
 ELEM              0.00000016              0.00000016              0.00000016

 3DD
 PLH  000 GRAC_ARP     N 43 45  16.16424 E  6 55  14.76230    1319.8586 m       0
 PLH  000 GRAC         N 43 45  16.16424 E  6 55  14.76230    1319.8000 m       0
 COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
 ELEM              0.00000016              0.00000016                0.000001


*GRAS_ARP centred and 0.0350 m above GRAS
*GRAS_TCR centred and 0.1006 m above GRAS_ARP with ASHTECH701945E_M
 3DD
 PLH  000 GRAS         N 43 45  17.05800 E  6 55  14.06800    1319.3000 m       0
 PLH  000 GRAS_ARP     N 43 45  17.05800 E  6 55  14.06800    1319.3350 m       0
 PLH  000 GRAS_TCR     N 43 45  17.05800 E  6 55  14.06800    1319.4356 m       0
 COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
 ELEM              0.00000016              0.00000016              0.00000016
 ELEM              0.00000016              0.00000016              0.00000016


 3DD
 PLH  000 100_ARP      N 43 45  16.88500 E  6 55  19.30700    1321.0000 m       0
 PLH  000 100_ITA      N 43 45  16.88500 E  6 55  19.30700    1321.0503 m       0
 PLH  000 100_PRI      N 43 45  16.88500 E  6 55  19.30700    1321.0503 m       0
 COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
```

```
ELEM              0.00000016              0.00000016              0.00000009
ELEM              0.00000016              0.00000016              0.00000009

3DD
PLH  000 200_ARP      N 43 45  15.98500 E  6 55  16.97800    1320.5000 m       0
PLH  000 200_ITA      N 43 45  15.98500 E  6 55  16.97800    1320.5503 m       0
PLH  000 200_PRI      N 43 45  15.98500 E  6 55  16.97800    1320.5503 m       0
COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
ELEM              0.00000016              0.00000016              0.00000009
ELEM              0.00000016              0.00000016              0.00000009

3DD
PLH  000 GRSF         N 43 45  16.81100 E  6 55  14.93600    1319.0000 m       0
PLH  000 GRSF_ITA     N 43 45  16.81100 E  6 55  14.93600    1320.5283 m       0
PLH  000 GRSF_PRI     N 43 45  16.81100 E  6 55  14.93600    1320.5283 m       0
COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
ELEM                0.000001                0.000001                0.000001
ELEM                0.000001                0.000001                0.000001

3DD
PLH  000 VLBI         N 43 45  16.66500 E  6 55  14.52300    1319.0000 m       0
PLH  000 VLBI_L       N 43 45  16.66500 E  6 55  14.52300    1319.0200 m       0
PLH  000 VLBI_ITA     N 43 45  16.66500 E  6 55  14.52300    1320.4793 m       0
PLH  000 VLBI_PRI     N 43 45  16.66500 E  6 55  14.52300    1320.4793 m       0
COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
ELEM                0.000001                0.000001                0.000001
ELEM                0.000001                0.000001                0.000001
ELEM              0.00000001              0.00000001              0.00000004

3DD
PLH  000 500          N 43 45  18.37100 E  6 55  12.93700    1316.0000 m       0
PLH  000 500_ITA      N 43 45  18.37100 E  6 55  12.93700    1317.4723 m       0
PLH  000 500_PRI      N 43 45  18.37100 E  6 55  12.93700    1317.4723 m       0
COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
ELEM                0.000009                0.000009                0.000009
ELEM                0.000009                0.000009                0.000009

3DD
PLH  000 600_ITA      N 43 45  17.17300 E  6 55  16.57200    1323.8000 m       0
PLH  000 600_PRI      N 43 45  17.17300 E  6 55  16.57200    1323.8000 m       0
COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
ELEM              0.00000025              0.00000025              0.00000025


3DD
PLH  000 10_ITA       N 43 45  16.63700 E  6 55  17.82300   1323.53800 m       0
PLH  000 10_PRI       N 43 45  16.63700 E  6 55  17.82300   1323.53800 m       0
COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
ELEM              0.00000025              0.00000025              0.00000025

3DD
PLH  000 11_ITA       N 43 45  16.79800 E  6 55  17.73200   1323.70900 m       0
PLH  000 11_PRI       N 43 45  16.79800 E  6 55  17.73200   1323.70900 m       0
COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
ELEM              0.00000025              0.00000025              0.00000025

3DD
PLH  000 12_ITA       N 43 45  16.66100 E  6 55  17.84700   1323.54100 m       0
PLH  000 12_PRI       N 43 45  16.66100 E  6 55  17.84700   1323.54100 m       0
COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
ELEM              0.00000025              0.00000025              0.00000025

3DD
PLH  000 13_ITA       N 43 45  16.80500 E  6 55  17.67300   1323.51800 m       0
PLH  000 13_PRI       N 43 45  16.80500 E  6 55  17.67300   1323.51800 m       0
COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
ELEM              0.00000025              0.00000025              0.00000025


* The two Laser stations
 3DD
PLH  000 GRAF_PRI     N 43 45  16.83100 E  6 55  16.04000   1322.32000 m       0
PLH  000 GRAF         N 43 45  16.83100 E  6 55  16.04000   1322.21220 m       0
PLH  000 GRAF_L       N 43 45  16.83100 E  6 55  16.04000   1322.00000 m       0
COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
ELEM              0.00000025              0.00000025                0.000001
ELEM              0.00000025              0.00000025                0.000001
```

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 3DD
 PLH  000 GRSM_PRI     N 43 45  16.68100 E  6 55  17.67000   1324.37400 m       0
 PLH  000 GRSM_L       N 43 45  16.68100 E  6 55  17.67000   1324.02000 m       0
 PLH  000 GRSM_plate   N 43 45  16.68100 E  6 55  17.67000   1324.00000 m       0
 PLH  000 GRSM         N 43 45  16.68100 E  6 55  17.67000   1323.07910 m       0
*a point to check if the two axes intersect
 PLH  000 GRSM_plumb   N 43 45  16.68100 E  6 55  17.67000   1322.50000 m       0
 COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
 ELEM              0.00000025              0.00000025              0.000001
 ELEM              0.00000025              0.00000025              0.000001
 ELEM              0.00000025              0.00000025              0.000001
 ELEM              0.00000025              0.00000025              0.000001

 2DD
 PL   000 SELF         N 43 45  16.30100 E  6 55  14.39900
 PL   000 SELF_ITA     N 43 45  16.30100 E  6 55  14.39900
 PL   000 SELF_PRI     N 43 45  16.30100 E  6 55  14.39900
 COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
 ELEM              0.00000009              0.00000009              0.000001
 ELEM                0.000001

*Points for the Laser MeO horizontal axis
 2DD
 PL   000 512          N 43 45  16.65200 E  6 55  17.60300
 PL   000 51           N 43 45  16.65200 E  6 55  17.60300
 PL   000 52           N 43 45  16.65200 E  6 55  17.60300
 COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
 ELEM                0.000001                0.000001                0.000001
 ELEM                0.000001

 2DD
 PL   000 534          N 43 45  16.70300 E  6 55  17.72100
 PL   000 55           N 43 45  16.70300 E  6 55  17.72100
 PL   000 56           N 43 45  16.70300 E  6 55  17.72100
 COV  LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
 ELEM                0.000001                0.000001                0.000001
 ELEM                0.000001


 3DD
 PLH  000 GR3B/400MHz  N 43 45 17.401926 E  6 55 16.406888    1323.7169 m       0
 PLH  000 GR3B         N 43 45 17.401926 E  6 55 16.406888    1323.7169 m       0
 PLH  000 DORIS_mark   N 43 45 17.402376 E  6 55 16.406258    1322.1057 m       0
 COV  LG DIAG                    1
 ELEM                0.000009                0.000009                0.000009
 ELEM                0.000009                0.000009                0.000009


*********************************
* FORMER DORIS STATIONS
*********************************

* Report Lansman 91/fev
 3DD
 PLH  000 DORIS_mark   n 43 45 18.000000 e  6 55 16.160000    1217.0000
 PLH  000 GRAA         n 43 45 18.000000 e  6 55 16.160000    1218.2300
 COV  LG DIAG                    1
 ELEM                0.00003                 0.00003                 0.000001

* Report Gervaise 92/nov
 3DD
 PLH  000 DORIS_mark   n 43 45 17.991451 e  6 55 16.159770    1217.0000
 PLH  000 GR2B         n 43 45 17.991000 e  6 55 16.160400    1218.4720
 COV  LG DIAG                    1
 ELEM                0.000001                0.000001                0.000001


****************************** GPS OBSERVATIONS ********************************************

 HIST NEW

* SINEX imported from ADD4GRAS.SNX (Bernese 5.0)

 3DC
 XYZ      100_ARP            4581681.5952        556231.9030       4389358.1522 m       0
 XYZ      200_ARP            4581706.5930        556182.4353       4389337.7258 m       0
 XYZ      VLBI               4581697.4726        556125.9947       4389351.6122 m       0
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XYZ      GRSF              4581693.2877        556134.7849       4389354.8764 m       0
XYZ      500               4581664.0931        556086.2028       4389388.2170 m       0
XYZ      GRAS              4581690.8417        556114.9231       4389360.8502 m       0
COV  CT UPPR    0.00000    5.00000    0.00000    1.00000    0.00000    0.00000    1.00000 m
ELEM   3.781622596200400e-06   1.484779147307600e-07   1.162545142764900e-06 m
ELEM   2.283871095912200e-06   2.794458500208300e-09   1.292682814992500e-08 m
ELEM   2.350365947008200e-06   1.011581298133300e-08   6.067497098559900e-08 m
ELEM   2.350907728385600e-06   9.540653712263000e-09   6.129568893381800e-08 m
ELEM   2.282766845339200e-06   2.591359710566600e-09   1.208932881860900e-08 m
ELEM   2.270419599744000e-06   1.277410333330100e-09   3.408699906207000e-09 m
ELEM   2.427047966398600e-06   1.219350099825200e-07   3.391895378014000e-09 m
ELEM   2.253634197822800e-06   8.318434005525500e-10   1.050546267679100e-08 m
ELEM   2.259923780621700e-06   6.755472334767500e-09   9.928508675790299e-09 m
ELEM   2.259899511353700e-06   6.386535563918500e-09   3.092187076282800e-09 m
ELEM   2.253538629843900e-06   6.669046526299400e-10   2.086586903346900e-09 m
ELEM   2.252589923513400e-06   1.440326275662900e-10   0.000000000000000e+00 m
ELEM   3.503076761742600e-06   1.170475647628700e-08   2.492943467214500e-10 m
ELEM   2.279040614284200e-06   5.996772357541800e-08   5.765703354871400e-09 m
ELEM   2.330928794151700e-06   5.994429059183800e-08   5.316159439279900e-09 m
ELEM   2.331262994369200e-06   1.129122241804800e-08   1.755871598989300e-10 m
ELEM   2.278639835389600e-06   3.017408028353400e-09  -6.292382267629900e-10 m
ELEM   2.270158369013300e-06   0.000000000000000e+00   0.000000000000000e+00 m
ELEM   3.395494050916300e-06   1.095400834777600e-07   8.564240723724000e-07 m
ELEM   2.404949767566000e-06   1.684561443026900e-08   1.011378436621400e-07 m
ELEM   2.406140129612300e-06   1.749575950555700e-08   1.021269687712900e-07 m
ELEM   2.614590603105500e-06   3.895713246998200e-08   2.615260245652000e-07 m
ELEM   2.270804030790500e-06   1.934347432493200e-09   2.715305787898100e-09 m
ELEM   2.367948232514300e-06   9.260222440700199e-08   1.700995038065300e-08 m
ELEM   2.267632172698000e-06   1.225652444749800e-08   1.778406163965300e-08 m
ELEM   2.267687109161200e-06   1.298873787939100e-08   3.917066857223200e-08 m
ELEM   2.290071549528800e-06   3.214584558647200e-08   2.050984443298200e-09 m
ELEM   2.252480049536900e-06   1.643464635025700e-10   0.000000000000000e+00 m
ELEM   3.188173698070000e-06   1.021971442349200e-07   1.179839611049300e-08 m
ELEM   2.374922780781400e-06   1.029650536075100e-07   1.230412346931000e-08 m
ELEM   2.375677751768500e-06   2.621432147272000e-07   3.235793879927600e-08 m
ELEM   2.547772807223800e-06   3.388740207300400e-09  -3.600895752769100e-11 m
ELEM   2.269521014461200e-06   0.000000000000000e+00   0.000000000000000e+00 m
ELEM   3.488452051670100e-06   1.312009528783300e-07   9.307304559056500e-07 m
ELEM   2.637353756750800e-06   4.117392180209700e-08   2.809556955750900e-07 m
ELEM   2.398483817532100e-06   1.555017177707600e-08   9.637012920335100e-08 m
ELEM   2.270535423331400e-06   1.989457738428800e-09   3.244870034549500e-09 m
ELEM   2.382790768451400e-06   1.070234318787500e-07   4.177164010000500e-08 m
ELEM   2.292649310754300e-06   3.507911983564900e-08   1.503093023949100e-08 m
ELEM   2.266699789148400e-06   1.008254142929900e-08   2.078314648814800e-09 m
ELEM   2.252676611563100e-06   2.813614600527900e-10   0.000000000000000e+00 m
ELEM   3.269977681336300e-06   2.806529346637800e-07   3.435596925132700e-08 m
ELEM   2.567610786476900e-06   9.542180556779500e-08   1.067317996948900e-08 m
ELEM   2.369083357960100e-06   3.088067425461500e-09   2.407240746524600e-10 m
ELEM   2.270111173402600e-06   0.000000000000000e+00   0.000000000000000e+00 m
ELEM   3.559692869626800e-06   1.346005989662200e-07   9.969637175924400e-07 m
ELEM   2.399561349033100e-06   1.629093436015200e-08   9.703588682957500e-08 m
ELEM   2.270620819299300e-06   2.029625938454800e-09   3.166233934559800e-09 m
ELEM   2.387128256654600e-06   1.147837874394200e-07   1.566090247282100e-08 m
ELEM   2.266746418150500e-06   1.056715647971400e-08   2.074656433246300e-09 m
ELEM   2.252726672326000e-06   2.394111708848800e-10   0.000000000000000e+00 m
ELEM   3.354483389245300e-06   9.632385568339100e-08   1.136876617417700e-08 m
ELEM   2.369745714731500e-06   3.190557999549700e-09   3.567067518167500e-10 m
ELEM   2.269934132436000e-06   0.000000000000000e+00   0.000000000000000e+00 m
ELEM   3.357503164641200e-06   1.273732733378500e-07   8.217903209313900e-07 m
ELEM   2.270272341798300e-06   1.780619515354600e-09   2.835527305052700e-09 m
ELEM   2.369314947372700e-06   1.030234497221600e-07   1.977779271903300e-09 m
ELEM   2.252462564000900e-06   2.403533211420200e-10   0.000000000000000e+00 m
ELEM   3.140426491296000e-06   3.071885711110100e-09  -5.329045143735400e-11 m
ELEM   2.269667070885000e-06   0.000000000000000e+00   0.000000000000000e+00 m
ELEM   2.270859322524900e-06   2.098810029256900e-09   3.116523445646100e-09 m
ELEM   2.252737597020600e-06   3.699018192512700e-10   0.000000000000000e+00 m
ELEM   2.270347808189600e-06   0.000000000000000e+00   0.000000000000000e+00 m


VSCA             900

3DD
DXYZ     GRAS          GRAC              17.4584       17.7911      -19.5284 m
COV  CT UPPR    0.00000    0.15468    0.00000    0.00000    0.00000    0.00000    0.00000
ELEM   1.200000000000000e-07   1.000000000000000e-08   7.000000000000000e-08 m
ELEM   3.000000000000000e-08   1.000000000000000e-08   0.000000000000000e+00 m
ELEM   1.000000000000000e-07   0.000000000000000e+00   0.000000000000000e+00 m
3DD
```

```
 DXYZ     GRAS         GRAC              17.4590       17.7909      -19.5274 m
 COV  CT UPPR    0.00000    0.15777    0.00000    0.00000    0.00000    0.00000    0.00000
 ELEM   1.100000000000000e-07   1.000000000000000e-08   5.999999999999999e-08 m
 ELEM   2.000000000000000e-08   0.000000000000000e+00   0.000000000000000e+00 m
 ELEM   9.000000000000000e-08   0.000000000000000e+00   0.000000000000000e+00 m

 VSCA               1


*GPS BASELINE ISSUED FROM CNES/SALP DORIS 2009 REPORT
*3DD
*DXYZ     GRAS         GR3B             -10.4407       51.4587       10.6947
*COV  CT DIAG                    160
*ELEM              0.00000001              0.00000001              0.00000001

 HIST GEN GPS baselines


*****************************************TOPOMETRIC SURVEY***********************************

 HORIZONTAL ANGLES

 SIGM AH           6
 SIGM AJ          10
 HIST NEW

 DSET AJ
 DIR      600_ITA      500_PRI                    0  0     0.0
 DIR      600_ITA      GRAC_ARP                 331 12    17.0         50
 DIR      600_ITA      GRAS_ARP                 368 82    39.0
 DIR      600_ITA      GRAF_PRI                 326 74    12.0
 DIR      600_ITA      GRSM_PRI                 208  3    71.0
 DIR      600_ITA      100_PRI                  181 99    15.0
 DIR      600_ITA      200_PRI                  257 36     8.0         15
 DIR      600_ITA      GR3B/2GHz                 42 16    22.0
 DIR      600_ITA      GR3B/400MHz               42 15    37.0
 DSET AH
 DIR      100_ITA      500_PRI                    0  0     0.0
 DIR      100_ITA      600_PRI                  389 34    74.0
 DIR      100_ITA      GR3B/2GHz                395 52    51.0
 DIR      100_ITA      GR3B/400MHz              395 52    44.0
 DIR      100_ITA      GRSM_PRI                 369 34    72.0
 DIR      100_ITA      200_PRI                  348 98    89.0
 DSET AH
 DIR      GRSF_ITA     500_PRI                   63 91    34.0
 DIR      GRSF_ITA     VLBI_PRI                 382 64     7.0
 DSET AH
 DIR      GRSF_ITA     GRAS_ARP                  35 42    85.0
 DIR      GRSF_ITA     500_PRI                   63 91    25.0
 DIR      GRSF_ITA     GRAF_PRI                 209 91    76.0
 DIR      GRSF_ITA     200_PRI                  243 94    42.0
 DIR      GRSF_ITA     GRAC_ARP                 323 73     4.0
 DIR      GRSF_ITA     SELF_PRI                 353  7    68.0
 DSET AJ
 DIR      SELF_ITA     500_PRI                   81  9    75.0
 DIR      SELF_ITA     GRAF_PRI                 184 51    43.0
 DIR      SELF_ITA     GRSM_PRI                 201  9     9.0
 DIR      SELF_ITA     200_PRI                  221 87    89.0
 DIR      SELF_ITA     GRSF_PRI                 152 73    72.0
 DIR      SELF_ITA     GR3B/2GHz                169 98    73.0
 DIR      SELF_ITA     GRAC_ARP                 241 36    29.0
 DIR      SELF_ITA     GRAS_ARP                  91 67    31.0
 DSET AJ
 DIR      SELF_ITA     VLBI_PRI                 126 72    13.0
 DIR      SELF_ITA     GRSM_PRI                 201  9    12.0
 DIR      SELF_ITA     GRAF_PRI                 184 51    57.0
 DSET AH
 DIR      200_ITA      100_PRI                  179 53    58.0
 DIR      200_ITA      SELF_PRI                  21 39    25.0
 DIR      200_ITA      500_PRI                   54 24    55.0
 DIR      200_ITA      600_PRI                   95 26    46.0
 DIR      200_ITA      VLBI_PRI                  33 96    33.0
 DIR      200_ITA      GRSM_PRI                 150 46    16.0
 DIR      200_ITA      GRSF_PRI                  43 11    90.0
 DIR      200_ITA      GRAC_ARP                  17 86    24.0
 DIR      200_ITA      GRAS_ARP                  40 69    11.0
 DIR      200_ITA      GRAF_PRI                  67 61    25.0
 DIR      200_ITA      GR3B/2GHz                 92 62    29.0
```

```
 DIR      200_ITA      GR3B/400MHz              92 62    26.0
 DSET AH
 DIR      VLBI_ITA     200_PRI                 234 71    89.0
 DIR      VLBI_ITA     SELF_PRI                326 99     2.0
 DIR      VLBI_ITA     500_PRI                  73 73     6.0
 DIR      VLBI_ITA     GRAF_PRI                201 91     3.0
 DIR      VLBI_ITA     GRSM_PRI                211  1    92.0
 DIR      VLBI_ITA     GRAC_ARP                290 13    67.0
 DIR      VLBI_ITA     GRAS_ARP                 67  2    47.0
 DIR      VLBI_ITA     GR3B/2GHz               179 95    71.0
 DSET AH
 DIR      VLBI_ITA     500_PRI                  73 73    11.0
 DIR      VLBI_ITA     GRSF_PRI                182 57    13.0
 DIR      VLBI_ITA     200_PRI                 234 71    89.0
 DSET AH
 DIR      500_ITA      100_PRI                   0  0     0.0
 DIR      500_ITA      GR3B/2GHz                 3 59    36.0
 DIR      500_ITA      GR3B/400MHz               3 59    52.0
 DIR      500_ITA      GRSM_PRI                  9 31    52.0
 DIR      500_ITA      200_PRI                  23 70     0.0
 DIR      500_ITA      600_PRI                   7 35    50.0
 DIR      500_ITA      GRSF_PRI                 32 54    26.0
 DIR      500_ITA      VLBI_PRI                 42 43     5.0
 DIR      500_ITA      GRAS_ARP                 44 65    24.0
 DIR      500_ITA      GRAC_ARP                 45 76    51.0
 DIR      500_ITA      SELF_PRI                 50  6    50.0
 DSET AJ
 DIR      SELF_ITA     GRSM_PRI                201  9    15.0
 DIR      SELF_ITA     10_PRI                  202 64    19.0
 DIR      SELF_ITA     200_PRI                 221 87    95.0
 DIR      SELF_ITA     500_PRI                  81  9    81.0
 DIR      SELF_ITA     512                     201 65    51.0
 DIR      SELF_ITA     600_PRI                 179  4    23.0
 DSET AH
 DIR      200_ITA      500_PRI                  54 24    58.0
 DIR      200_ITA      600_PRI                  95 26    46.0
 DIR      200_ITA      100_PRI                 179 53    59.0
 DIR      200_ITA      10_PRI                  158 70    32.0
 DIR      200_ITA      512                     148 67    12.0
 DIR      200_ITA      GRSM_PRI                150 46    10.0
 DIR      200_ITA      GRAF_PRI                 67 61    19.0
 DSET AJ
 DIR      600_ITA      500_PRI                  38 83    41.0
 DIR      600_ITA      GRAF_PRI                365 57    58.0
 DIR      600_ITA      200_PRI                 296 19    84.0
 DIR      600_ITA      11_PRI                  238 34    28.0
 DIR      600_ITA      100_PRI                 220 82    60.0
 DIR      600_ITA      GRSM_PRI                246 86    89.0
 DIR      600_ITA      512                     250 38    11.0
 DSET AJ
 DIR      11_ITA       GRAF_PRI                 12 98    64.0
 DIR      11_ITA       600_PRI                  37 94    75.0
 DIR      11_ITA       100_PRI                 206 41    25.0
 DIR      11_ITA       10_PRI                  286 60     2.0
 DIR      11_ITA       GRSM_PRI                334 68    44.0
*pb pt 534 not well defined
 DIR      11_ITA       534                     316 73    43.0        260
 DSET AJ
 DIR      10_ITA       200_PRI                 359 11    25.0
 DIR      10_ITA       100_PRI                 196 71    61.0
 DIR      10_ITA       11_PRI                   86 47    14.0
 DIR      10_ITA       GRSM_PRI                 35 28    33.0
 DIR      10_ITA       534                      57 66    21.0        260
 DSET AH
 DIR      100_ITA      500_PRI                   0  0     0.0
 DIR      100_ITA      600_PRI                 389 34    76.0
 DIR      100_ITA      10_PRI                  365 76    12.0
 DIR      100_ITA      GRSM_PRI                369 34    78.0
 DIR      100_ITA      200_PRI                 348 98    96.0
 DIR      100_ITA      11_PRI                  375 32    72.0
 DSET AJ
 DIR      12_ITA       GRSM_PRI                 20 94    73.0
 DIR      12_ITA       11_PRI                   76 29    33.0
 DIR      12_ITA       534                      38 44    13.0        260
 DIR      12_ITA       200_PRI                 358 87    89.0
 DIR      12_ITA       100_PRI                 197 88    58.0
 DSET AJ
 DIR      11_ITA       GRSM_PRI                334 68    48.8
```

```
 DIR      11_ITA       600_PRI                37 94    58.2
 DIR      11_ITA       534                   316 68    44.5        260
 DIR      11_ITA       100_PRI               206 41    11.3
 DIR      11_ITA       GRAF_PRI               12 98    56.0
 DSET AJ
 DIR      13_ITA       GRSM_PRI              312 30    66.4
 DIR      13_ITA       GRAF_PRI               12 65    69.9
 DIR      13_ITA       600_PRI                38 72    93.9
 DIR      13_ITA       534                   290 28    53.4        260
 DIR      13_ITA       100_PRI               206 99    93.7
*DSET AH
*DIR      13_ITA       61                    392 35    47.7
*DIR      13_ITA       62                    392 69    11.9
 DIR      13_ITA       GRAC_ARP              392 52    29.8

 HIST GEN Horizontal Directions


 VERTICAL ANGLES

 SIGM ZA          10
 SIGM ZB          15
 HIST NEW

 ZANG ZA  600_ITA      500_PRI              +104 10    23.0
 ZANG ZB  600_ITA      GRAC_ARP             +104 81     3.0
 ZANG ZB  600_ITA      GRAS_ARP             +105  3    20.0
 ZANG ZA  600_ITA      GRAF_PRI             +105 98    75.0
 ZANG ZA  600_ITA      GRSM_PRI             + 98 12    88.0
 ZANG ZA  600_ITA      100_PRI              +102 81    66.0
 ZANG ZA  600_ITA      200_PRI              +105 46    54.0
 ZANG ZA  600_ITA      GR3B/2GHz            + 96 94    56.0
 ZANG ZA  600_ITA      GR3B/400MHz          +100 72     9.0
 ZANG ZA  100_ITA      500_PRI              +101 28    88.0
 ZANG ZA  100_ITA      600_PRI              + 97 18    42.0
 ZANG ZA  100_ITA      GR3B/2GHz            + 97  2    82.0
 ZANG ZA  100_ITA      GR3B/400MHz          + 97 48     0.0
 ZANG ZA  100_ITA      GRSM_PRI             + 93 87    61.0
 ZANG ZA  100_ITA      200_PRI              +100 55    50.0
 ZANG ZA  GRSF_ITA     500_PRI              +102 10    24.0
 ZANG ZA  GRSF_ITA     VLBI_PRI             +100 44    10.0
 ZANG ZA  GRSF_ITA     GRAS_ARP             +102 59    60.0
 ZANG ZA  GRSF_ITA     500_PRI              +102 10    38.0
 ZANG ZA  GRSF_ITA     GRAF_PRI             + 94 61    82.0
 ZANG ZA  GRSF_ITA     200_PRI              + 99 58    28.0
 ZANG ZA  GRSF_ITA     GRAC_ARP             +100 83    95.0
 ZANG ZA  GRSF_ITA     SELF_PRI             +100 20     2.0
 ZANG ZA  SELF_ITA     500_PRI              +101 87    17.0
 ZANG ZA  SELF_ITA     GRAF_PRI             + 96 59     0.0
 ZANG ZA  SELF_ITA     GRSM_PRI             + 96 13    61.0
 ZANG ZA  SELF_ITA     200_PRI              + 99 55    94.0
 ZANG ZA  SELF_ITA     GRSF_PRI             + 99 80     3.0
 ZANG ZB  SELF_ITA     GR3B/2GHz            + 95 44    44.0
 ZANG ZA  SELF_ITA     GRAC_ARP             +101 42    78.0
 ZANG ZA  SELF_ITA     GRAS_ARP             +102  4    98.0
 ZANG ZA  SELF_ITA     VLBI_PRI             +100  4    85.0
 ZANG ZA  SELF_ITA     GRSM_PRI             + 96 13    64.0
 ZANG ZA  SELF_ITA     GRAF_PRI             + 96 58    98.0
 ZANG ZA  200_ITA      100_PRI              + 99 44    70.0
 ZANG ZA  200_ITA      SELF_PRI             +100 44    22.0
 ZANG ZA  200_ITA      500_PRI              +101 37    40.0
 ZANG ZA  200_ITA      600_PRI              + 94 53    45.0
 ZANG ZA  200_ITA      VLBI_PRI             +100 44    96.0
 ZANG ZA  200_ITA      GRSM_PRI             + 90 22    61.0
 ZANG ZA  200_ITA      GRSF_PRI             +100 41    80.0
 ZANG ZA  200_ITA      GRAC_ARP             +100 77    99.0
 ZANG ZA  200_ITA      GRAS_ARP             +101  4    25.0
 ZANG ZA  200_ITA      GRAF_PRI             + 96 68     8.0
 ZANG ZA  200_ITA      GR3B/2GHz            + 94 93    43.0
 ZANG ZB  200_ITA      GR3B/400MHz          + 95 59     9.0
 ZANG ZA  VLBI_ITA     200_PRI              + 99 55    23.0
 ZANG ZA  VLBI_ITA     SELF_PRI             + 99 95    16.0
 ZANG ZA  VLBI_ITA     500_PRI              +102 10    60.0
 ZANG ZA  VLBI_ITA     GRAF_PRI             + 95 98    94.0
 ZANG ZA  VLBI_ITA     GRSM_PRI             + 95 92    46.0
 ZANG ZA  VLBI_ITA     GRAC_ARP             +100 76    80.0
 ZANG ZA  VLBI_ITA     GRAS_ARP             +103 13    14.0
 ZANG ZA  VLBI_ITA     500_PRI              +102 10    57.0
```

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 ZANG ZA  VLBI_ITA     GRSF_PRI                + 99 55    86.0
 ZANG ZA  VLBI_ITA     200_PRI                 + 99 55    25.0
 ZANG ZA  500_ITA      100_PRI                 + 98 71    41.0
 ZANG ZA  500_ITA      GR3B/2GHz               + 95 30    40.0
 ZANG ZA  500_ITA      GR3B/400MHz             + 95 66    42.0
 ZANG ZA  500_ITA      GRSM_PRI                + 96 43    81.0
 ZANG ZA  500_ITA      200_PRI                 + 98 62    95.0
 ZANG ZA  500_ITA      600_PRI                 + 95 89    80.0
 ZANG ZA  500_ITA      GRSF_PRI                + 97 89    90.0
 ZANG ZA  500_ITA      VLBI_PRI                + 97 89    61.0
 ZANG ZA  500_ITA      GRAS_ARP                + 98 24    10.0
 ZANG ZA  500_ITA      GRAC_ARP                + 98 47    49.0
 ZANG ZA  500_ITA      SELF_PRI                + 98 13     8.0
 ZANG ZA  SELF_ITA     GRSM_PRI                + 96 13    68.0
 ZANG ZA  SELF_ITA     10_PRI                  + 97 21    34.0
 ZANG ZA  SELF_ITA     200_PRI                 + 99 56     2.0
 ZANG ZA  SELF_ITA     500_PRI                 +101 87     8.0
 ZANG ZA  SELF_ITA     600_PRI                 + 95 81    85.0
 ZANG ZA  200_ITA      500_PRI                 +101 37    34.0
 ZANG ZA  200_ITA      600_PRI                 + 94 53    39.0
 ZANG ZA  200_ITA      100_PRI                 + 99 44    63.0
 ZANG ZA  200_ITA      10_PRI                  + 93 15    43.0
 ZANG ZA  200_ITA      GRSM_PRI                + 90 22    63.0
 ZANG ZA  200_ITA      GRAF_PRI                + 96 68     7.0
 ZANG ZA  600_ITA      500_PRI                 +104 10    32.0
 ZANG ZA  600_ITA      GRAF_PRI                +105 98    82.0
 ZANG ZA  600_ITA      200_PRI                 +105 46    59.0
 ZANG ZA  600_ITA      11_PRI                  +100 21    90.0
 ZANG ZA  600_ITA      100_PRI                 +102 81    71.0
 ZANG ZA  600_ITA      GRSM_PRI                + 98 13     3.0
 ZANG ZA  11_ITA       GRAF_PRI                +102 35    75.0
 ZANG ZA  11_ITA       600_PRI                 + 99 78    17.0
 ZANG ZA  11_ITA       100_PRI                 +104 74    56.0
 ZANG ZA  11_ITA       10_PRI                  +102  3    45.0
 ZANG ZA  11_ITA       GRSM_PRI                + 84 69    22.0
 ZANG ZB  11_ITA       534                     +107 51    93.0
 ZANG ZA  10_ITA       200_PRI                 +106 84    76.0
 ZANG ZA  10_ITA       100_PRI                 +104 60     6.0
 ZANG ZA  10_ITA       11_PRI                  + 97 96    13.0
 ZANG ZA  10_ITA       GRSM_PRI                + 81 19    81.0
 ZANG ZB  10_ITA       534                     +103 68    48.0
 ZANG ZA  100_ITA      500_PRI                 +101 28    92.0
 ZANG ZA  100_ITA      600_PRI                 + 97 18    45.0
 ZANG ZA  100_ITA      10_PRI                  + 95 39    90.0
 ZANG ZA  100_ITA      GRSM_PRI                + 93 87    66.0
 ZANG ZA  100_ITA      200_PRI                 +100 55    55.0
 ZANG ZA  100_ITA      11_PRI                  + 95 25    42.0
 ZANG ZA  12_ITA       GRSM_PRI                + 82 73     5.0
 ZANG ZB  12_ITA       11_PRI                  + 97 82    97.0         30
 ZANG ZB  12_ITA       534                     +103 69    91.0
 ZANG ZA  12_ITA       200_PRI                 +106 63    78.0
 ZANG ZA  12_ITA       100_PRI                 +104 70    30.0
 ZANG ZA  11_ITA       GRSM_PRI                + 84 69     8.1
 ZANG ZA  11_ITA       600_PRI                 + 99 78     2.5
 ZANG ZA  11_ITA       100_PRI                 +104 74    43.7
 ZANG ZA  11_ITA       GRAF_PRI                +102 35    65.8
 ZANG ZA  13_ITA       GRSM_PRI                + 81 63    42.2
 ZANG ZA  13_ITA       GRAF_PRI                +102 11     3.1
 ZANG ZA  13_ITA       600_PRI                 + 99 32    14.6
 ZANG ZA  13_ITA       100_PRI                 +104 24    66.1

 HIST GEN Zenith Angles

*DISTANCES

 SIGM DI       0.001
 HIST NEW

 DIST DI  600_ITA      500_PRI                   89.5434
 DIST DI  600_ITA      GRAF_PRI                  15.9855
 DIST DI  600_ITA      GRSM_PRI                  28.8875
 DIST DI  600_ITA      100_PRI                   61.9035
 DIST DI  600_ITA      200_PRI                   37.9165
 DIST DI  100_ITA      500_PRI                  149.7712
 DIST DI  100_ITA      600_PRI                   61.9031
 DIST DI  100_ITA      GRSM_PRI                  37.3423
 DIST DI  100_ITA      200_PRI                   59.0681
 DIST DI  GRSF_ITA     500_PRI                   65.7653
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DIST DI  GRSF_ITA     VLBI_PRI              10.2660
DIST DI  GRSF_ITA     500_PRI               65.7657
DIST DI  GRSF_ITA     GRAF_PRI              24.7900
DIST DI  GRSF_ITA     200_PRI               52.3330
DIST DI  GRSF_ITA     SELF_PRI              19.7954
DIST DI  SELF_ITA     500_PRI               71.8162
DIST DI  SELF_ITA     GRAF_PRI              40.2492
DIST DI  SELF_ITA     GRSM_PRI              74.2750
DIST DI  SELF_ITA     200_PRI               58.5384
DIST DI  SELF_ITA     GRSF_PRI              19.7948
DIST DI  SELF_ITA     VLBI_PRI              11.5684
DIST DI  SELF_ITA     GRSM_PRI              74.2752
DIST DI  SELF_ITA     GRAF_PRI              40.2493
DIST DI  200_ITA      100_PRI               59.0687
DIST DI  200_ITA      SELF_PRI              58.5387
DIST DI  200_ITA      500_PRI              116.6591
DIST DI  200_ITA      600_PRI               37.9164
DIST DI  200_ITA      VLBI_PRI              58.8027
DIST DI  200_ITA      GRSM_PRI              26.8116
DIST DI  200_ITA      GRSF_PRI              52.3328
DIST DI  200_ITA      GRAF_PRI              33.5724
DIST DI  VLBI_ITA     200_PRI               58.8010
DIST DI  VLBI_ITA     SELF_PRI              11.5684
DIST DI  VLBI_ITA     500_PRI               63.5508
DIST DI  VLBI_ITA     GRAF_PRI              34.3728
DIST DI  VLBI_ITA     GRSM_PRI              70.5571
DIST DI  VLBI_ITA     500_PRI               63.5530
DIST DI  VLBI_ITA     GRSF_PRI              10.2660
DIST DI  VLBI_ITA     200_PRI               58.8030
DIST DI  500_ITA      100_PRI              149.7710
DIST DI  500_ITA      GRSM_PRI             118.2440
DIST DI  500_ITA      200_PRI              116.6585
DIST DI  500_ITA      600_PRI               89.5437
DIST DI  500_ITA      GRSF_PRI              65.7655
DIST DI  500_ITA      VLBI_PRI              63.5527
DIST DI  500_ITA      SELF_PRI              71.8162
DIST DI  SELF_ITA     GRSM_PRI              74.2742
DIST DI  SELF_ITA     10_PRI                77.3894
DIST DI  SELF_ITA     200_PRI               58.5388
DIST DI  SELF_ITA     500_PRI               71.8158
DIST DI  SELF_ITA     600_PRI               55.7002
DIST DI  200_ITA      500_PRI              116.6579
DIST DI  200_ITA      600_PRI               37.9165
DIST DI  200_ITA      100_PRI               59.0681
DIST DI  200_ITA      10_PRI                27.7780
DIST DI  200_ITA      GRSM_PRI              26.8110
DIST DI  200_ITA      GRAF_PRI              33.5721
DIST DI  600_ITA      500_PRI               89.5427
DIST DI  600_ITA      GRAF_PRI              15.9855
DIST DI  600_ITA      200_PRI               37.9167
DIST DI  600_ITA      11_PRI                28.4170
DIST DI  600_ITA      100_PRI               61.9026
DIST DI  600_ITA      GRSM_PRI              28.8868
DIST DI  11_ITA       GRAF_PRI              37.9213
DIST DI  11_ITA       600_PRI               28.4174
DIST DI  11_ITA       100_PRI               35.4454
DIST DI  11_ITA       10_PRI                 5.3634
DIST DI  11_ITA       GRSM_PRI               3.9751
DIST DI  10_ITA       200_PRI               27.7782
DIST DI  10_ITA       100_PRI               34.1786
DIST DI  10_ITA       11_PRI                 5.3634
DIST DI  10_ITA       GRSM_PRI               3.8417
DIST DI  100_ITA      500_PRI              149.7701
DIST DI  100_ITA      600_PRI               61.9026
DIST DI  100_ITA      10_PRI                34.1789
DIST DI  100_ITA      GRSM_PRI              37.3428
DIST DI  100_ITA      200_PRI               59.0681
DIST DI  100_ITA      11_PRI                35.4457
DIST DI  12_ITA       GRSM_PRI               4.1599
DIST DI  12_ITA       11_PRI                 4.9420
DIST DI  12_ITA       200_PRI               28.6922
DIST DI  12_ITA       100_PRI               33.4865
DIST DI  11_ITA       GRSM_PRI               3.97478
DIST DI  11_ITA       600_PRI               28.41796
DIST DI  11_ITA       100_PRI               35.44553
DIST DI  11_ITA       GRAF_PRI              37.92129
DIST DI  13_ITA       GRSM_PRI               3.99993
DIST DI  13_ITA       GRAF_PRI              36.58363
```

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 DIST DI  13_ITA       600_PRI                          27.11536
 DIST DI  13_ITA       100_PRI                          36.73493


 HIST GEN Distances

*****************************************SPIRIT LEVELLING************************************

 VSCA               1

 HIST NEW

 OHDF     GRSF         VLBI_L                         -0.00018    0.00010
 OHDF     VLBI_L       SELF                           -0.10580    0.00010
 OHDF     SELF         VLBI_L                          0.10581    0.00010
 OHDF     VLBI_L       GRSF                            0.00015    0.00010
 OHDF     GRSF         GRAC_TCR                        1.36112    0.00010
 OHDF     GRAC_TCR     GRSF                           -1.36112    0.00010
 OHDF     GRSF         GRAS_TCR                        0.77754    0.00010
 OHDF     GRAS_TCR     GRSF                           -0.77754    0.00010
 OHDF     GRSF         GRAF_L                          3.30092    0.00020
 OHDF     GRAF_L       DORIS_mark                      0.12050    0.00017
 OHDF     DORIS_mark   3000                            0.00800    0.00010
 OHDF     3000         GR3B_plate                      1.21220    0.00010
 OHDF     GR3B_plate   3000                           -1.21220    0.00010
*height of DORIS Ref. Pt issued from constructor value
 OHDF     GR3B_plate   GR3B                            0.39100    0.00100
 OHDF     3000         56                              1.04701    0.00017
 OHDF     56           55                              0.40032    0.00010
*OHDF     55           56                             -0.40032    0.00010
*OK to get the horizontal axis height (Nasmyth pillar side)
 OHDF     55           534                            -0.20016    0.00010
 OHDF     534          56                             -0.20016    0.00010
 OHDF     56           20000                          -0.23445    0.00010
 OHDF     20000        GRSM_L                          1.37594    0.00017
 OHDF     GRSM_L       51                             -1.01557    0.00020
 OHDF     51           52                              0.14984    0.00010
*OHDF     52           51                             -0.14983    0.00010
*OK to get the horizontal axis height (Motor pillar side)
 OHDF     52           512                            -0.07492    0.00010
 OHDF     512          51                             -0.07492    0.00010
 OHDF     51           20000                          -0.36029    0.00017
 OHDF     20000        3000                           -0.81251    0.00017
 OHDF     3000         GRAF_L                         -0.12886    0.00010
 OHDF     GRAF_L       GRSF                           -3.30059    0.00020

 HIST GEN Spirit Levelling

 HIST ALL All Observations

 END
```

6.9.Grasse/Calern network adjustment output file

```
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0             WGS 84      UNITS: m,GRAD Page 0001
================================================================================
Fri Oct 16 18:41:17 2009

Input file:  X:\Ratt_Grasse2009\Ratt_Grasse2009.iob
Output file: X:\Ratt_Grasse2009\Ratt_Grasse2009.lst
Options file: C:\Program Files\Microsearch\GeoLab\default.gpj

Geoid File:  C:\Program Files\Microsearch\GeoLab\EGM96.gsp
 ------------------------------------------------------------------------------
|             PARAMETERS                |             OBSERVATIONS             |
|---------------------------------------------------------------------------|
|   Description     |      Number       |   Description     |      Number      |
|---------------------------------------------------------------------------|
| No. of Stations   |          58       | Directions        |          121     |
| Coord Parameters  |         168       | Distances         |           90     |
| Free Latitudes    |          55       | Azimuths          |            0     |
| Free Longitudes   |          55       | Vertical Angles   |            0     |
| Free Heights      |          58       | Zenithal Angles   |          114     |
| Fixed Coordinates|           6       | Angles            |            0     |
| Astro. Latitudes  |           0       | Heights           |            0     |
| Astro. Longitudes|           0       | Height Differences|           28     |
| Geoid Records     |           0       | Auxiliary Params. |            0     |
| All Aux. Pars.    |          19       | 2-D Coords.       |            0     |
| Direction Pars.   |          19       | 2-D Coord. Diffs. |           12     |
| Scale Parameters  |           0       | 3-D Coords.       |           21     |
| Constant Pars.    |           0       | 3-D Coord. Diffs. |           96     |
| Rotation Pars.    |           0       |                   |                  |
| Translation Pars.|           0       |                   |                  |
|                   |                   |                   |                  |
|                   |    --------       |                   |    --------      |
| Total Parameters  |         187       | Total Observations|          482     |
|---------------------------------------------------------------------------|
|                     Degrees of Freedom =       295                        |
 ------------------------------------------------------------------------------

--------------------------------------------------------------------------------
                        SUMMARY OF SELECTED OPTIONS
--------------------------------------------------------------------------------
    OPTION                                |   SELECTION
--------------------------------------------------------------------------------
    Computation Mode                      |   Adjustment
    Maximum Iterations                    |   10
    Convergence Criterion                 |   0.00010
    Residual Rejection Criterion          |   Tau Max
    Confidence Region Types               |   1D 2D 3D Station
    Variance Factor (VF) Known            |   Yes
    Scale Covariance Matrix With VF       |   Yes
    Scale Residual Variances With VF      |   No
    Force Convergence in Max Iters        |   No
    Distances Contribute To Heights       |   No
    Compute Full Inverse                  |   Yes
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0             WGS 84      UNITS: m,GRAD Page 0002
================================================================================
    Optimize Band Width                   |   Yes
    Generate Initial Coordinates          |   Yes
    Re-Transform Obs After 1st Pass       |   Yes
    Geoid Interpolation Method            |   Bi-Quadratic
--------------------------------------------------------------------------------
```

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================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0            WGS 84      UNITS: m,GRAD Page 0003
================================================================================
Adjusted PLH Coordinates:
                                LATITUDE          LONGITUDE  ELIP-HEIGHT
 CODE FFF STATION                STD DEV            STD DEV      STD DEV
 ---- --- ------------ ----------------- ----------------- ------------
 PLH  000 100_ARP      N 43 45 16.885122 E  6 55 19.307519    1321.0064 m       0
                                 0.0015            0.0012       0.0012
 PLH  000 100_ITA      N 43 45 16.885117 E  6 55 19.307515    1321.0567 m       0
                                 0.0015            0.0012       0.0012
 PLH  000 100_PRI      N 43 45 16.885114 E  6 55 19.307524    1321.0567 m       0
                                 0.0015            0.0012       0.0012
 PLH  000 10_ITA       N 43 45 16.637189 E  6 55 17.822903    1323.5248 m       0
                                 0.0013            0.0012       0.0012
 PLH  000 10_PRI       N 43 45 16.637194 E  6 55 17.822900    1323.5248 m       0
                                 0.0013            0.0012       0.0012
 PLH  000 11_ITA       N 43 45 16.797989 E  6 55 17.732398    1323.6962 m       0
                                 0.0013            0.0012       0.0012
 PLH  000 11_PRI       N 43 45 16.797986 E  6 55 17.732403    1323.6966 m       0
                                 0.0013            0.0012       0.0012
 PLH  000 12_ITA       N 43 45 16.661379 E  6 55 17.847305    1323.5284 m       0
                                 0.0013            0.0012       0.0012
 PLH  000 12_PRI       N 43 45 16.661379 E  6 55 17.847305    1323.5284 m       0
                                 0.0015            0.0014       0.0013
 PLH  000 13_ITA       N 43 45 16.805490 E  6 55 17.673112    1323.5049 m       0
                                 0.0014            0.0012       0.0012
 PLH  000 13_PRI       N 43 45 16.805490 E  6 55 17.673112    1323.5049 m       0
                                 0.0015            0.0013       0.0013
 PLH  110 20000        N 43 45 16.857833 E  6 55 16.204650    1322.9137 m       0
                                 0.0000            0.0000       0.0012
 PLH  000 200_ARP      N 43 45 15.984841 E  6 55 16.978234    1320.4927 m       0
                                 0.0013            0.0012       0.0012
 PLH  000 200_ITA      N 43 45 15.984842 E  6 55 16.978234    1320.5431 m       0
                                 0.0013            0.0012       0.0012
 PLH  000 200_PRI      N 43 45 15.984834 E  6 55 16.978238    1320.5428 m       0
                                 0.0013            0.0012       0.0012
 PLH  110 3000         N 43 45 16.857833 E  6 55 16.204650    1322.1010 m       0
                                 0.0000            0.0000       0.0012
 PLH  000 500          N 43 45 18.371268 E  6 55 12.937639    1316.5582 m       0
                                 0.0014            0.0013       0.0023
 PLH  000 500_ITA      N 43 45 18.371315 E  6 55 12.937275    1318.0289 m       0
                                 0.0015            0.0013       0.0012
 PLH  000 500_PRI      N 43 45 18.371284 E  6 55 12.937264    1318.0279 m       0
                                 0.0013            0.0013       0.0012
 PLH  000 51           N 43 45 16.652399 E  6 55 17.603062    1323.2733 m       0
                                 0.0018            0.0017       0.0012
 PLH  000 512          N 43 45 16.652399 E  6 55 17.603062    1323.3483 m       0
                                 0.0014            0.0013       0.0012
 PLH  000 52           N 43 45 16.652399 E  6 55 17.603062    1323.4232 m       0
                                 0.0018            0.0017       0.0012
 PLH  000 534          N 43 45 16.703222 E  6 55 17.721229    1323.3478 m       0
                                 0.0019            0.0015       0.0012
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0            WGS 84      UNITS: m,GRAD Page 0004
================================================================================
Adjusted PLH Coordinates:
                                LATITUDE          LONGITUDE  ELIP-HEIGHT
 CODE FFF STATION                STD DEV            STD DEV      STD DEV
 ---- --- ------------ ----------------- ----------------- ------------
 PLH  000 55           N 43 45 16.703222 E  6 55 17.721229    1323.5479 m       0
                                 0.0022            0.0019       0.0012
 PLH  000 56           N 43 45 16.703222 E  6 55 17.721229    1323.1475 m       0
                                 0.0022            0.0019       0.0012
 PLH  000 600_ITA      N 43 45 17.172688 E  6 55 16.572329    1323.7943 m       0
                                 0.0013            0.0012       0.0012
 PLH  000 600_PRI      N 43 45 17.172693 E  6 55 16.572334    1323.7942 m       0
                                 0.0013            0.0012       0.0012
 PLH  000 DORIS_mark   N 43 45 17.402490 E  6 55 16.406273    1322.0951 m       0
                                 0.0038            0.0037       0.0012
 PLH  000 GR2B         N 43 45 17.402039 E  6 55 16.406903    1323.5671 m       0
                                 0.0039            0.0039       0.0017
 PLH  000 GR3B         N 43 45 17.402040 E  6 55 16.406903    1323.7062 m       0
                                 0.0038            0.0037       0.0016
 PLH  000 GR3B/2GHz    N 43 45 17.402057 E  6 55 16.406942    1324.1779 m       0
                                 0.0013            0.0012       0.0012
```

```
 PLH  000 GR3B/400MHz  N 43 45 17.402040 E  6 55 16.406903    1323.7039 m       0
                             0.0014             0.0013       0.0012
 PLH  110 GR3B_plate   N 43 45 16.857833 E  6 55 16.204650    1323.3132 m       0
                             0.0000             0.0000       0.0012
 PLH  000 GRAA         N 43 45 17.402490 E  6 55 16.406273    1323.3251 m       0
                             0.0074             0.0074       0.0017
 PLH  000 GRAC         N 43 45 16.165678 E  6 55 14.763394    1319.8738 m       0
                             0.0013             0.0013       0.0016
 PLH  000 GRAC_ARP     N 43 45 16.165701 E  6 55 14.763425    1319.9324 m       0
                             0.0012             0.0012       0.0012
 PLH  000 GRAC_TCR     N 43 45 16.165701 E  6 55 14.763425    1320.0335 m       0
                             0.0013             0.0013       0.0012
 PLH  000 GRAF         N 43 45 16.831263 E  6 55 16.039401    1322.1852 m       0
                             0.0014             0.0013       0.0017
 PLH  000 GRAF_L       N 43 45 16.831263 E  6 55 16.039401    1321.9721 m       0
                             0.0014             0.0013       0.0012
 PLH  000 GRAF_PRI     N 43 45 16.831263 E  6 55 16.039401    1322.2930 m       0
                             0.0012             0.0012       0.0012
 PLH  000 GRAS         N 43 45 17.058515 E  6 55 14.067822    1319.3151 m       0
                             0.0011             0.0011       0.0011
 PLH  000 GRAS_ARP     N 43 45 17.058517 E  6 55 14.067754    1319.3486 m       0
                             0.0012             0.0012       0.0012
 PLH  000 GRAS_TCR     N 43 45 17.058515 E  6 55 14.067822    1319.4521 m       0
                             0.0012             0.0012       0.0012
 PLH  000 GRSF         N 43 45 16.810737 E  6 55 14.935854    1318.6724 m       0
                             0.0013             0.0013       0.0012
 PLH  000 GRSF_ITA     N 43 45 16.810770 E  6 55 14.935821    1320.2001 m       0
                             0.0012             0.0012       0.0012
 PLH  000 GRSF_PRI     N 43 45 16.810766 E  6 55 14.935826    1320.2003 m       0
                             0.0012             0.0012       0.0012
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0            WGS 84      UNITS: m,GRAD Page 0005
================================================================================
Adjusted PLH Coordinates:
                              LATITUDE          LONGITUDE  ELIP-HEIGHT
 CODE FFF STATION              STD DEV            STD DEV      STD DEV
 ---- --- ------------ ---------------- ---------------- ------------
 PLH  000 GRSM         N 43 45 16.681279 E  6 55 17.670328    1323.3480 m       0
                             0.0014             0.0013       0.0017
 PLH  000 GRSM_L       N 43 45 16.681279 E  6 55 17.670328    1324.2889 m       0
                             0.0014             0.0013       0.0012
 PLH  000 GRSM_PRI     N 43 45 16.681279 E  6 55 17.670328    1324.6429 m       0
                             0.0013             0.0012       0.0012
 PLH  000 GRSM_plate   N 43 45 16.681279 E  6 55 17.670328    1324.2689 m       0
                             0.0014             0.0013       0.0017
 PLH  000 GRSM_plumb   N 43 45 16.681279 E  6 55 17.670328    1322.7689 m       0
                             0.0014             0.0013       0.0017
 PLH  000 SELF         N 43 45 16.301185 E  6 55 14.398781    1318.5664 m       0
                             0.0013             0.0013       0.0012
 PLH  000 SELF_ITA     N 43 45 16.301185 E  6 55 14.398782    1320.1380 m       0
                             0.0012             0.0012       0.0012
 PLH  000 SELF_PRI     N 43 45 16.301184 E  6 55 14.398774    1320.1379 m       0
                             0.0013             0.0012       0.0012
 PLH  000 VLBI         N 43 45 16.664900 E  6 55 14.523499    1318.6499 m       0
                             0.0012             0.0012       0.0012
 PLH  000 VLBI_ITA     N 43 45 16.664899 E  6 55 14.523523    1320.1292 m       0
                             0.0012             0.0012       0.0012
 PLH  000 VLBI_L       N 43 45 16.664900 E  6 55 14.523499    1318.6722 m       0
                             0.0017             0.0017       0.0012
 PLH  000 VLBI_PRI     N 43 45 16.664898 E  6 55 14.523503    1320.1291 m       0
                             0.0012             0.0012       0.0012
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0            WGS 84      UNITS: m,GRAD Page 0006
================================================================================
Adjusted XYZ Coordinates:
                           X-COORDINATE       Y-COORDINATE       Z-COORDINATE
 CODE FFF STATION              STD DEV            STD DEV            STD DEV
 ---- --- ------------ ------------------ ------------------ ------------------
 XYZ      100_ARP          4581681.6002        556231.9038       4389358.1544 m       0
                               0.0013             0.0012             0.0014
 XYZ      100_ITA          4581681.6364        556231.9081       4389358.1891 m       0
                               0.0014             0.0012             0.0014
 XYZ      100_PRI          4581681.6364        556231.9083       4389358.1890 m       0
                               0.0013             0.0012             0.0014
 XYZ      10_ITA           4581692.6639        556199.7837       4389354.3678 m       0
                               0.0013             0.0012             0.0013
```

XYZ	10_PRI	4581692.6637	556199.7836	4389354.3679	m	0
		0.0013	0.0012	0.0013		
XYZ	11_ITA	4581689.6229	556197.3745	4389358.0718	m	0
		0.0013	0.0012	0.0013		
XYZ	11_PRI	4581689.6233	556197.3747	4389358.0719	m	0
		0.0013	0.0012	0.0013		
XYZ	12_ITA	4581692.0879	556200.2638	4389354.9096	m	0
		0.0013	0.0012	0.0013		
XYZ	12_PRI	4581692.0879	556200.2638	4389354.9096	m	0
		0.0014	0.0014	0.0014		
XYZ	13_ITA	4581689.4867	556196.0217	4389358.1067	m	0
		0.0013	0.0012	0.0013		
XYZ	13_PRI	4581689.4867	556196.0217	4389358.1067	m	0
		0.0014	0.0013	0.0014		
XYZ	20000	4581691.9131	556163.2171	4389358.8650	m	0
		0.0008	0.0001	0.0008		
XYZ	200_ARP	4581706.5925	556182.4356	4389337.7252	m	0
		0.0012	0.0012	0.0012		
XYZ	200_ITA	4581706.6286	556182.4400	4389337.7601	m	0
		0.0012	0.0012	0.0012		
XYZ	200_PRI	4581706.6285	556182.4401	4389337.7597	m	0
		0.0012	0.0012	0.0012		
XYZ	3000	4581691.3304	556163.1464	4389358.3029	m	0
		0.0008	0.0001	0.0008		
XYZ	500	4581664.0900	556086.2020	4389388.2151	m	0
		0.0020	0.0014	0.0019		
XYZ	500_ITA	4581665.1445	556086.3218	4389389.2333	m	0
		0.0014	0.0013	0.0014		
XYZ	500_PRI	4581665.1445	556086.3215	4389389.2318	m	0
		0.0013	0.0013	0.0013		
XYZ	51	4581692.7540	556194.8394	4389354.5330	m	0
		0.0015	0.0017	0.0015		
XYZ	512	4581692.8077	556194.8459	4389354.5849	m	0
		0.0013	0.0013	0.0013		
XYZ	52	4581692.8614	556194.8524	4389354.6367	m	0
		0.0015	0.0017	0.0015		
XYZ	534	4581691.4117	556197.3399	4389355.7178	m	0
		0.0015	0.0015	0.0016		

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Adjusted XYZ Coordinates:

CODE	FFF	STATION	X-COORDINATE STD DEV	Y-COORDINATE STD DEV	Z-COORDINATE STD DEV		
XYZ		55	4581691.5552	556197.3573	4389355.8561	m	0
			0.0017	0.0019	0.0018		
XYZ		56	4581691.2681	556197.3225	4389355.5793	m	0
			0.0017	0.0019	0.0018		
XYZ		600_ITA	4581684.8804	556170.6509	4389366.4944	m	0
			0.0012	0.0012	0.0012		
XYZ		600_PRI	4581684.8802	556170.6510	4389366.4944	m	0
			0.0012	0.0012	0.0012		
XYZ		DORIS_mark	4581679.2396	556166.2232	4389370.4433	m	0
			0.0027	0.0037	0.0028		
XYZ		GR2B	4581680.3029	556166.3665	4389371.4512	m	0
			0.0030	0.0039	0.0031		
XYZ		GR3B	4581680.4026	556166.3786	4389371.5474	m	0
			0.0029	0.0037	0.0029		
XYZ		GR3B/2GHz	4581680.7404	556166.4205	4389371.8740	m	0
			0.0012	0.0012	0.0012		
XYZ		GR3B/400MHz	4581680.4009	556166.3784	4389371.5458	m	0
			0.0013	0.0013	0.0013		
XYZ		GR3B_plate	4581692.1996	556163.2519	4389359.1413	m	0
			0.0008	0.0001	0.0008		
XYZ		GRAA	4581680.1215	556166.3303	4389371.2939	m	0
			0.0053	0.0073	0.0055		
XYZ		GRAC	4581708.2882	556132.7189	4389341.3294	m	0
			0.0015	0.0013	0.0015		
XYZ		GRAC_ARP	4581708.3296	556132.7246	4389341.3705	m	0
			0.0012	0.0012	0.0012		
XYZ		GRAC_TCR	4581708.4021	556132.7334	4389341.4404	m	0
			0.0012	0.0013	0.0013		
XYZ		GRAF	4581692.3994	556159.5514	4389357.7687	m	0
			0.0015	0.0013	0.0015		
XYZ		GRAF_L	4581692.2466	556159.5329	4389357.6214	m	0
			0.0013	0.0013	0.0013		

XYZ	GRAF_PRI	4581692.4767	556159.5608	4389357.8433	m	0
		0.0012	0.0012	0.0012		
XYZ	GRAS	4581690.8411	556114.9230	4389360.8509	m	0
		0.0011	0.0011	0.0011		
XYZ	GRAS_ARP	4581690.8652	556114.9244	4389360.8742	m	0
		0.0012	0.0012	0.0012		
XYZ	GRAS_TCR	4581690.9393	556114.9349	4389360.9457	m	0
		0.0012	0.0012	0.0012		
XYZ	GRSF	4581693.2910	556134.7858	4389354.8817	m	0
		0.0013	0.0013	0.0013		
XYZ	GRSF_ITA	4581694.3859	556134.9179	4389355.9390	m	0
		0.0012	0.0012	0.0012		
XYZ	GRSF_PRI	4581694.3861	556134.9181	4389355.9390	m	0
		0.0012	0.0012	0.0012		

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Adjusted XYZ Coordinates:

CODE	FFF	STATION	X-COORDINATE STD DEV	Y-COORDINATE STD DEV	Z-COORDINATE STD DEV		
XYZ		GRSM	4581692.0141	556196.2658	4389355.2287	m	0
			0.0016	0.0013	0.0015		
XYZ		GRSM_L	4581692.6888	556196.3477	4389355.8794	m	0
			0.0013	0.0013	0.0013		
XYZ		GRSM_PRI	4581692.9426	556196.3785	4389356.1242	m	0
			0.0012	0.0012	0.0013		
XYZ		GRSM_plate	4581692.6744	556196.3459	4389355.8656	m	0
			0.0016	0.0013	0.0015		
XYZ		GRSM_plumb	4581691.5989	556196.2153	4389354.8282	m	0
			0.0016	0.0013	0.0015		
XYZ		SELF	4581705.4620	556124.1575	4389343.4467	m	0
			0.0012	0.0013	0.0012		
XYZ		SELF_ITA	4581706.5889	556124.2943	4389344.5336	m	0
			0.0012	0.0012	0.0012		
XYZ		SELF_PRI	4581706.5889	556124.2941	4389344.5335	m	0
			0.0012	0.0012	0.0012		
XYZ		VLBI	4581697.4774	556125.9995	4389351.6144	m	0
			0.0012	0.0012	0.0012		
XYZ		VLBI_ITA	4581698.5381	556126.1287	4389352.6374	m	0
			0.0012	0.0012	0.0012		
XYZ		VLBI_L	4581697.4934	556126.0014	4389351.6298	m	0
			0.0014	0.0017	0.0015		
XYZ		VLBI_PRI	4581698.5381	556126.1283	4389352.6373	m	0
			0.0012	0.0012	0.0012		

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Geoid Values:

CODE	STATION	N/S DEFLECTION	E/W DEFLECTION	UNDULATION
GEOI	100_ARP	- 0 0 14.42	0 0 5.89	49.9473 m
GEOI	100_ITA	- 0 0 14.42	0 0 5.89	49.9473 m
GEOI	100_PRI	- 0 0 14.42	0 0 5.89	49.9473 m
GEOI	10_ITA	- 0 0 14.41	0 0 5.89	49.9486 m
GEOI	10_PRI	- 0 0 14.41	0 0 5.89	49.9486 m
GEOI	11_ITA	- 0 0 14.41	0 0 5.89	49.9486 m
GEOI	11_PRI	- 0 0 14.41	0 0 5.89	49.9486 m
GEOI	12_ITA	- 0 0 14.41	0 0 5.89	49.9486 m
GEOI	12_PRI	- 0 0 14.41	0 0 5.89	49.9486 m
GEOI	13_ITA	- 0 0 14.41	0 0 5.89	49.9486 m
GEOI	13_PRI	- 0 0 14.41	0 0 5.89	49.9486 m
GEOI	20000	- 0 0 14.41	0 0 5.89	49.9493 m
GEOI	200_ARP	- 0 0 14.41	0 0 5.90	49.9471 m
GEOI	200_ITA	- 0 0 14.41	0 0 5.90	49.9471 m
GEOI	200_PRI	- 0 0 14.41	0 0 5.90	49.9471 m
GEOI	3000	- 0 0 14.41	0 0 5.89	49.9493 m
GEOI	500	- 0 0 14.39	0 0 5.87	49.9563 m
GEOI	500_ITA	- 0 0 14.39	0 0 5.87	49.9563 m
GEOI	500_PRI	- 0 0 14.39	0 0 5.87	49.9563 m
GEOI	51	- 0 0 14.41	0 0 5.89	49.9486 m
GEOI	512	- 0 0 14.41	0 0 5.89	49.9486 m
GEOI	52	- 0 0 14.41	0 0 5.89	49.9486 m
GEOI	534	- 0 0 14.41	0 0 5.89	49.9486 m
GEOI	55	- 0 0 14.41	0 0 5.89	49.9486 m
GEOI	56	- 0 0 14.41	0 0 5.89	49.9486 m

GEOI	600_ITA	-	0	0	14.41	0	0	5.88	49.9515	m
GEOI	600_PRI	-	0	0	14.41	0	0	5.88	49.9515	m
GEOI	DORIS_mark	-	0	0	14.41	0	0	5.88	49.9515	m
GEOI	GR2B	-	0	0	14.41	0	0	5.88	49.9515	m
GEOI	GR3B	-	0	0	14.41	0	0	5.88	49.9515	m
GEOI	GR3B/2GHz	-	0	0	14.41	0	0	5.88	49.9515	m
GEOI	GR3B/400MHz	-	0	0	14.41	0	0	5.88	49.9515	m
GEOI	GR3B_plate	-	0	0	14.41	0	0	5.89	49.9493	m
GEOI	GRAA	-	0	0	14.40	0	0	5.88	49.9537	m
GEOI	GRAC	-	0	0	14.40	0	0	5.89	49.9506	m
GEOI	GRAC_ARP	-	0	0	14.40	0	0	5.89	49.9506	m
GEOI	GRAC_TCR	-	0	0	14.40	0	0	5.89	49.9506	m
GEOI	GRAF	-	0	0	14.41	0	0	5.89	49.9493	m
GEOI	GRAF_L	-	0	0	14.41	0	0	5.89	49.9493	m
GEOI	GRAF_PRI	-	0	0	14.41	0	0	5.89	49.9493	m
GEOI	GRAS	-	0	0	14.40	0	0	5.88	49.9528	m
GEOI	GRAS_ARP	-	0	0	14.40	0	0	5.88	49.9528	m
GEOI	GRAS_TCR	-	0	0	14.40	0	0	5.88	49.9528	m
GEOI	GRSF	-	0	0	14.40	0	0	5.89	49.9506	m
GEOI	GRSF_ITA	-	0	0	14.40	0	0	5.89	49.9506	m
GEOI	GRSF_PRI	-	0	0	14.40	0	0	5.89	49.9506	m
GEOI	GRSM	-	0	0	14.41	0	0	5.89	49.9486	m

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Geoid Values:

CODE	STATION	N/S	DEFLECTION		E/W	DEFLECTION		UNDULATION	
GEOI	GRSM_L	-	0	0 14.41	0	0	5.89	49.9486	m
GEOI	GRSM_PRI	-	0	0 14.41	0	0	5.89	49.9486	m
GEOI	GRSM_plate	-	0	0 14.41	0	0	5.89	49.9486	m
GEOI	GRSM_plumb	-	0	0 14.41	0	0	5.89	49.9486	m
GEOI	SELF	-	0	0 14.40	0	0	5.89	49.9506	m
GEOI	SELF_ITA	-	0	0 14.40	0	0	5.89	49.9506	m
GEOI	SELF_PRI	-	0	0 14.40	0	0	5.89	49.9506	m
GEOI	VLBI	-	0	0 14.40	0	0	5.89	49.9506	m
GEOI	VLBI_ITA	-	0	0 14.40	0	0	5.89	49.9506	m
GEOI	VLBI_L	-	0	0 14.40	0	0	5.89	49.9506	m
GEOI	VLBI_PRI	-	0	0 14.40	0	0	5.89	49.9506	m

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Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO		OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
XCT	GRAS				4581690.84100	-0.0001	-1.3782
					0.0002	0.0001	
YCT	GRAS				556114.92300	0.0000	0.0054
					0.0009	0.0003	
ZCT	GRAS				4389360.85100	-0.0000	-0.0099
					0.0012	0.0003	
ELAT		GRAC_TCR	GRAC_ARP	0 00	0.000000	-0.0000	-0.0000
					0.0004	0.0000	0.00
ELON		GRAC_TCR	GRAC_ARP	0 00	0.000000	-0.0000	-0.0000
					0.0004	-0.0000	0.00
EHGT		GRAC_TCR	GRAC_ARP		-0.10080	-0.0003	-0.8398
					0.0004	0.0003	2716.38
ELAT		GRAC_ARP	GRAC	0 00	0.000000	-0.0007	-8.1377
					0.0004	0.0001	12533.49
					^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^		
ELON		GRAC_ARP	GRAC	0 00	0.000000	-0.0007	-6.0547
					0.0004	0.0001	11866.01
					^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^		
EHGT		GRAC_ARP	GRAC		-0.05860	-0.0000	-0.0819
					0.0010	0.0003	388.65
ELAT		GRAS	GRAS_ARP	0 00	0.000000	0.0001	0.4080
					0.0004	0.0002	2062.73
ELON		GRAS	GRAS_ARP	0 00	0.000000	-0.0015	-7.2100
					0.0004	0.0002	45541.90
					^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^		
EHGT		GRAS	GRAS_ARP		0.03500	-0.0015	-5.8272
					0.0004	0.0003	44514.31
					^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^		
ELAT		GRAS	GRAS_TCR	0 00	0.000000	-0.0000	-0.0000

```
                                                    0.0004   0.0000     0.00
ELON            GRAS        GRAS_TCR        0 00  0.000000   0.0000   0.0000
                                                    0.0004  -0.0000     0.00
EHGT            GRAS        GRAS_TCR                0.13560   0.0014   5.5035
                                                    0.0004   0.0003 10262.54
                                                  ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
ELAT            100_ARP     100_ITA         0 00  0.000000  -0.0002  -0.6981
                                                    0.0004   0.0002  3023.05
ELON            100_ARP     100_ITA         0 00  0.000000  -0.0001  -0.3729
                                                    0.0004   0.0002  1757.17
EHGT            100_ARP     100_ITA                 0.05030  -0.0000  -0.0693
                                                    0.0003   0.0002   234.26
ELAT            100_ARP     100_PRI         0 00  0.000000  -0.0002  -0.1135
                                                    0.0004   0.0002  4867.71
ELON            100_ARP     100_PRI         0 00  0.000000   0.0001   0.4164
                                                    0.0004   0.0002  1952.44
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
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================================================================================
Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                  OBSERVATION RESIDUAL  STD RES
TYPE AT         FROM        TO                        STD DEV  STD DEV      PPM
---- ---------- ----------- ----------- ----------------- -------- --------
EHGT            100_ARP     100_PRI                 0.05030   0.0000   0.2114
                                                    0.0003   0.0002   714.08
ELAT            200_ARP     200_ITA         0 00  0.000000   0.0000   0.1074
                                                    0.0004   0.0003   554.04
ELON            200_ARP     200_ITA         0 00  0.000000   0.0000   0.0128
                                                    0.0004   0.0003    64.80
EHGT            200_ARP     200_ITA                 0.05030   0.0002   0.9374
                                                    0.0003   0.0002  3372.63
ELAT            200_ARP     200_PRI         0 00  0.000000  -0.0002  -0.8222
                                                    0.0004   0.0003  4195.75
ELON            200_ARP     200_PRI         0 00  0.000000   0.0001   0.3592
                                                    0.0004   0.0003  1825.40
EHGT            200_ARP     200_PRI                 0.05030  -0.0002  -0.9797
                                                    0.0003   0.0002  3546.18
ELAT            GRSF        GRSF_ITA        0 00  0.000000   0.0010   1.2602
                                                    0.0010   0.0008   673.77
ELON            GRSF        GRSF_ITA        0 00  0.000000  -0.0007  -0.8706
                                                    0.0010   0.0008   474.15
EHGT            GRSF        GRSF_ITA                1.52830  -0.0006  -0.5764
                                                    0.0010   0.0010   366.54
ELAT            GRSF        GRSF_PRI        0 00  0.000000   0.0009   1.1368
                                                    0.0010   0.0008   599.45
ELON            GRSF        GRSF_PRI        0 00  0.000000  -0.0006  -0.7441
                                                    0.0010   0.0008   401.28
EHGT            GRSF        GRSF_PRI                1.52830  -0.0004  -0.3954
                                                    0.0010   0.0010   250.04
ELAT            VLBI        VLBI_L          0 00  0.000000  -0.0000  -0.0000
                                                    0.0010   0.0001     0.00
ELON            VLBI        VLBI_L          0 00  0.000000   0.0000   0.0000
                                                    0.0010  -0.0000     0.00
EHGT            VLBI        VLBI_L                  0.02000   0.0023   2.4259
                                                    0.0010   0.0009 103156.2
ELAT            VLBI        VLBI_ITA        0 00  0.000000  -0.0000  -0.0265
                                                    0.0010   0.0010    17.21
ELON            VLBI        VLBI_ITA        0 00  0.000000   0.0005   0.5484
                                                    0.0010   0.0010   355.52
EHGT            VLBI        VLBI_ITA                1.47930  -0.0000  -0.0233
                                                    0.0010   0.0010    15.18
ELAT            VLBI        VLBI_PRI        0 00  0.000000  -0.0000  -0.0000
                                                    0.0001   0.0000    23.94*
ELON            VLBI        VLBI_PRI        0 00  0.000000   0.0001   0.0001
                                                    0.0001   0.0000    48.62*
EHGT            VLBI        VLBI_PRI                1.47930  -0.0001  -0.0001
                                                    0.0002   0.0000    53.16*
ELAT            500         500_ITA         0 00  0.000000   0.0015   0.5203
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
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================================================================================
Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                  OBSERVATION RESIDUAL  STD RES
TYPE AT         FROM        TO                        STD DEV  STD DEV      PPM
```

```
---- ------------ ------------ ------------ ----------------- -------- --------
                                                     0.0030   0.0028   989.64
ELON              500          500_ITA         0 00  0.000000  -0.0081  -2.8372
                                                     0.0030   0.0029  5531.91
EHGT              500          500_ITA                1.47230  -0.0016  -0.6562
                                                     0.0030   0.0025  1095.32
ELAT              500          500_PRI         0 00  0.000000   0.0005   0.1746
                                                     0.0030   0.0028   338.29
ELON              500          500_PRI         0 00  0.000000  -0.0084  -2.9070
                                                     0.0030   0.0029  5705.39
EHGT              500          500_PRI                1.47230  -0.0027  -0.1834
                                                     0.0030   0.0025  1809.36
ELAT              600_ITA      600_PRI         0 00  0.000000   0.0001   0.3338
                                                     0.0005   0.0004 619490.2
ELON              600_ITA      600_PRI         0 00  0.000000   0.0001   0.2826
                                                     0.0005   0.0004 528119.0
EHGT              600_ITA      600_PRI                0.00000  -0.0001  -0.2967
                                                     0.0005   0.0004 580794.9
ELAT              10_ITA       10_PRI          0 00  0.000000   0.0002   0.3964
                                                     0.0005   0.0004 904844.7
ELON              10_ITA       10_PRI          0 00  0.000000  -0.0001  -0.1879
                                                     0.0005   0.0004 414109.0
EHGT              10_ITA       10_PRI                0.00000  -0.0000  -0.0384
                                                     0.0005   0.0005 98833.55
ELAT              11_ITA       11_PRI          0 00  0.000000  -0.0001  -0.2843
                                                     0.0005   0.0004 278685.3
ELON              11_ITA       11_PRI          0 00  0.000000   0.0001   0.2358
                                                     0.0005   0.0004 242149.1
EHGT              11_ITA       11_PRI                0.00000   0.0004   0.7897
                                                     0.0005   0.0005 929351.2
ELAT              12_ITA       12_PRI          0 00  0.000000  -0.0000  -0.0000
                                                     0.0005   0.0000         *
ELON              12_ITA       12_PRI          0 00  0.000000  -0.0000  -0.0000
                                                     0.0005   0.0000         *
EHGT              12_ITA       12_PRI                0.00000   0.0000   0.0000
                                                     0.0005   0.0000         *
ELAT              13_ITA       13_PRI          0 00  0.000000  -0.0000  -0.0000
                                                     0.0005   0.0000         *
ELON              13_ITA       13_PRI          0 00  0.000000  -0.0000  -0.0000
                                                     0.0005   0.0000         *
EHGT              13_ITA       13_PRI                0.00000   0.0000   0.0000
                                                     0.0005   0.0000         *
ELAT              GRAF_PRI     GRAF            0 00  0.000000  -0.0000  -0.0000
                                                     0.0005   0.0000      0.00*
ELON              GRAF_PRI     GRAF            0 00  0.000000   0.0000   0.0000
                                                     0.0005   0.0000      0.00*
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
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================================================================================
Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                 OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                    STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
EHGT              GRAF_PRI     GRAF                 -0.10780  -0.0000  -0.0000
                                                     0.0010   0.0000      0.00*
ELAT              GRAF_PRI     GRAF_L          0 00  0.000000  -0.0000  -0.0000
                                                     0.0005   0.0001      0.00
ELON              GRAF_PRI     GRAF_L          0 00  0.000000   0.0000   0.0000
                                                     0.0005  -0.0000      0.00
EHGT              GRAF_PRI     GRAF_L               -0.32000  -0.0009  -0.8760
                                                     0.0010   0.0010  2656.16
ELAT              GRSM_PRI     GRSM_L          0 00  0.000000  -0.0000  -0.0000
                                                     0.0005   0.0001      0.00
ELON              GRSM_PRI     GRSM_L          0 00  0.000000  -0.0000  -0.0000
                                                     0.0005  -0.0000      0.00
EHGT              GRSM_PRI     GRSM_L               -0.35400  -0.0000  -0.0123
                                                     0.0010   0.0010    34.09
ELAT              GRSM_PRI     GRSM_plate      0 00  0.000000   0.0000   0.0000
                                                     0.0005   0.0000      0.00*
ELON              GRSM_PRI     GRSM_plate      0 00  0.000000   0.0000   0.0000
                                                     0.0005   0.0000      0.00*
EHGT              GRSM_PRI     GRSM_plate           -0.37400   0.0000   0.0000
                                                     0.0010   0.0000      0.00*
ELAT              GRSM_PRI     GRSM            0 00  0.000000   0.0000   0.0000
                                                     0.0005   0.0000      0.00*
ELON              GRSM_PRI     GRSM            0 00  0.000000   0.0000   0.0000
```

```
                                                    0.0005   0.0000     0.00*
EHGT              GRSM_PRI     GRSM                -1.29490   0.0000   0.0000
                                                    0.0010   0.0000     0.00*
ELAT              GRSM_PRI     GRSM_plumb      0 00  0.000000   0.0000   0.0000
                                                    0.0005   0.0000     0.00*
ELON              GRSM_PRI     GRSM_plumb      0 00  0.000000   0.0000   0.0000
                                                    0.0005   0.0000     0.00*
EHGT              GRSM_PRI     GRSM_plumb          -1.87400   0.0000   0.0000
                                                    0.0010   0.0000     0.00*
ELAT              SELF         SELF_ITA        0 00  0.000000   0.0000   0.0000
                                                    0.0003  -0.0000     1.54
ELON              SELF         SELF_ITA        0 00  0.000000   0.0000   0.6025
                                                    0.0003   0.0000     9.36
ELAT              SELF         SELF_PRI        0 00  0.000000  -0.0000  -0.0449
                                                    0.0010   0.0006    17.15
ELON              SELF         SELF_PRI        0 00  0.000000  -0.0002  -0.1770
                                                    0.0010   0.0009   104.00
ELAT              512          51              0 00  0.000000  -0.0000  -0.0000
                                                    0.0010   0.0000     0.00*
ELON              512          51              0 00  0.000000  -0.0000  -0.0000
                                                    0.0010   0.0000     0.00*
ELAT              512          52              0 00  0.000000  -0.0000  -0.0000
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
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================================================================================
Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                  OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                     STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                                    0.0010   0.0000     0.00*
ELON              512          52              0 00  0.000000  -0.0000  -0.0000
                                                    0.0010   0.0000     0.00*
ELAT              534          55              0 00  0.000000   0.0000   0.0000
                                                    0.0010   0.0000     0.00*
ELON              534          55              0 00  0.000000  -0.0000  -0.0000
                                                    0.0010   0.0000     0.00*
ELAT              534          56              0 00  0.000000   0.0000   0.0000
                                                    0.0010   0.0000     0.00*
ELON              534          56              0 00  0.000000  -0.0000  -0.0000
                                                    0.0010   0.0000     0.00*
ELAT              GR3B/400MHz  GR3B            0 00  0.000000   0.0000   0.0000
                                                    0.0030   0.0002     0.00
ELON              GR3B/400MHz  GR3B            0 00  0.000000   0.0000   0.0000
                                                    0.0030  -0.0000     0.00
EHGT              GR3B/400MHz  GR3B                 0.00000   0.0023   0.8058
                                                    0.0030   0.0028  1000000
ELAT              GR3B/400MHz  DORIS_mark      0 00  0.000450   0.0000   0.0000
                                                    0.0030   0.0003     0.00
ELON              GR3B/400MHz  DORIS_mark      0 00  0.000630  -0.0000  -0.0233
                                                    0.0030   0.0000     0.00
EHGT              GR3B/400MHz  DORIS_mark          -1.61120   0.0024   0.8156
                                                    0.0030   0.0030  1509.96
ELAT              DORIS_mark   GRAA            0 00  0.000000   0.0000   0.0000
                                                    0.0055   0.0000     0.00*
ELON              DORIS_mark   GRAA            0 00  0.000000  -0.0000  -0.0000
                                                    0.0055   0.0000     0.00*
EHGT              DORIS_mark   GRAA                 1.23000  -0.0000  -0.0000
                                                    0.0010   0.0000     0.00*
ELAT              DORIS_mark   GR2B            0 00  0.000451  -0.0000  -0.0000
                                                    0.0010   0.0000     0.00*
ELON              DORIS_mark   GR2B            0 00  0.000630  -0.0000  -0.0000
                                                    0.0010   0.0000     0.00*
EHGT              DORIS_mark   GR2B                 1.47200  -0.0000  -0.0000
                                                    0.0010   0.0000     0.00*
XCT  100_ARP                                  4581681.59520  -0.0019  -1.6621
                                                    0.0012   0.0011
YCT  100_ARP                                   556231.90300   0.0002   0.0702
                                                    0.0031   0.0030
ZCT  100_ARP                                  4389358.15220   0.0052   1.0427
                                                    0.0052   0.0050
XCT  200_ARP                                  4581706.59300  -0.0001  -0.0706
                                                    0.0011   0.0010
YCT  200_ARP                                   556182.43530   0.0004   0.1388
                                                    0.0031   0.0030
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
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================================================================================
Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
ZCT  200_ARP                                     4389337.72580  -0.0008  -0.1606
                                                       0.0049   0.0047
XCT  VLBI                                        4581697.47260  -0.0021  -2.0412
                                                       0.0011   0.0011
YCT  VLBI                                         556125.99470   0.0041   1.3964
                                                       0.0031   0.0030
ZCT  VLBI                                        4389351.61220   0.0054   1.1118
                                                       0.0050   0.0048
XCT  GRSF                                        4581693.28770   0.0015   1.4288
                                                       0.0010   0.0010
YCT  GRSF                                         556134.78490   0.0004   0.1532
                                                       0.0031   0.0029
ZCT  GRSF                                        4389354.87640   0.0061   1.2560
                                                       0.0050   0.0049
XCT  500                                         4581664.09310   0.0008   0.8497
                                                       0.0011   0.0010
YCT  500                                          556086.20280  -0.0005  -0.1555
                                                       0.0031   0.0030
ZCT  500                                         4389388.21700  -0.0036  -0.8018
                                                       0.0049   0.0045
XCT  GRAS                                        4581690.84170   0.0010   1.4001
                                                       0.0007   0.0007
YCT  GRAS                                         556114.92310  -0.0000  -0.0045
                                                       0.0031   0.0030
ZCT  GRAS                                        4389360.85020   0.0000   0.0099
                                                       0.0041   0.0039
DXCT              GRAS         GRAC                   17.45840   0.0123   9.3373
                                                       0.0013   0.0013   389.07
                                                 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
DYCT              GRAS         GRAC                   17.79110   0.0061   4.4345
                                                       0.0015   0.0014   193.02
                                                 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
DZCT              GRAS         GRAC                  -19.52840  -0.0029  -0.6337
                                                       0.0047   0.0046    91.71
DXCT              GRAS         GRAC                   17.45900   0.0120   9.1750
                                                       0.0013   0.0013   378.74
                                                 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
DYCT              GRAS         GRAC                   17.79090   0.0064   7.6118
                                                       0.0010   0.0008   201.58
                                                 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
DZCT              GRAS         GRAC                  -19.52740  -0.0040  -0.9121
                                                       0.0045   0.0044   126.59
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
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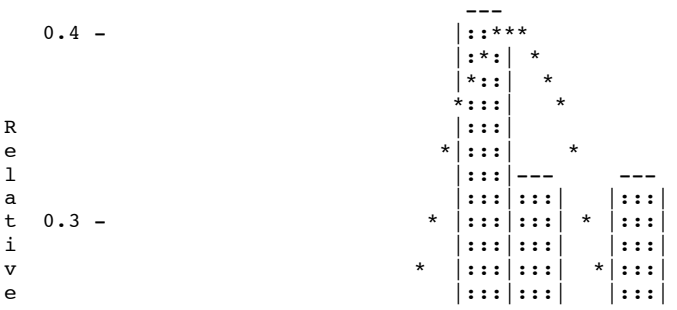

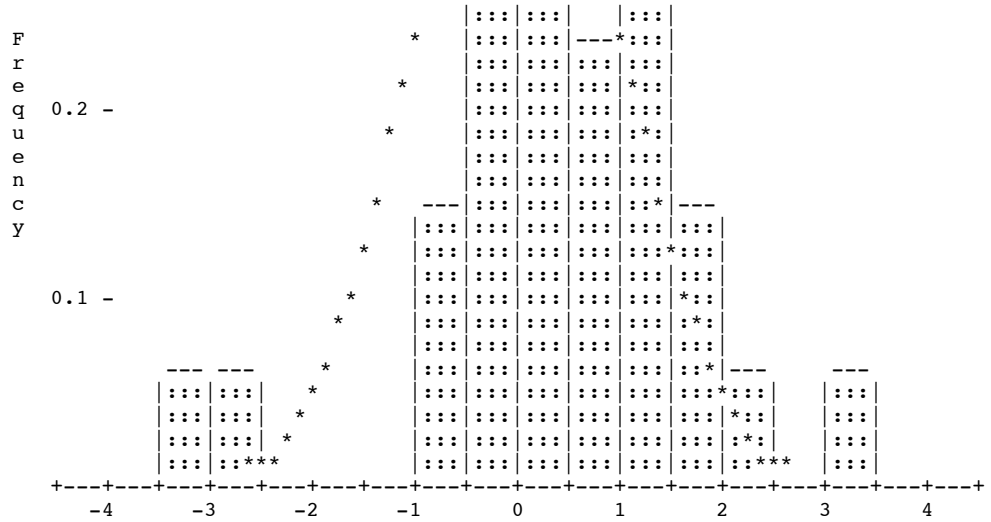


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================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0             WGS 84      UNITS: m,GRAD Page 0018
================================================================================
Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
DIR               600_ITA      500_PRI          0  0       0.0      5.6      0.7
                                                          10.0      8.6
DIR               600_ITA      GRAC_ARP       331 12      17.0     62.0      1.2
                                                          51.0     50.6
DIR               600_ITA      GRAS_ARP       368 82      39.0     -6.6     -0.8
                                                          10.0      8.2
DIR               600_ITA      GRAF_PRI       326 74      12.0      1.1      0.1
                                                          10.0      7.1
DIR               600_ITA      GRSM_PRI       208  3      71.0    -13.2     -1.7
                                                          10.0      7.9
DIR               600_ITA      100_PRI        181 99      15.0      2.8      0.3
                                                          10.0      8.4
DIR               600_ITA      200_PRI        257 36       8.0     33.2      2.0
                                                          18.0     16.8
DIR               600_ITA      GR3B/2GHz       42 16      22.0     -2.6     -1.0
                                                          10.0      2.7
DIR               600_ITA      GR3B/400MHz     42 15      37.0      0.3      0.1
                                                          10.0      2.7
DIR               100_ITA      500_PRI          0  0       0.0      2.2      0.5
                                                           6.0      4.8
DIR               100_ITA      600_PRI        389 34      74.0     -6.7     -1.3
                                                           6.0      5.0
DIR               100_ITA      GR3B/2GHz      395 52      51.0     -3.2     -0.7
                                                           6.0      4.8
DIR               100_ITA      GR3B/400MHz    395 52      44.0     -3.2     -0.9
                                                           6.0      3.4
DIR               100_ITA      GRSM_PRI       369 34      72.0      0.8      0.2
                                                           6.0      4.7
DIR               100_ITA      200_PRI        348 98      89.0     10.0      2.0
                                                           6.0      4.9
DIR               GRSF_ITA     500_PRI         63 91      34.0     -0.6     -0.4
                                                           6.0      1.4
DIR               GRSF_ITA     VLBI_PRI       382 64       7.0      0.6      0.4
                                                           6.0      1.4
DIR               GRSF_ITA     GRAS_ARP        35 42      85.0    -10.3     -4.3
                                                           6.0      2.4
                                                ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
DIR               GRSF_ITA     500_PRI         63 91      25.0     13.6      3.4
                                                           6.0      4.0
DIR               GRSF_ITA     GRAF_PRI       209 91      76.0     -6.2     -1.9
                                                           6.0      3.2
DIR               GRSF_ITA     200_PRI        243 94      42.0      3.4      0.8
                                                           6.0      4.4
DIR               GRSF_ITA     GRAC_ARP       323 73       4.0     -8.2     -2.9
                                                           6.0      2.9
================================================================================
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GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
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Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO		OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIR		GRSF_ITA	SELF_PRI	353 7	68.0	7.7	2.5
					6.0	3.1	
DIR		SELF_ITA	500_PRI	81 9	75.0	-10.9	-1.3
					10.0	8.4	
DIR		SELF_ITA	GRAF_PRI	184 51	43.0	-1.5	-0.2
					10.0	8.8	
DIR		SELF_ITA	GRSM_PRI	201 9	9.0	-9.0	-1.0
					10.0	9.0	
DIR		SELF_ITA	200_PRI	221 87	89.0	-2.3	-0.3
					10.0	8.8	
DIR		SELF_ITA	GRSF_PRI	152 73	72.0	9.4	1.5
					10.0	6.4	
DIR		SELF_ITA	GR3B/2GHz	169 98	73.0	-15.7	-1.8
					10.0	8.5	
DIR		SELF_ITA	GRAC_ARP	241 36	29.0	4.5	1.4
					10.0	3.3	
DIR		SELF_ITA	GRAS_ARP	91 67	31.0	25.5	3.7
					10.0	6.9	
DIR		SELF_ITA	VLBI_PRI	126 72	13.0	-13.5	-3.3
					10.0	4.1	
DIR		SELF_ITA	GRSM_PRI	201 9	12.0	8.5	1.2
					10.0	7.0	
DIR		SELF_ITA	GRAF_PRI	184 51	57.0	5.0	0.7
					10.0	7.3	
DIR		200_ITA	100_PRI	179 53	58.0	-3.1	-0.7
					6.0	4.8	
DIR		200_ITA	SELF_PRI	21 39	25.0	-5.7	-1.2
					6.0	4.6	
DIR		200_ITA	500_PRI	54 24	55.0	-0.2	-0.0
					6.0	5.4	
DIR		200_ITA	600_PRI	95 26	46.0	-1.8	-0.4
					6.0	4.8	
DIR		200_ITA	VLBI_PRI	33 96	33.0	-3.4	-0.7
					6.0	5.1	
DIR		200_ITA	GRSM_PRI	150 46	16.0	-4.2	-0.9
					6.0	4.6	
DIR		200_ITA	GRSF_PRI	43 11	90.0	-7.0	-1.5
					6.0	4.5	
DIR		200_ITA	GRAC_ARP	17 86	24.0	12.5	2.6
					6.0	4.8	
DIR		200_ITA	GRAS_ARP	40 69	11.0	8.8	1.7
					6.0	5.3	
DIR		200_ITA	GRAF_PRI	67 61	25.0	-5.2	-1.1
					6.0	4.7	
DIR		200_ITA	GR3B/2GHz	92 62	29.0	10.1	2.0

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Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO		OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
					6.0	5.0	
DIR		200_ITA	GR3B/400MHz	92 62	26.0	-0.8	-0.2
					6.0	4.7	
DIR		VLBI_ITA	200_PRI	234 71	89.0	-5.4	-1.1
					6.0	5.0	
DIR		VLBI_ITA	SELF_PRI	326 99	2.0	-4.0	-2.1
					6.0	1.9	
DIR		VLBI_ITA	500_PRI	73 73	6.0	-8.1	-1.8
					6.0	4.6	
DIR		VLBI_ITA	GRAF_PRI	201 91	3.0	1.2	0.3
					6.0	4.4	
DIR		VLBI_ITA	GRSM_PRI	211 1	92.0	1.5	0.3
					6.0	5.1	
DIR		VLBI_ITA	GRAC_ARP	290 13	67.0	9.6	3.2
					6.0	3.0	
DIR		VLBI_ITA	GRAS_ARP	67 2	47.0	6.4	2.7

					6.0	2.3		
DIR	VLBI_ITA	GR3B/2GHz	179	95	71.0	-1.2	-0.3	
					6.0	3.5		
DIR	VLBI_ITA	500_PRI	73	73	11.0	-2.8	-0.8	
					6.0	3.7		
DIR	VLBI_ITA	GRSF_PRI	182	57	13.0	-2.0	-1.5	
					6.0	1.4		
DIR	VLBI_ITA	200_PRI	234	71	89.0	4.9	1.3	
					6.0	3.9		
DIR	500_ITA	100_PRI	0	0	0.0	-2.0	-0.4	
					6.0	5.0		
DIR	500_ITA	GR3B/2GHz	3	59	36.0	5.6	1.1	
					6.0	5.2		
DIR	500_ITA	GR3B/400MHz	3	59	52.0	-4.1	-0.9	
					6.0	4.6		
DIR	500_ITA	GRSM_PRI	9	31	52.0	2.2	0.4	
					6.0	5.4		
DIR	500_ITA	200_PRI	23	70	0.0	0.4	0.1	
					6.0	5.4		
DIR	500_ITA	600_PRI	7	35	50.0	1.2	0.2	
					6.0	5.5		
DIR	500_ITA	GRSF_PRI	32	54	26.0	0.8	0.2	
					6.0	4.8		
DIR	500_ITA	VLBI_PRI	42	43	5.0	-5.9	-1.2	
					6.0	5.0		
DIR	500_ITA	GRAS_ARP	44	65	24.0	0.1	0.0	
					6.0	4.2		
DIR	500_ITA	GRAC_ARP	45	76	51.0	4.6	0.8	
					6.0	5.5		

GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
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Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

					OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM	
DIR	500_ITA	SELF_PRI	50	6	50.0	-3.0	-0.6	
					6.0	5.1		
DIR	SELF_ITA	GRSM_PRI	201	9	15.0	-4.3	-0.5	
					10.0	9.0		
DIR	SELF_ITA	10_PRI	202	64	19.0	7.0	0.8	
					10.0	8.9		
DIR	SELF_ITA	200_PRI	221	87	95.0	2.4	0.3	
					10.0	8.8		
DIR	SELF_ITA	500_PRI	81	9	81.0	-6.3	-0.7	
					10.0	8.4		
DIR	SELF_ITA	512	201	65	51.0	-2.2	-0.3	
					10.0	8.7		
DIR	SELF_ITA	600_PRI	179	4	23.0	3.4	0.4	
					10.0	8.7		
DIR	200_ITA	500_PRI	54	24	58.0	-2.1	-0.4	
					6.0	4.8		
DIR	200_ITA	600_PRI	95	26	46.0	-0.7	-0.1	
					6.0	4.6		
DIR	200_ITA	100_PRI	179	53	59.0	-3.0	-0.6	
					6.0	4.7		
DIR	200_ITA	10_PRI	158	70	32.0	0.7	0.2	
					6.0	3.8		
DIR	200_ITA	512	148	67	12.0	0.2	0.3	
					6.0	0.7		
DIR	200_ITA	GRSM_PRI	150	46	10.0	2.9	0.6	
					6.0	4.7		
DIR	200_ITA	GRAF_PRI	67	61	19.0	1.9	0.4	
					6.0	4.4		
DIR	600_ITA	500_PRI	38	83	41.0	4.4	0.5	
					10.0	8.3		
DIR	600_ITA	GRAF_PRI	365	57	58.0	-5.2	-0.7	
					10.0	6.9		
DIR	600_ITA	200_PRI	296	19	84.0	-3.0	-0.4	
					10.0	8.2		
DIR	600_ITA	11_PRI	238	34	28.0	-2.9	-0.4	
					10.0	8.0		
DIR	600_ITA	100_PRI	220	82	60.0	-2.4	-0.3	
					10.0	8.6		
DIR	600_ITA	GRSM_PRI	246	86	89.0	8.5	1.0	
					10.0	8.4		

DIR	600_ITA	512	250	38	11.0	0.6	0.3
					10.0	2.5	
DIR	11_ITA	GRAF_PRI	12	98	64.0	-3.0	-0.4
					10.0	7.9	
DIR	11_ITA	600_PRI	37	94	75.0	1.9	0.3

Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO		OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
					10.0	7.5	
DIR	11_ITA	100_PRI	206	41	25.0	-5.7	-0.8
					10.0	7.0	
DIR	11_ITA	10_PRI	286	60	2.0	1.1	0.5
					10.0	2.1	
DIR	11_ITA	GRSM_PRI	334	68	44.0	6.3	1.0
					10.0	6.2	
DIR	11_ITA	534	316	73	43.0	-488.3	-2.5
					260.2	198.7	
DIR	10_ITA	200_PRI	359	11	25.0	1.9	0.3
					10.0	5.6	
DIR	10_ITA	100_PRI	196	71	61.0	-2.0	-0.4
					10.0	5.5	
DIR	10_ITA	11_PRI	86	47	14.0	1.5	0.7
					10.0	2.4	
DIR	10_ITA	GRSM_PRI	35	28	33.0	-1.1	-0.5
					10.0	2.0	
DIR	10_ITA	534	57	66	21.0	-199.0	-1.0
					260.2	202.5	
DIR	100_ITA	500_PRI	0	0	0.0	3.2	0.7
					6.0	4.6	
DIR	100_ITA	600_PRI	389	34	76.0	-7.7	-1.5
					6.0	5.0	
DIR	100_ITA	10_PRI	365	76	12.0	1.0	0.2
					6.0	4.1	
DIR	100_ITA	GRSM_PRI	369	34	78.0	-4.2	-0.8
					6.0	5.0	
DIR	100_ITA	200_PRI	348	98	96.0	4.0	0.8
					6.0	4.9	
DIR	100_ITA	11_PRI	375	32	72.0	3.7	0.9
					6.0	3.9	
DIR	12_ITA	GRSM_PRI	20	94	73.0	2.6	1.3
					10.0	2.0	
DIR	12_ITA	11_PRI	76	29	33.0	-3.4	-1.8
					10.0	1.9	
DIR	12_ITA	534	38	44	13.0	420.9	2.4
					260.2	172.7	
DIR	12_ITA	200_PRI	358	87	89.0	-8.4	-1.4
					10.0	6.0	
DIR	12_ITA	100_PRI	197	88	58.0	8.7	1.6
					10.0	5.6	
DIR	11_ITA	GRSM_PRI	334	68	48.8	-6.8	-1.1
					10.0	6.2	
DIR	11_ITA	600_PRI	37	94	58.2	10.4	1.4
					10.0	7.5	

Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO		OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIR	11_ITA	534	316	68	44.5	1.9	0.0
					260.2	198.7	
DIR	11_ITA	100_PRI	206	41	11.3	-0.3	-0.0
					10.0	6.8	
DIR	11_ITA	GRAF_PRI	12	98	56.0	-3.3	-0.4
					10.0	7.9	
DIR	13_ITA	GRSM_PRI	312	30	66.4	-0.4	-0.4
					10.0	1.1	
DIR	13_ITA	GRAF_PRI	12	65	69.9	1.4	0.2
					10.0	7.7	

```
DIR               13_ITA       600_PRI          38 72     93.9       9.4       1.4
                                                          10.0       6.8
DIR               13_ITA       534             290 28     53.4     627.4       2.7
                                                         260.2     229.3
DIR               13_ITA       100_PRI         206 99     93.7       1.9       0.5
                                                          10.0       3.6
DIR               13_ITA       GRAC_ARP        392 52     29.8     -13.2      -1.6
                                                          10.0       8.2
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
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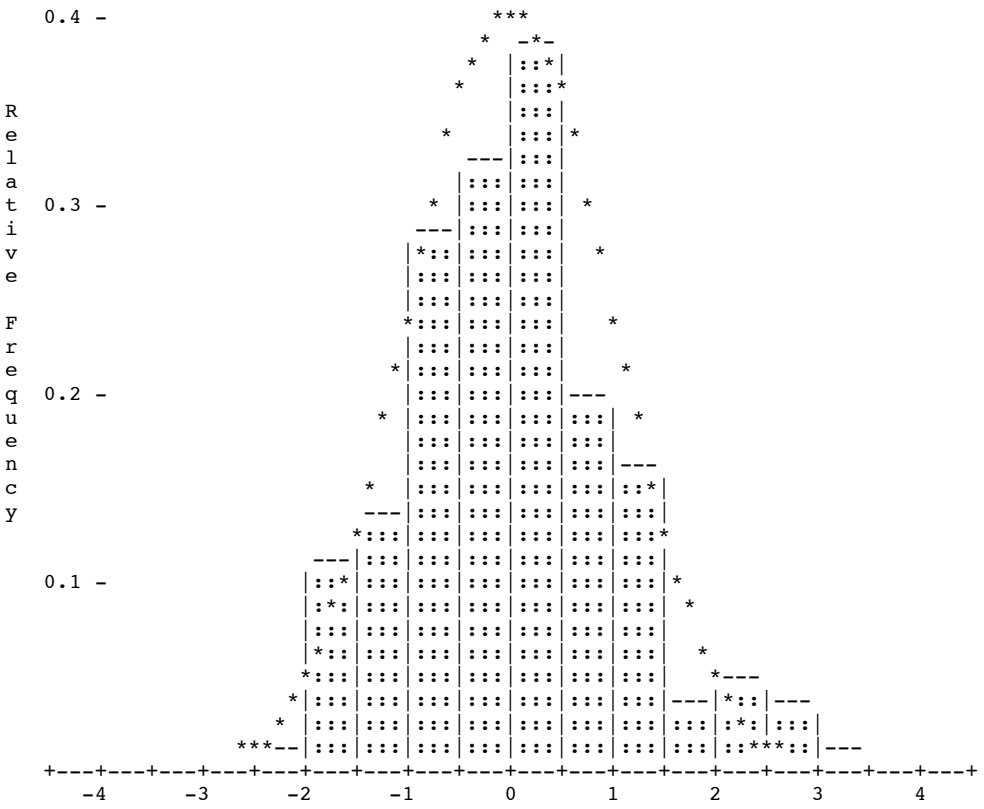


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     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0            WGS 84      UNITS: m,GRAD Page 0025
================================================================================
Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                      OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                         STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
ZANG              600_ITA      500_PRI         104 10     23.0     -7.4      -0.8
                                                          10.0      9.6
ZANG              600_ITA      GRAC_ARP        104 81      3.0     18.0       1.2
                                                          15.0     14.8
ZANG              600_ITA      GRAS_ARP        105  3     20.0     19.1       1.3
                                                          15.0     14.7
ZANG              600_ITA      GRAF_PRI        105 98     75.0     -4.8      -0.6
                                                          10.0      8.1
```

ZANG	600_ITA	GRSM_PRI	98	12	88.0	-8.3	-0.9	
					10.0	9.4		
ZANG	600_ITA	100_PRI	102	81	66.0	0.1	0.0	
					10.0	9.7		
ZANG	600_ITA	200_PRI	105	46	54.0	-8.7	-0.9	
					10.0	9.3		
ZANG	600_ITA	GR3B/2GHz	96	94	56.0	0.1	0.0	
					10.0	2.3		
ZANG	600_ITA	GR3B/400MHz	100	72	9.0	2.7	1.4	
					10.0	1.9		
ZANG	100_ITA	500_PRI	101	28	88.0	5.1	0.5	
					10.0	9.8		
ZANG	100_ITA	600_PRI	97	18	42.0	1.0	0.1	
					10.0	9.6		
ZANG	100_ITA	GR3B/2GHz	97	2	82.0	-12.6	-1.3	
					10.0	9.7		
ZANG	100_ITA	GR3B/400MHz	97	48	0.0	-1.8	-0.2	
					10.0	9.7		
ZANG	100_ITA	GRSM_PRI	93	87	61.0	-7.3	-0.8	
					10.0	9.3		
ZANG	100_ITA	200_PRI	100	55	50.0	8.1	0.8	
					10.0	9.6		
ZANG	GRSF_ITA	500_PRI	102	10	24.0	-11.0	-1.2	
					10.0	9.3		
ZANG	GRSF_ITA	VLBI_PRI	100	44	10.0	7.0	1.3	
					10.0	5.3		
ZANG	GRSF_ITA	GRAS_ARP	102	59	60.0	4.1	0.5	
					10.0	8.0		
ZANG	GRSF_ITA	500_PRI	102	10	38.0	3.0	0.3	
					10.0	9.3		
ZANG	GRSF_ITA	GRAF_PRI	94	61	82.0	-9.6	-1.1	
					10.0	8.5		
ZANG	GRSF_ITA	200_PRI	99	58	28.0	-6.2	-0.6	
					10.0	9.5		
ZANG	GRSF_ITA	GRAC_ARP	100	83	95.0	-7.8	-0.9	
					10.0	8.5		
ZANG	GRSF_ITA	SELF_PRI	100	20	2.0	0.9	0.1	

GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
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Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO		OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
					10.0	7.6	
ZANG		SELF_ITA	500_PRI	101 87	17.0	4.7	0.5
					10.0	9.4	
ZANG		SELF_ITA	GRAF_PRI	96 59	0.0	-1.7	-0.2
					10.0	9.5	
ZANG		SELF_ITA	GRSM_PRI	96 13	61.0	-6.7	-0.7
					10.0	9.9	
ZANG		SELF_ITA	200_PRI	99 55	94.0	-7.3	-0.8
					10.0	9.7	
ZANG		SELF_ITA	GRSF_PRI	99 80	3.0	4.0	0.5
					10.0	8.0	
ZANG		SELF_ITA	GR3B/2GHz	95 44	44.0	14.1	1.0
					15.0	14.8	
ZANG		SELF_ITA	GRAC_ARP	101 42	78.0	2.2	0.4
					10.0	5.3	
ZANG		SELF_ITA	GRAS_ARP	102 4	98.0	9.9	1.1
					10.0	8.6	
ZANG		SELF_ITA	VLBI_PRI	100 4	85.0	-6.5	-1.1
					10.0	6.0	
ZANG		SELF_ITA	GRSM_PRI	96 13	64.0	-3.7	-0.4
					10.0	9.9	
ZANG		SELF_ITA	GRAF_PRI	96 58	98.0	-3.7	-0.4
					10.0	9.5	
ZANG		200_ITA	100_PRI	99 44	70.0	2.7	0.3
					10.0	9.6	
ZANG		200_ITA	SELF_PRI	100 44	22.0	12.4	1.3
					10.0	9.6	
ZANG		200_ITA	500_PRI	101 37	40.0	6.9	0.7
					10.0	9.8	
ZANG		200_ITA	600_PRI	94 53	45.0	-3.9	-0.4
					10.0	9.3	
ZANG		200_ITA	VLBI_PRI	100 44	96.0	10.9	1.1

						10.0	9.7	
ZANG	200_ITA	GRSM_PRI	90	22	61.0	-7.6	-0.8	
					10.0	9.2		
ZANG	200_ITA	GRSF_PRI	100	41	80.0	6.9	0.7	
					10.0	9.5		
ZANG	200_ITA	GRAC_ARP	100	77	99.0	1.1	0.1	
					10.0	9.6		
ZANG	200_ITA	GRAS_ARP	101	4	25.0	15.2	1.6	
					10.0	9.8		
ZANG	200_ITA	GRAF_PRI	96	68	8.0	3.5	0.4	
					10.0	9.3		
ZANG	200_ITA	GR3B/2GHz	94	93	43.0	3.1	0.3	
					10.0	9.5		

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Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO		OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
ZANG	200_ITA	GR3B/400MHz	95	59	9.0	-15.3	-1.0
					15.0	14.7	
ZANG	VLBI_ITA	200_PRI	99	55	23.0	-2.1	-0.2
					10.0	9.6	
ZANG	VLBI_ITA	SELF_PRI	99	95	16.0	-3.4	-0.7
					10.0	4.7	
ZANG	VLBI_ITA	500_PRI	102	10	60.0	3.5	0.4
					10.0	9.2	
ZANG	VLBI_ITA	GRAF_PRI	95	98	94.0	-6.5	-0.7
					10.0	9.2	
ZANG	VLBI_ITA	GRSM_PRI	95	92	46.0	-3.8	-0.4
					10.0	9.8	
ZANG	VLBI_ITA	GRAC_ARP	100	76	80.0	3.2	0.4
					10.0	7.7	
ZANG	VLBI_ITA	GRAS_ARP	103	13	14.0	11.6	1.7
					10.0	6.8	
ZANG	VLBI_ITA	500_PRI	102	10	57.0	0.5	0.1
					10.0	9.2	
ZANG	VLBI_ITA	GRSF_PRI	99	55	86.0	-4.4	-1.0
					10.0	4.5	
ZANG	VLBI_ITA	200_PRI	99	55	25.0	-0.1	-0.0
					10.0	9.6	
ZANG	500_ITA	100_PRI	98	71	41.0	4.7	0.5
					10.0	9.8	
ZANG	500_ITA	GR3B/2GHz	95	30	40.0	-0.3	-0.0
					10.0	9.5	
ZANG	500_ITA	GR3B/400MHz	95	66	42.0	-6.9	-0.7
					10.0	9.5	
ZANG	500_ITA	GRSM_PRI	96	43	81.0	3.7	0.4
					10.0	9.8	
ZANG	500_ITA	200_PRI	98	62	95.0	8.8	0.9
					10.0	9.7	
ZANG	500_ITA	600_PRI	95	89	80.0	-7.0	-0.7
					10.0	9.6	
ZANG	500_ITA	GRSF_PRI	97	89	90.0	9.8	1.1
					10.0	9.3	
ZANG	500_ITA	VLBI_PRI	97	89	61.0	-0.1	-0.0
					10.0	9.2	
ZANG	500_ITA	GRAS_ARP	98	24	10.0	-10.6	-1.2
					10.0	8.6	
ZANG	500_ITA	GRAC_ARP	98	47	49.0	3.0	0.3
					10.0	9.5	
ZANG	500_ITA	SELF_PRI	98	13	8.0	2.6	0.3
					10.0	9.4	
ZANG	SELF_ITA	GRSM_PRI	96	13	68.0	0.3	0.0

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Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO		OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
					10.0	9.9	
ZANG	SELF_ITA	10_PRI	97	21	34.0	-1.3	-0.1

```
                                                          10.0      9.9
ZANG              SELF_ITA     200_PRI          99 56      2.0      0.7      0.1
                                                          10.0      9.7
ZANG              SELF_ITA     500_PRI         101 87      8.0     -4.3     -0.5
                                                          10.0      9.4
ZANG              SELF_ITA     600_PRI          95 81     85.0     -0.1     -0.0
                                                          10.0      9.6
ZANG              200_ITA      500_PRI         101 37     34.0      0.9      0.1
                                                          10.0      9.8
ZANG              200_ITA      600_PRI          94 53     39.0     -9.9     -1.1
                                                          10.0      9.3
ZANG              200_ITA      100_PRI          99 44     63.0     -4.3     -0.4
                                                          10.0      9.6
ZANG              200_ITA      10_PRI           93 15     43.0      6.8      0.7
                                                          10.0      9.1
ZANG              200_ITA      GRSM_PRI         90 22     63.0     -5.6     -0.6
                                                          10.0      9.2
ZANG              200_ITA      GRAF_PRI         96 68      7.0      2.5      0.3
                                                          10.0      9.3
ZANG              600_ITA      500_PRI         104 10     32.0      1.6      0.2
                                                          10.0      9.6
ZANG              600_ITA      GRAF_PRI        105 98     82.0      2.2      0.3
                                                          10.0      8.1
ZANG              600_ITA      200_PRI         105 46     59.0     -3.7     -0.4
                                                          10.0      9.3
ZANG              600_ITA      11_PRI          100 21     90.0     -1.4     -0.2
                                                          10.0      9.2
ZANG              600_ITA      100_PRI         102 81     71.0      5.1      0.5
                                                          10.0      9.7
ZANG              600_ITA      GRSM_PRI         98 13      3.0      6.7      0.7
                                                          10.0      9.4
ZANG              11_ITA       GRAF_PRI        102 35     75.0     11.4      1.2
                                                          10.0      9.6
ZANG              11_ITA       600_PRI          99 78     17.0     11.3      1.3
                                                          10.0      9.0
ZANG              11_ITA       100_PRI         104 74     56.0      4.8      0.5
                                                          10.0      9.3
ZANG              11_ITA       10_PRI          102  3     45.0     -1.0     -0.4
                                                          10.0      2.8
ZANG              11_ITA       GRSM_PRI         84 69     22.0      4.1      0.5
                                                          10.0      7.8
ZANG              11_ITA       534             107 51     93.0      5.1      0.5
                                                          15.0      9.9
================================================================================
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================================================================================
Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                  OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                     STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
ZANG              10_ITA       200_PRI         106 84     76.0      1.2      0.1
                                                          10.0      8.9
ZANG              10_ITA       100_PRI         104 60      6.0     -5.9     -0.6
                                                          10.0      9.2
ZANG              10_ITA       11_PRI           97 96     13.0      2.2      0.6
                                                          10.0      3.8
ZANG              10_ITA       GRSM_PRI         81 19     81.0      1.2      0.2
                                                          10.0      5.9
ZANG              10_ITA       534             103 68     48.0     -3.9     -0.4
                                                          15.0      9.7
ZANG              100_ITA      500_PRI         101 28     92.0      9.1      0.9
                                                          10.0      9.8
ZANG              100_ITA      600_PRI          97 18     45.0      4.0      0.4
                                                          10.0      9.6
ZANG              100_ITA      10_PRI           95 39     90.0     -0.7     -0.1
                                                          10.0      9.1
ZANG              100_ITA      GRSM_PRI         93 87     66.0     -2.3     -0.3
                                                          10.0      9.3
ZANG              100_ITA      200_PRI         100 55     55.0     13.1      1.4
                                                          10.0      9.6
ZANG              100_ITA      11_PRI           95 25     42.0     -2.2     -0.2
                                                          10.0      9.2
ZANG              12_ITA       GRSM_PRI         82 73      5.0     11.0      1.8
                                                          10.0      6.0
ZANG              12_ITA       11_PRI           97 82     97.0    -29.8     -1.0
                                                          33.5     31.1
```

```
ZANG              12_ITA       534            103 69     91.0    -16.7     -1.7
                                                          15.0      9.6
ZANG              12_ITA       200_PRI        106 63     78.0     12.4      1.4
                                                          10.0      9.0
ZANG              12_ITA       100_PRI        104 70     30.0     -2.2     -0.2
                                                          10.0      9.2
ZANG              11_ITA       GRSM_PRI        84 69      8.1     -9.8     -1.3
                                                          10.0      7.8
ZANG              11_ITA       600_PRI         99 78      2.5     -3.2     -0.4
                                                          10.0      9.0
ZANG              11_ITA       100_PRI        104 74     43.7     -7.5     -0.8
                                                          10.0      9.3
ZANG              11_ITA       GRAF_PRI       102 35     65.8      2.2      0.2
                                                          10.0      9.6
ZANG              13_ITA       GRSM_PRI        81 63     42.2     -2.2     -1.1
                                                          10.0      2.0
ZANG              13_ITA       GRAF_PRI       102 11      3.1      7.5      0.8
                                                          10.0      9.5
ZANG              13_ITA       600_PRI         99 32     14.6      4.3      0.5
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
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================================================================================
Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                  OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                     STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                                          10.0      8.8
ZANG              13_ITA       100_PRI        104 24     66.1      5.9      0.6
                                                          10.0      9.3
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
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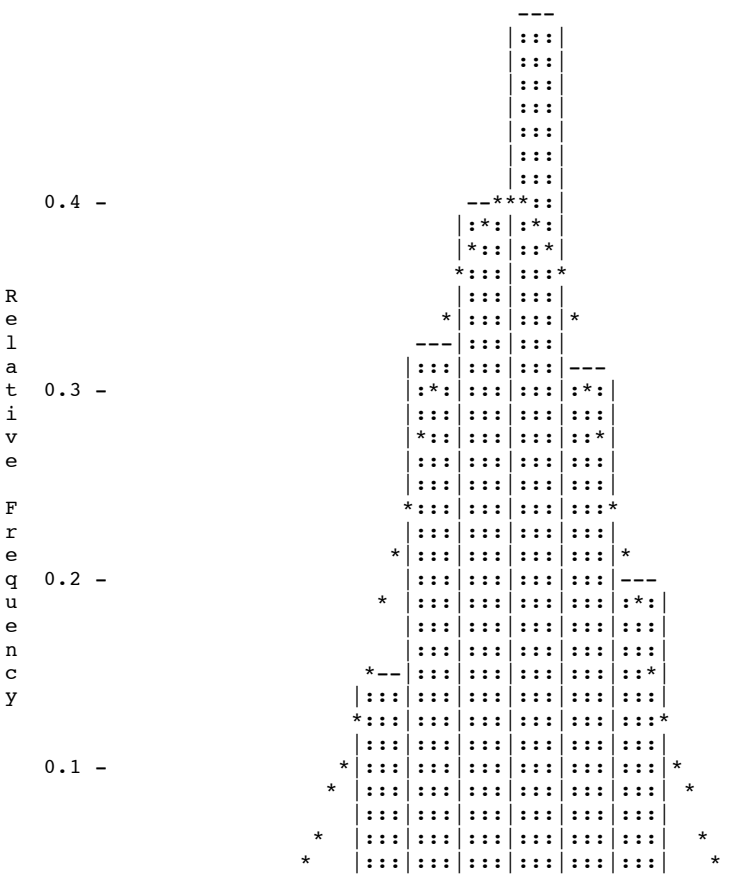

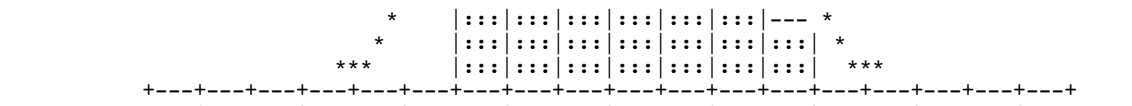

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Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIST		600_ITA	500_PRI	89.54340	-0.0004	-0.4525
				0.0010	0.0009	4.75
DIST		600_ITA	GRAF_PRI	15.98550	-0.0000	-0.0262
				0.0010	0.0010	1.59
DIST		600_ITA	GRSM_PRI	28.88750	-0.0007	-0.6917
				0.0010	0.0010	23.29
DIST		600_ITA	100_PRI	61.90350	-0.0006	-0.5885
				0.0010	0.0009	8.99
DIST		600_ITA	200_PRI	37.91650	-0.0002	-0.1720
				0.0010	0.0010	4.36
DIST		100_ITA	500_PRI	149.77120	-0.0010	-1.1296
				0.0010	0.0009	6.98
DIST		100_ITA	600_PRI	61.90310	-0.0005	-0.4862
				0.0010	0.0009	7.40
DIST		100_ITA	GRSM_PRI	37.34230	0.0001	0.0572
				0.0010	0.0010	1.46
DIST		100_ITA	200_PRI	59.06810	0.0001	0.0816
				0.0010	0.0009	1.29
DIST		GRSF_ITA	500_PRI	65.76530	0.0001	0.0942
				0.0010	0.0009	1.35
DIST		GRSF_ITA	VLBI_PRI	10.26600	0.0004	0.4774
				0.0010	0.0009	43.45
DIST		GRSF_ITA	500_PRI	65.76570	-0.0003	-0.3304
				0.0010	0.0009	4.73
DIST		GRSF_ITA	GRAF_PRI	24.79000	-0.0000	-0.0056
				0.0010	0.0009	0.21
DIST		GRSF_ITA	200_PRI	52.33300	-0.0002	-0.1635
				0.0010	0.0009	2.96
DIST		GRSF_ITA	SELF_PRI	19.79540	0.0001	0.1562
				0.0010	0.0009	7.30
DIST		SELF_ITA	500_PRI	71.81620	-0.0004	-0.4620
				0.0010	0.0009	5.95
DIST		SELF_ITA	GRAF_PRI	40.24920	0.0004	0.4260
				0.0010	0.0010	10.15
DIST		SELF_ITA	GRSM_PRI	74.27500	-0.0006	-0.5739
				0.0010	0.0010	7.43
DIST		SELF_ITA	200_PRI	58.53840	0.0007	0.7351
				0.0010	0.0009	11.89
DIST		SELF_ITA	GRSF_PRI	19.79480	0.0006	0.6354
				0.0010	0.0009	29.83
DIST		SELF_ITA	VLBI_PRI	11.56840	0.0009	0.9752
				0.0010	0.0009	79.48
DIST		SELF_ITA	GRSM_PRI	74.27520	-0.0008	-0.7818
				0.0010	0.0010	10.12
DIST		SELF_ITA	GRAF_PRI	40.24930	0.0003	0.3218

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Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
				0.0010	0.0010	7.66
DIST		200_ITA	100_PRI	59.06870	-0.0004	-0.4702
				0.0010	0.0009	7.45
DIST		200_ITA	SELF_PRI	58.53870	0.0004	0.4668
				0.0010	0.0009	7.57
DIST		200_ITA	500_PRI	116.65910	-0.0013	-1.3701
				0.0010	0.0009	11.08
DIST		200_ITA	600_PRI	37.91640	-0.0003	-0.2630
				0.0010	0.0010	6.65

DIST	200_ITA	VLBI_PRI	58.80270	0.0004	0.3984
			0.0010	0.0010	6.47
DIST	200_ITA	GRSM_PRI	26.81160	-0.0007	-0.7101
			0.0010	0.0010	25.52
DIST	200_ITA	GRSF_PRI	52.33280	-0.0003	-0.3154
			0.0010	0.0009	5.72
DIST	200_ITA	GRAF_PRI	33.57240	-0.0006	-0.5850
			0.0010	0.0010	16.90
DIST	VLBI_ITA	200_PRI	58.80100	0.0018	1.9112
			0.0010	0.0010	31.02
DIST	VLBI_ITA	SELF_PRI	11.56840	0.0011	1.1989
			0.0010	0.0009	95.95
DIST	VLBI_ITA	500_PRI	63.55080	0.0016	1.6700
			0.0010	0.0009	24.73
DIST	VLBI_ITA	GRAF_PRI	34.37280	0.0008	0.8739
			0.0010	0.0010	24.36
DIST	VLBI_ITA	GRSM_PRI	70.55710	0.0013	1.3940
			0.0010	0.0010	19.03
DIST	VLBI_ITA	500_PRI	63.55300	-0.0006	-0.6681
			0.0010	0.0009	9.89
DIST	VLBI_ITA	GRSF_PRI	10.26600	0.0001	0.0910
			0.0010	0.0009	8.25
DIST	VLBI_ITA	200_PRI	58.80300	-0.0002	-0.1841
			0.0010	0.0010	2.99
DIST	500_ITA	100_PRI	149.77100	-0.0006	-0.6772
			0.0010	0.0009	4.02
DIST	500_ITA	GRSM_PRI	118.24400	-0.0009	-1.0109
			0.0010	0.0009	7.89
DIST	500_ITA	200_PRI	116.65850	-0.0001	-0.1010
			0.0010	0.0009	0.78
DIST	500_ITA	600_PRI	89.54370	-0.0006	-0.6405
			0.0010	0.0009	6.50
DIST	500_ITA	GRSF_PRI	65.76550	0.0006	0.6115
			0.0010	0.0009	8.38
DIST	500_ITA	VLBI_PRI	63.55270	0.0000	0.0507
			0.0010	0.0009	0.70

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Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIST		500_ITA	SELF_PRI	71.81620	0.0002	0.2642
				0.0010	0.0008	3.10
DIST		SELF_ITA	GRSM_PRI	74.27420	0.0002	0.2580
				0.0010	0.0010	3.34
DIST		SELF_ITA	10_PRI	77.38940	0.0009	0.9440
				0.0010	0.0010	11.64
DIST		SELF_ITA	200_PRI	58.53880	0.0003	0.3125
				0.0010	0.0009	5.05
DIST		SELF_ITA	500_PRI	71.81580	-0.0000	-0.0298
				0.0010	0.0009	0.38
DIST		SELF_ITA	600_PRI	55.70020	-0.0002	-0.2103
				0.0010	0.0010	3.62
DIST		200_ITA	500_PRI	116.65790	-0.0001	-0.0976
				0.0010	0.0009	0.79
DIST		200_ITA	600_PRI	37.91650	-0.0004	-0.3673
				0.0010	0.0010	9.29
DIST		200_ITA	100_PRI	59.06810	0.0002	0.1709
				0.0010	0.0009	2.71
DIST		200_ITA	10_PRI	27.77800	0.0003	0.3278
				0.0010	0.0010	11.30
DIST		200_ITA	GRSM_PRI	26.81100	-0.0001	-0.0873
				0.0010	0.0010	3.14
DIST		200_ITA	GRAF_PRI	33.57210	-0.0003	-0.2757
				0.0010	0.0010	7.97
DIST		600_ITA	500_PRI	89.54270	0.0003	0.2916
				0.0010	0.0009	3.06
DIST		600_ITA	GRAF_PRI	15.98550	-0.0000	-0.0262
				0.0010	0.0010	1.59
DIST		600_ITA	200_PRI	37.91670	-0.0004	-0.3800
				0.0010	0.0010	9.64
DIST		600_ITA	11_PRI	28.41700	0.0012	1.2611
				0.0010	0.0009	41.82
DIST		600_ITA	100_PRI	61.90260	0.0003	0.3632

```
                                                    0.0010   0.0009     5.55
DIST              600_ITA      GRSM_PRI            28.88680   0.0000   0.0280
                                                    0.0010   0.0010     0.94
DIST              11_ITA       GRAF_PRI            37.92130   0.0006   0.6520
                                                    0.0010   0.0010    16.61
DIST              11_ITA       600_PRI             28.41740   0.0006   0.6192
                                                    0.0010   0.0010    21.02
DIST              11_ITA       100_PRI             35.44540   0.0001   0.0561
                                                    0.0010   0.0010     1.51
DIST              11_ITA       10_PRI               5.36340   0.0002   0.2195
                                                    0.0010   0.0010    39.48
DIST              11_ITA       GRSM_PRI             3.97510   0.0005   0.5265
================================================================================
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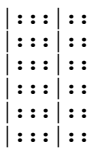
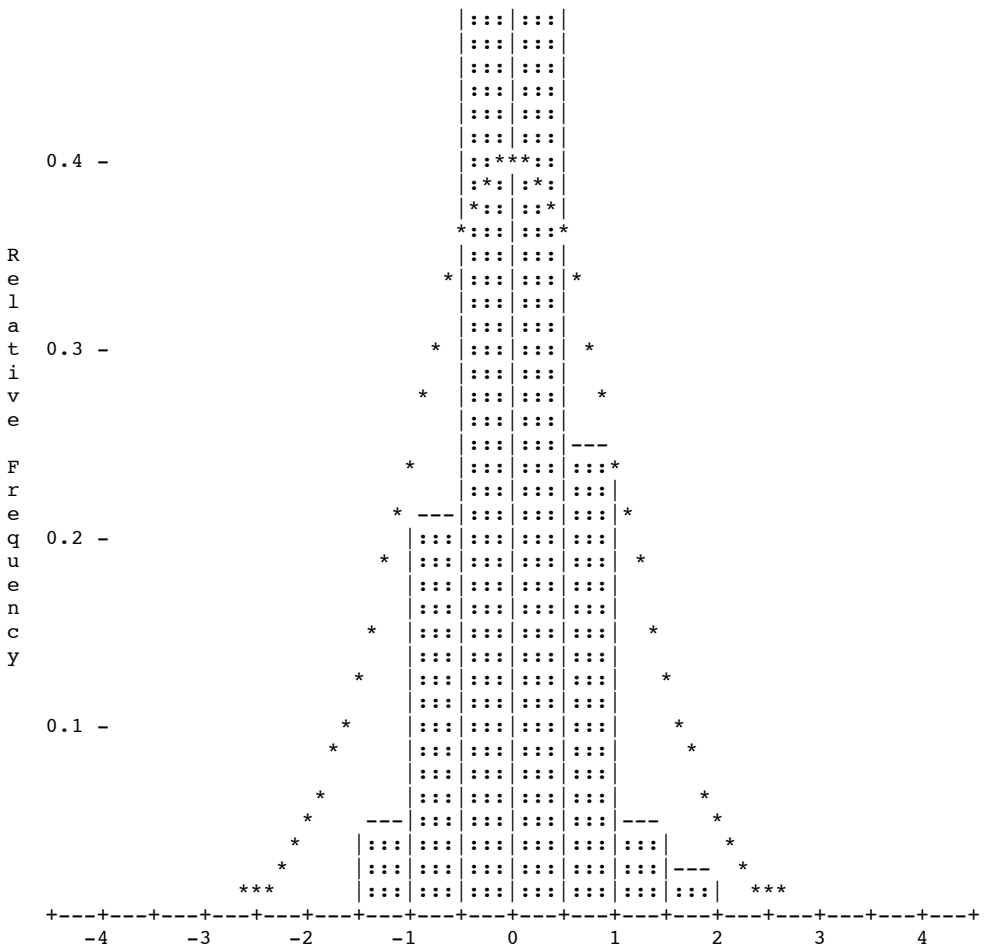
================================================================================
Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                    0.0010   0.0010   128.76
DIST              10_ITA       200_PRI             27.77820   0.0002   0.2034
                                                    0.0010   0.0010     7.01
DIST              10_ITA       100_PRI             34.17860   0.0003   0.3359
                                                    0.0010   0.0009     9.25
DIST              10_ITA       11_PRI               5.36340   0.0003   0.2801
                                                    0.0010   0.0010    49.79
DIST              10_ITA       GRSM_PRI             3.84170  -0.0001  -0.0694
                                                    0.0010   0.0010    17.45
DIST              100_ITA      500_PRI            149.77010   0.0001   0.0598
                                                    0.0010   0.0009     0.37
DIST              100_ITA      600_PRI             61.90260   0.0000   0.0446
                                                    0.0010   0.0009     0.68
DIST              100_ITA      10_PRI              34.17890  -0.0001  -0.1102
                                                    0.0010   0.0009     3.05
DIST              100_ITA      GRSM_PRI            37.34280  -0.0004  -0.4687
                                                    0.0010   0.0010    11.93
DIST              100_ITA      200_PRI             59.06810   0.0001   0.0816
                                                    0.0010   0.0009     1.29
DIST              100_ITA      11_PRI              35.44570  -0.0005  -0.5187
                                                    0.0010   0.0009    13.69
DIST              12_ITA       GRSM_PRI             4.15990  -0.0004  -0.4228
                                                    0.0010   0.0010    98.38
DIST              12_ITA       11_PRI               4.94200  -0.0002  -0.1883
                                                    0.0010   0.0009    36.12
DIST              12_ITA       200_PRI             28.69220  -0.0002  -0.2131
                                                    0.0010   0.0010     7.10
DIST              12_ITA       100_PRI             33.48650   0.0003   0.3109
                                                    0.0010   0.0009     8.72
DIST              11_ITA       GRSM_PRI             3.97470   0.0009   0.9378
                                                    0.0010   0.0010   229.37
DIST              11_ITA       600_PRI             28.41790   0.0001   0.1008
                                                    0.0010   0.0010     3.42
DIST              11_ITA       100_PRI             35.44550  -0.0000  -0.0487
                                                    0.0010   0.0010     1.31
DIST              11_ITA       GRAF_PRI            37.92120   0.0007   0.7555
                                                    0.0010   0.0010    19.25
DIST              13_ITA       GRSM_PRI             3.99990   0.0002   0.2639
                                                    0.0010   0.0009    61.99
DIST              13_ITA       GRAF_PRI            36.58360   0.0006   0.6344
                                                    0.0010   0.0010    16.70
DIST              13_ITA       600_PRI             27.11530   0.0001   0.1264
                                                    0.0010   0.0010     4.44
DIST              13_ITA       100_PRI             36.73490   0.0004   0.4307
                                                    0.0010   0.0010    11.17
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0             WGS 84      UNITS: m,GRAD Page 0036
================================================================================
```






```
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0              WGS 84      UNITS: m,GRAD Page 0037
================================================================================
Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                      OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                         STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
OHDF              GRSF         VLBI_L                -0.00018   0.0000   0.0000
                                                       0.0001   0.0000     0.34*
OHDF              VLBI_L       SELF                  -0.10580  -0.0000  -0.0000
                                                       0.0001   0.0000     0.43*
OHDF              SELF         VLBI_L                 0.10581  -0.0000  -0.0000
                                                       0.0001   0.0000     0.43*
OHDF              VLBI_L       GRSF                   0.00015   0.0000   0.0000
                                                       0.0001   0.0000     2.58*
OHDF              GRSF         GRAC_TCR               1.36112  -0.0000  -0.0000
                                                       0.0001   0.0000     0.42*
OHDF              GRAC_TCR     GRSF                  -1.36112   0.0000   0.0000
                                                       0.0001   0.0000     0.42*
OHDF              GRSF         GRAS_TCR               0.77754  -0.0000  -0.0000
                                                       0.0001   0.0000     2.10*
OHDF              GRAS_TCR     GRSF                  -0.77754   0.0000   0.0000
                                                       0.0001   0.0000     2.10*
OHDF              GRSF         GRAF_L                 3.30092   0.0001   0.8031
                                                       0.0002   0.0001     4.81
OHDF              GRAF_L       DORIS_mark             0.12050   0.0003   2.2072
                                                       0.0002   0.0001    14.93
OHDF              DORIS_mark   3000                   0.00800   0.0001   0.0001
                                                       0.0001   0.0000     5.93*
OHDF              3000         GR3B_plate             1.21220  -0.0000  -0.0000
                                                       0.0001   0.0000     1.04*
OHDF              GR3B_plate   3000                  -1.21220   0.0000   0.0000
                                                       0.0001   0.0000     1.04*
OHDF              GR3B_plate   GR3B                   0.39100  -0.0003  -0.8029
                                                       0.0010   0.0003    14.55
```

```
OHDF              3000          56                    1.04701   0.0002   1.7668
                                                      0.0002   0.0001     6.11
OHDF              56            55                    0.40032   0.0000   0.0000
                                                      0.0001   0.0000   115.76*
OHDF              55            534                  -0.20016   0.0000   0.0000
                                                      0.0001   0.0000   231.60*
OHDF              534           56                   -0.20016  -0.0001  -0.0001
                                                      0.0001   0.0000   462.87*
OHDF              56            20000                -0.23445  -0.0001  -0.0001
                                                      0.0001   0.0000     1.94*
OHDF              20000         GRSM_L                1.37594  -0.0000  -0.0000
                                                      0.0002   0.0000     0.70*
OHDF              GRSM_L        51                   -1.01557  -0.0000  -0.2559
                                                      0.0002   0.0001    16.25
OHDF              51            52                    0.14984  -0.0000  -0.0000
                                                      0.0001   0.0000     0.00*
OHDF              52            512                  -0.07492   0.0000   0.0000
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
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================================================================================
Residuals (critical value = 4.001, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                      OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM          TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                      0.0001   0.0000     0.00*
OHDF              512           51                   -0.07492   0.0000   0.0000
                                                      0.0001   0.0000          *
OHDF              51            20000                -0.36029  -0.0000  -0.0000
                                                      0.0002   0.0000     0.74*
OHDF              20000         3000                 -0.81251  -0.0002  -1.6721
                                                      0.0002   0.0001   237.22
OHDF              3000          GRAF_L               -0.12886  -0.0000  -0.0000
                                                      0.0001   0.0000     8.83*
OHDF              GRAF_L        GRSF                 -3.30059  -0.0004  -3.0134
                                                      0.0002   0.0001    18.05
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
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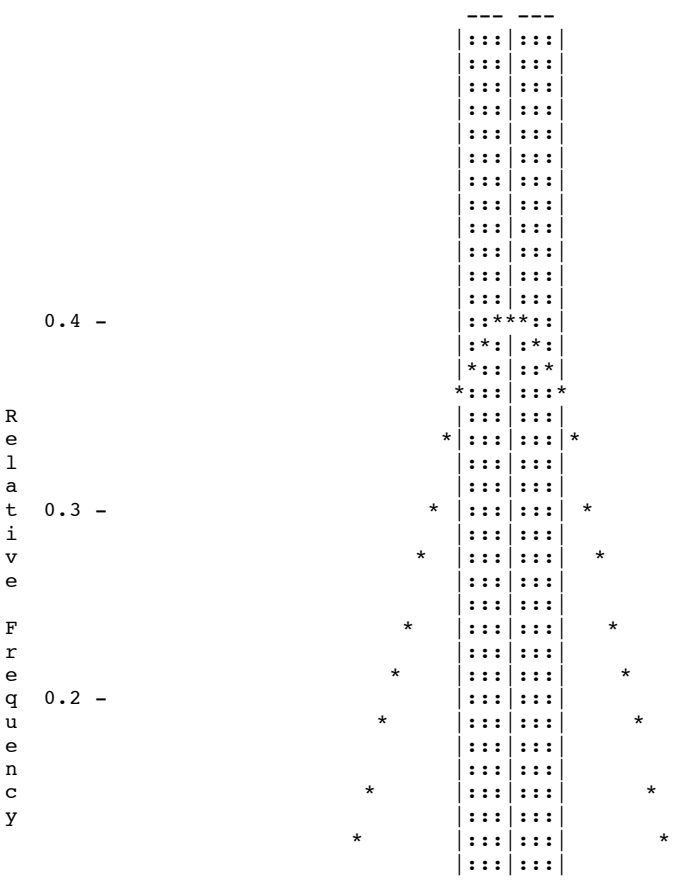
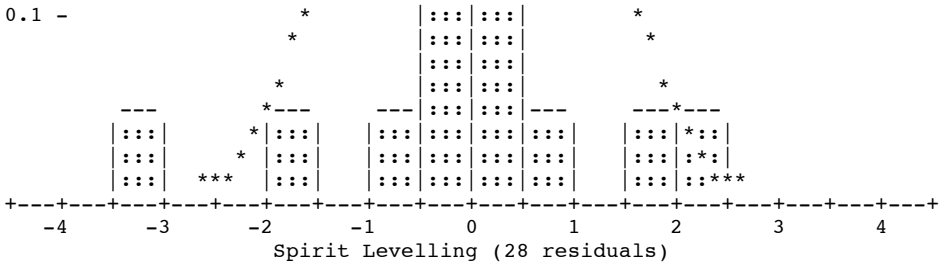
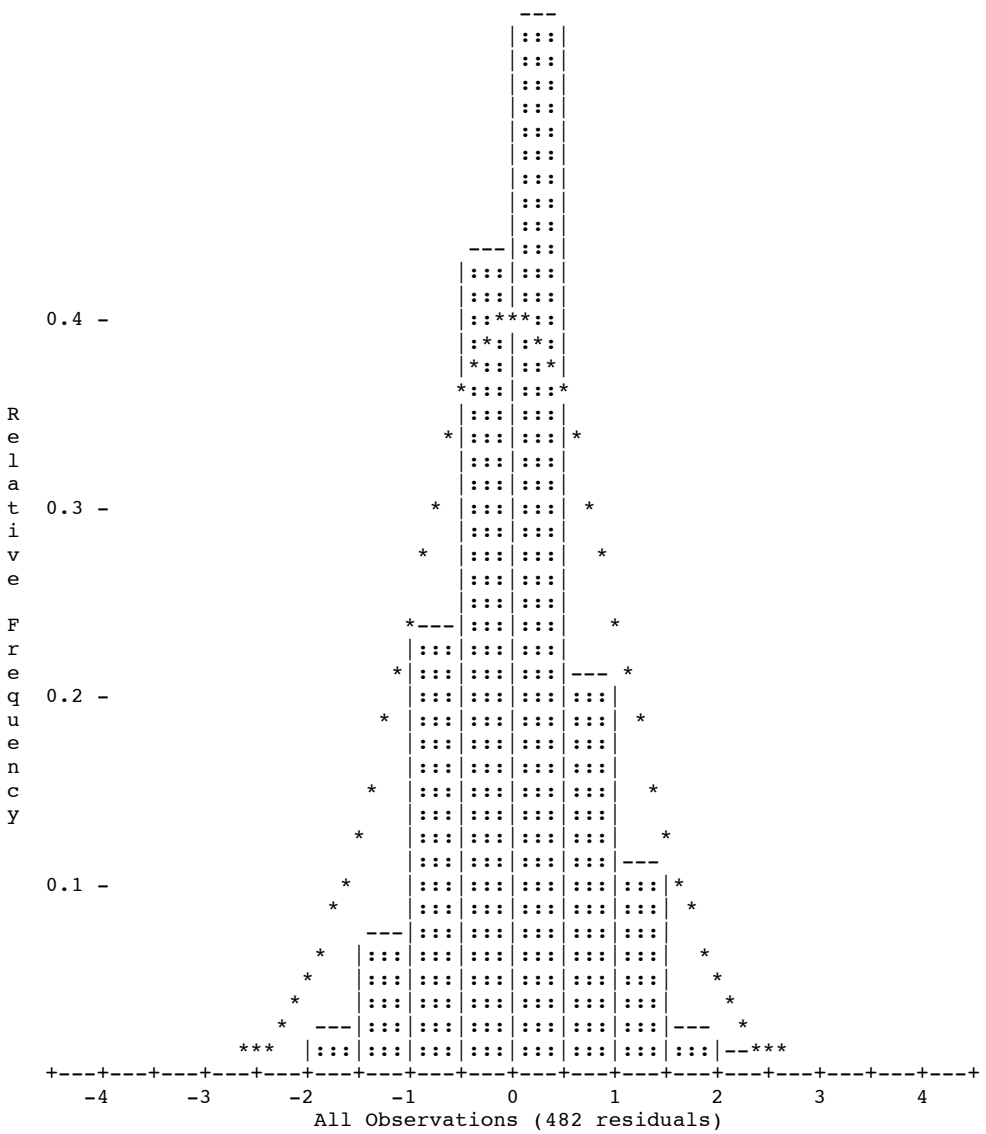
================================================================================
```






```
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0             WGS 84      UNITS: m,GRAD Page 0040
================================================================================
```




```
================================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0             WGS 84      UNITS: m,GRAD Page 0041
================================================================================
```

```
 ---------------------------------------------------------------------------
|                                                                           |
|                  S T A T I S T I C S     S U M M A R Y                    |
|                                                                           |
 ---------------------------------------------------------------------------
|                                    |                                      |
|     Residual Critical Value Type   |                Tau Max               |
|     Residual Critical Value        |                 4.0014               |
|     Number of Flagged Residuals    |                     10               |
|     Convergence Criterion          |                 0.0001               |
|     Final Iteration Counter Value  |                      4               |
|     Confidence Level Used          |                95.0000               |
|     Estimated Variance Factor      |                 1.3451               |
|     Number of Degrees of Freedom   |                    295               |
|                                    |                                      |
 ---------------------------------------------------------------------------
|                                                                           |
|                 Chi-Square Test on the Variance Factor:                   |
|                                                                           |
|                  1.1519e+00  <  1.0000  <  1.5916e+00  ?                  |
|                                                                           |
|                   ********   THE TEST FAILS   ********                   |
|                                                                           |
 ---------------------------------------------------------------------------

 ---------------------------------------------------------------------------
|                                                                           |
| NOTE:  All confidence regions were computed using the following factors:  |
|        ---------------------------------------------------------------    |
|        Variance factor used      =          1.3451                       |
|        1-D expansion factor      =          1.9600                       |
|        2-D expansion factor      =          2.4477                       |
|        3-D expansion factor      =          2.7955                       |
|                                                                           |
|        Note that, for relative confidence regions, precisions are         |
|        computed from the ratio of the major semi-axis and the spatial     |
|        distance between the two stations.                                 |
|                                                                           |
 ---------------------------------------------------------------------------
```

```
===========================================================================
     GRASSE-CALERN (FRANCE) GPS&LASER&VLBI&DORIS TIES - AUGUST 2009 SURVEY
Microsearch GeoLab, V2001.9.20.0             WGS 84      UNITS: m,GRAD Page 0042
===========================================================================
2-D and 1-D Station Confidence Regions (95.000 and 95.000 percent):
STATION            MAJOR SEMI-AXIS  AZ     MINOR SEMI-AXIS              VERTICAL
------------ ---------------------- --- -------------------- ----------------------
100_ARP                     0.0036 177              0.0030                 0.0024
100_ITA                     0.0037 178              0.0030                 0.0023
100_PRI                     0.0037 178              0.0030                 0.0023
10_ITA                      0.0033 178              0.0030                 0.0023
10_PRI                      0.0033   0              0.0030                 0.0023
11_ITA                      0.0033 178              0.0029                 0.0023
11_PRI                      0.0033 173              0.0030                 0.0023
12_ITA                      0.0033 179              0.0030                 0.0023
12_PRI                      0.0036 179              0.0033                 0.0026
13_ITA                      0.0033 176              0.0030                 0.0023
13_PRI                      0.0036 176              0.0033                 0.0026
20000                       0.0000   0              0.0000                 0.0023
200_ARP                     0.0032  19              0.0030                 0.0024
200_ITA                     0.0031  29              0.0030                 0.0023
200_PRI                     0.0032  21              0.0030                 0.0023
3000                        0.0000   0              0.0000                 0.0023
500                         0.0035 177              0.0033                 0.0045
500_ITA                     0.0038  31              0.0031                 0.0024
500_PRI                     0.0033  39              0.0031                 0.0024
51                          0.0045  15              0.0042                 0.0023
512                         0.0034  15              0.0031                 0.0023
52                          0.0045  15              0.0042                 0.0023
534                         0.0047 162              0.0035                 0.0023
55                          0.0055 162              0.0045                 0.0023
56                          0.0055 162              0.0045                 0.0023
600_ITA                     0.0031 156              0.0029                 0.0023
```

600_PRI	0.0031 155	0.0029	0.0023
DORIS_mark	0.0093 150	0.0090	0.0023
GR2B	0.0097 150	0.0094	0.0032
GR3B	0.0093 150	0.0090	0.0032
GR3B/2GHz	0.0032 150	0.0030	0.0023
GR3B/400MHz	0.0037 150	0.0030	0.0023
GR3B_plate	0.0000 0	0.0000	0.0023
GRAA	0.0181 150	0.0180	0.0032
GRAC	0.0033 146	0.0031	0.0032
GRAC_ARP	0.0031 142	0.0029	0.0023
GRAC_TCR	0.0033 142	0.0031	0.0023
GRAF	0.0033 152	0.0033	0.0032
GRAF_L	0.0033 152	0.0033	0.0023
GRAF_PRI	0.0030 152	0.0029	0.0023
GRAS	0.0027 0	0.0027	0.0022
GRAS_ARP	0.0029 170	0.0029	0.0023
GRAS_TCR	0.0029 0	0.0029	0.0023
GRSF	0.0033 171	0.0032	0.0023
GRSF_ITA	0.0030 116	0.0029	0.0023
GRSF_PRI	0.0030 74	0.0030	0.0023
GRSM	0.0035 1	0.0033	0.0032

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2-D and 1-D Station Confidence Regions (95.000 and 95.000 percent):

STATION	MAJOR SEMI-AXIS	AZ	MINOR SEMI-AXIS	VERTICAL
GRSM_L	0.0035	1	0.0033	0.0023
GRSM_PRI	0.0032	1	0.0029	0.0023
GRSM_plate	0.0035	1	0.0033	0.0032
GRSM_plumb	0.0035	1	0.0033	0.0032
SELF	0.0032	148	0.0030	0.0023
SELF_ITA	0.0031	149	0.0029	0.0023
SELF_PRI	0.0031	169	0.0030	0.0023
VLBI	0.0030	160	0.0029	0.0023
VLBI_ITA	0.0030	148	0.0029	0.0023
VLBI_L	0.0041	160	0.0041	0.0023
VLBI_PRI	0.0030	160	0.0029	0.0023

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3D Station Confidence Regions (95.000 percent):

STATION	MAJ-SEMI (AZ,VANG)	MED-SEMI (AZ,VANG)	MIN-SEMI (AZ,VANG)
100_ARP	0.0041 (177, 1)	0.0034 (267, 1)	0.0034 (53, 89)
100_ITA	0.0042 (178, 0)	0.0034 (268, 0)	0.0033 (41, 89)
100_PRI	0.0042 (178, 0)	0.0034 (268, 0)	0.0033 (39, 89)
10_ITA	0.0037 (178, 1)	0.0034 (268, 0)	0.0033 (23, 89)
10_PRI	0.0038 (180, 1)	0.0034 (270, 0)	0.0033 (26, 89)
11_ITA	0.0037 (178, 1)	0.0034 (268, 0)	0.0033 (28, 89)
11_PRI	0.0038 (173, 1)	0.0034 (263, 0)	0.0033 (30, 89)
12_ITA	0.0037 (179, 1)	0.0034 (269, 0)	0.0033 (19, 89)
12_PRI	0.0041 (179, 1)	0.0038 (269, 0)	0.0037 (19, 89)
13_ITA	0.0038 (176, 1)	0.0034 (266, 1)	0.0033 (39, 89)
13_PRI	0.0041 (176, 1)	0.0037 (266, 1)	0.0037 (39, 89)
20000	0.0033 (0, 90)	0.0000 (90, 0)	0.0000 (0, 0)
200_ARP	0.0036 (199, 2)	0.0034 (109, 0)	0.0034 (14, 88)
200_ITA	0.0036 (209, 1)	0.0034 (119, 1)	0.0033 (358, 89)
200_PRI	0.0036 (201, 1)	0.0034 (111, 0)	0.0033 (10, 89)
3000	0.0033 (0, 90)	0.0000 (90, 0)	0.0000 (0, 0)
500	0.0064 (175, 87)	0.0040 (357, 3)	0.0038 (267, 0)
500_ITA	0.0043 (211, 0)	0.0035 (121, 1)	0.0035 (302, 89)
500_PRI	0.0038 (39, 0)	0.0035 (129, 5)	0.0035 (308, 85)
51	0.0051 (195, 0)	0.0048 (105, 0)	0.0033 (3, 90)
512	0.0039 (195, 0)	0.0035 (105, 0)	0.0033 (343, 89)
52	0.0051 (195, 0)	0.0048 (105, 0)	0.0033 (3, 90)
534	0.0053 (162, 0)	0.0040 (252, 0)	0.0033 (38, 90)
55	0.0063 (162, 0)	0.0051 (252, 0)	0.0033 (19, 90)
56	0.0063 (162, 0)	0.0051 (252, 0)	0.0033 (19, 90)
600_ITA	0.0035 (156, 1)	0.0034 (246, 2)	0.0033 (36, 88)
600_PRI	0.0036 (155, 1)	0.0034 (245, 3)	0.0033 (49, 87)
DORIS_mark	0.0106 (150, 0)	0.0103 (240, 0)	0.0033 (353, 90)

```
GR2B              0.0111 (150,  0)      0.0108 (240,  0)      0.0046 (353, 90)
GR3B              0.0106 (150,  0)      0.0103 (240,  0)      0.0045 (353, 90)
GR3B/2GHz         0.0037 (150,  1)      0.0034 (240,  2)      0.0033 ( 43, 88)
GR3B/400MHz       0.0042 (150,  0)      0.0034 (240,  2)      0.0033 ( 53, 88)
GR3B_plate        0.0033 (  0, 90)      0.0000 ( 90,  0)      0.0000 (  0,  0)
GRAA              0.0207 (150,  0)      0.0205 (240,  0)      0.0046 (352, 90)
GRAC              0.0045 (206, 89)      0.0037 (326,  0)      0.0035 ( 56,  1)
GRAC_ARP          0.0035 (142,  0)      0.0033 (232,  3)      0.0033 ( 46, 87)
GRAC_TCR          0.0038 (142,  0)      0.0036 (232,  0)      0.0033 ( 33, 90)
GRAF              0.0046 (182, 90)      0.0038 (332,  0)      0.0037 ( 62,  0)
GRAF_L            0.0038 (152,  0)      0.0037 (242,  0)      0.0033 (  8, 90)
GRAF_PRI          0.0034 (152,  1)      0.0034 (242,  2)      0.0033 ( 27, 88)
GRAS              0.0031 (187, 88)      0.0031 (  0,  2)      0.0031 ( 90,  0)
GRAS_ARP          0.0033 (170,  1)      0.0033 (260,  1)      0.0033 ( 41, 89)
GRAS_TCR          0.0034 (180,  0)      0.0034 (270,  0)      0.0033 ( 41, 90)
GRSF              0.0037 (171,  0)      0.0036 (261,  0)      0.0033 ( 12, 90)
GRSF_ITA          0.0034 (116,  0)      0.0033 (206,  5)      0.0033 ( 21, 85)
GRSF_PRI          0.0034 (254,  0)      0.0034 (164,  1)      0.0033 (  4, 89)
GRSM              0.0046 (184, 90)      0.0040 (  1,  0)      0.0037 ( 91,  0)
================================================================================
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================================================================================
3D Station Confidence Regions (95.000 percent):
STATION         MAJ-SEMI (AZ,VANG)    MED-SEMI (AZ,VANG)    MIN-SEMI (AZ,VANG)
------------ -------------------- -------------------- --------------------
GRSM_L            0.0040 (181,  0)      0.0037 (271,  0)      0.0033 (  8, 90)
GRSM_PRI          0.0037 (181,  1)      0.0034 (271,  0)      0.0033 ( 22, 89)
GRSM_plate        0.0046 (184, 90)      0.0040 (  1,  0)      0.0037 ( 91,  0)
GRSM_plumb        0.0046 (184, 90)      0.0040 (  1,  0)      0.0037 ( 91,  0)
SELF              0.0036 (148,  0)      0.0034 (238,  1)      0.0033 ( 42, 89)
SELF_ITA          0.0035 (149,  0)      0.0033 (239,  3)      0.0033 ( 53, 87)
SELF_PRI          0.0035 (169,  1)      0.0034 (259,  1)      0.0033 ( 46, 89)
VLBI              0.0034 (160,  2)      0.0034 (250,  4)      0.0033 ( 44, 86)
VLBI_ITA          0.0034 (148,  1)      0.0033 (238, 26)      0.0033 ( 56, 64)
VLBI_L            0.0047 (160,  0)      0.0047 (250,  0)      0.0033 ( 13, 90)
VLBI_PRI          0.0034 (160,  1)      0.0034 (250,  1)      0.0033 ( 29, 88)

Fri Oct 16 18:41:22 2009
```

6.10. Global Covariance Matrix

```
*
* Extracted coordinates follow: (extracted on Tue Sep 29 17:34:36 2009)
* Source (GeoLab adjustment): Ratt_Grasse2009
* Variance factor of adjustment = 1.345083
* Variance factor used in computing covariance matrix = 1.345083
* Number of degrees of freedom of adjustment = 295
* Number of stations in adjusted network = 58
* Number of stations extracted = 4
*
 3DC
 XYZ      GRAS 10002M006     4581690.8411        556114.9230       4389360.8509 m       0
 XYZ      VLBI 10002M003     4581697.4774        556125.9995       4389351.6144 m       0
 XYZ      GRAF 10002S017     4581692.3994        556159.5514       4389357.7687 m       0
 XYZ      GRSM 10002S002     4581692.0141        556196.2658       4389355.2287 m       0
 COV  CT UPPR
 ELEM    1.23621358892255e-06      5.066820771483e-11    1.42715720464132e-10
 ELEM    1.23617735825536e-06    3.63315119539653e-11    1.75520079243134e-10
 ELEM    1.23616566396229e-06    2.24470898201107e-11    1.88787039561483e-10
 ELEM    1.23614863946303e-06    1.09296252415517e-10     2.4638379416494e-10
 ELEM    1.23540072391478e-06   -5.74507096142457e-11    5.10308956857145e-11
 ELEM    1.23537221552658e-06   -6.84921878980334e-11    7.89944992532412e-11
 ELEM    1.23537881806894e-06    -9.8453625557492e-11    1.71551220302884e-11
 ELEM    1.23537871419268e-06   -8.01761083950281e-11
 ELEM     1.2361791819641e-06    1.76277250826934e-10    -1.0009562729482e-10
 ELEM    1.23613435410951e-06    2.08049341411195e-10   -8.36774429977278e-11
 ELEM    1.23610061413994e-06    2.06992649439154e-10    -1.3046571514091e-10
 ELEM     1.2360609036024e-06
 ELEM    1.46239853478902e-06    1.33975253931856e-08   -2.89071108380312e-08
 ELEM    1.37977653589494e-06    2.25415084188657e-08   -1.98953269750379e-08
 ELEM    1.35997956551458e-06   -3.12703504672432e-09   -2.42820729007978e-09
 ELEM    1.46150812005836e-06   -1.42573069528667e-08    1.52242104847297e-08
 ELEM    1.39149582650146e-06   -1.62494355508804e-08    2.31900093749769e-08
 ELEM     1.3901655358796e-06   -2.39248925550661e-08
 ELEM    1.45978912256117e-06   -1.87254254068214e-08   -2.32439004927412e-08
 ELEM    1.37609620482351e-06   -4.75764130289854e-09    2.90264005371456e-09
 ELEM    1.35381916229264e-06
 ELEM    2.30873992317385e-06    2.26088673383301e-08      4.519171045346e-07
 ELEM    1.44925828536861e-06    3.09706749188146e-08   -7.98868158751418e-08
 ELEM    1.80873668015936e-06   -2.33972371285337e-08    2.29468356987995e-08
 ELEM    1.41875422039423e-06   -2.37594482038647e-08
 ELEM    2.26294635598434e-06    -8.1275400539606e-08   -3.21294147213785e-08
 ELEM    1.44828128420574e-06
 ELEM    2.42234831573256e-06    2.07484189134852e-08    3.22183455734366e-07
 ELEM    1.79137650590809e-06   -2.14647677042362e-08
 ELEM    2.38466287731352e-06
*
* End of extracted coordinates
*
```

6.11. SINEX file for the ITRF points of interest

```
%=SNX 1.00 IGN 09:272:00000 IGN 09:238:00000 09:238:00000 C 00012
*-------------------------------------------------------------------------------
+FILE/COMMENT
* File created by geotosnx software (Z.Altamimi)
* Original input file: Ratt_Grasse2009.cov
* Matrix Scalling Factor used:         1.0000000000
-FILE/COMMENT
*-------------------------------------------------------------------------------
+SITE/ID
*CODE PT __DOMES__ T _STATION DESCRIPTION__ APPROX_LON_ APPROX_LAT_ _APP_H_
 GRAS  A 10002M006   10002M006                6 55 14.0  43 45 17.0  1319.3
 VLBI  A 10002M003   10002M003                6 55 14.5  43 45 16.6  1318.6
 GRAF  A 10002S017   10002S017                6 55 16.0  43 45 16.8  1322.2
 GRSM  A 10002S002   10002S002                6 55 17.6  43 45 16.6  1323.3
-SITE/ID
*-------------------------------------------------------------------------------
+SOLUTION/EPOCHS
*Code PT SOLN T Data_start__ Data_end____ Mean_epoch__
-SOLUTION/EPOCHS
*-------------------------------------------------------------------------------
+SOLUTION/ESTIMATE
*INDEX TYPE__ CODE PT SOLN _REF_EPOCH__ UNIT S __ESTIMATED VALUE____ _STD_DEV___
     1 STAX   GRAS  A    1 09:238:00000 m    2 0.458169084110000E+07 0.11119E-02
     2 STAY   GRAS  A    1 09:238:00000 m    2 0.556114923000000E+06 0.11115E-02
     3 STAZ   GRAS  A    1 09:238:00000 m    2 0.438936085090000E+07 0.11118E-02
     4 STAX   VLBI  A    1 09:238:00000 m    2 0.458169747740000E+07 0.12093E-02
     5 STAY   VLBI  A    1 09:238:00000 m    2 0.556125999500000E+06 0.12089E-02
     6 STAZ   VLBI  A    1 09:238:00000 m    2 0.438935161440000E+07 0.12082E-02
     7 STAX   GRAF  A    1 09:238:00000 m    2 0.458169239940000E+07 0.15195E-02
     8 STAY   GRAF  A    1 09:238:00000 m    2 0.556159551400000E+06 0.13449E-02
     9 STAZ   GRAF  A    1 09:238:00000 m    2 0.438935776870000E+07 0.15043E-02
    10 STAX   GRSM  A    1 09:238:00000 m    2 0.458169201410000E+07 0.15564E-02
    11 STAY   GRSM  A    1 09:238:00000 m    2 0.556196265800000E+06 0.13384E-02
    12 STAZ   GRSM  A    1 09:238:00000 m    2 0.438935522870000E+07 0.15442E-02
-SOLUTION/ESTIMATE
*-------------------------------------------------------------------------------
+SOLUTION/MATRIX_ESTIMATE L COVA
*PARA1 PARA2 ____PARA2+0___________ ____PARA2+1___________ ____PARA2+2___________
     1     1 0.123621358892255E-05
     2     1 0.506682077148300E-10 0.123540072391478E-05
     3     1 0.142715720464132E-09 -.574507096142457E-10 0.123617918196410E-05
     4     1 0.123617735825536E-05 0.510308956857145E-10 0.176277250826934E-09
     4     4 0.146239853478902E-05
     5     1 0.363315119539653E-10 0.123537221552658E-05 -.100095627294820E-09
     5     4 0.133975253931856E-07 0.146150812005836E-05
     6     1 0.175520079243134E-09 -.684921878980334E-10 0.123613435410951E-05
     6     4 -.289071108380312E-07 -.142573069528667E-07 0.145978912256117E-05
     7     1 0.123616566396229E-05 0.789944992532412E-10 0.208049341411195E-09
     7     4 0.137977653589494E-05 0.152242104847297E-07 -.187254254068214E-07
     7     7 0.230873992317385E-05
     8     1 0.224470898201107E-10 0.123537881806894E-05 -.836774429977278E-10
     8     4 0.225415084188657E-07 0.139149582650146E-05 -.232439004927412E-07
     8     7 0.226088673383301E-07 0.180873668015936E-05
     9     1 0.188787039561483E-09 -.984536255574920E-10 0.123610061413994E-05
     9     4 -.198953269750379E-07 -.162494355508804E-07 0.137609620482351E-05
     9     7 0.451917104534600E-06 -.233972371285337E-07 0.226294635598434E-05
    10     1 0.123614863946303E-05 0.171551220302884E-10 0.206992649439154E-09
    10     4 0.135997956551458E-05 0.231900093749769E-07 -.475764130289854E-08
    10     7 0.144925828536861E-05 0.229468356987995E-07 -.812754005396060E-07
    10    10 0.242234831573256E-05
    11     1 0.109296252415517E-09 0.123537871419268E-05 -.130465715140910E-09
    11     4 -.312703504672432E-08 0.139016553587960E-05 0.290264005371456E-08
    11     7 0.309706749188146E-07 0.141875422039423E-05 -.321294147213785E-07
    11    10 0.207484189134852E-07 0.179137650590809E-05
    12     1 0.246383794164940E-09 -.801761083950281E-10 0.123606090360240E-05
    12     4 -.242820729007978E-08 -.239248925550661E-07 0.135381916229264E-05
    12     7 -.798868158751418E-07 -.237594482038647E-07 0.144828128420574E-05
    12    10 0.322183455734366E-06 -.214647677042362E-07 0.238466287731352E-05
-SOLUTION/MATRIX_ESTIMATE L COVA
%ENDSNX
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