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1 INTRODUCTION

The Tahiti geodetic observatory, hereafter designated as “OGT” from its French name (Observatoire Géodésique de Tahiti), is a co-location site hosting three space geodesy techniques: Satellite Laser Ranging (SLR), GPS and DORIS.

During the combination of the individual technique solutions for the computation of the ITRF2005 realisation of the IERS terrestrial reference system, a centimetre-level discrepancy was detected between the SLR and GPS solutions on the one hand, and the available local tie connection on the other hand. Such a disagreement was not a complete surprise, since the short distance connection between both techniques was never actually measured, but resulted from a combination of two much longer baselines measured at different epochs, as shown in Fig. 1.

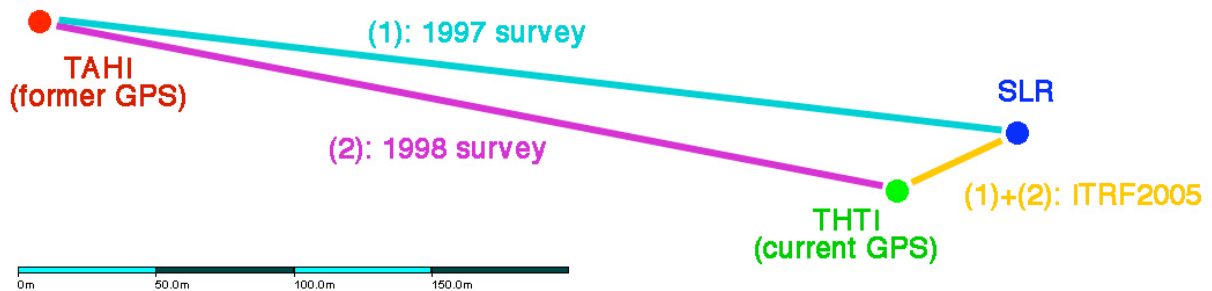


Fig. 1: sketch of the 1997 and 1998 baseline measurements

IGN-F (Institut Géographique National, France) has therefore decided to carry out a complete site survey, whose main objective would be to measure a direct connection between the SLR telescope reference point and the current permanent GPS station. Additionally, the current and former DORIS occupations, as well as the former GPS occupation, should be included in this global site computation.

2 SITE DESCRIPTION

2.1 General description

The Tahiti geodetic observatory is located on the campus of the French Polynesia university (Centre Universitaire de Polynésie Française), in the northwest part of the Tahiti island (Fig. 2). It is about two km south of the Faa’a airport (main airport of French Polynesia) and six km southwest of the centre of Papeete, the capital city of French Polynesia. The site is frequently – and incorrectly – named “Papeete” (IGS site logs, DORIS station name), whereas it is not located on the Papeete district, but in fact within the Punaauia city limits. The name “Tahiti” used on the SLR station log, although more general – it is the name of the whole island – is more correct.



Fig. 2: location of the OGT on Tahiti island

Tahiti, like all the Society Archipelago of which it is part, is in the UTC–10 time zone. The OGT is made of a main one storey building, and two trailers that host the SLR instruments and the telescope. Both the GPS and DORIS antennas are located on the terrace of the building, on top of load-bearing walls.

The “administration” building of the university campus, located about 300 metres west of the OGT, was the initial location of the GPS and DORIS antennas. There is no direct visibility between both sub-sites, but they are both visible from the top of the “Presidency” building located next-door to the OGT. A general aerial view of the campus is given in Annex 1.

2.2 Site history

The first space geodesy instrument on this site was the DORIS station whose “PAPB” antenna was installed in July 1995 on the roof of the administrative building. At the same time, the “TAHI” mark was put on the same roof and tied to the DORIS antenna, in expectation of the planned installation of a permanent GPS station, which eventually happened in April 1997.

A PRARE antenna was also installed and moved later to the OGT before the PRARE system end of operation.

A global survey of the recently built OGT was carried out by NASA/GSFC (team leader Vaughn Nelson) in August 1997, during the installation of the SLR. This survey included the main station mark (CDP 7124), three auxiliary marks (RM-1, RM-2 and RM-3) and three calibration piers (CAL-A, CAL-B and CAL-C), and the DORIS, GPS and PRARE antennas located 300 m away from the new OGT site.

In April 1998, the DORIS, GPS and PRARE stations were moved by IGN-France (surveyor Alain Orsoni) from the administrative building, to the OGT. The connection between the former and new antenna locations was measured by GPS observations. The OGT was officially inaugurated in May 1998.

In August 2000, the United States National Imagery and Mapping Agency (NIMA, now NGA since November 2003) installed a monitor station of the GPS space segment, also on the roof of the OGT main building.

2.3 Description of the current space geodesy points

2.3.1 The SLR station

The Tahiti SLR station (4-character code “THTL”) system reference is MOBLAS-8.

The telescope reference point (intersection of the rotation axes) was approximately centred above the ground reference mark during the installation, then the offset was measured.

The mark (a brass disk in a concrete monument flush with the main concrete pad) is identified as “SLR 7124” in the Geolab adjustment, and its DOMES number is 92201M007.

A self-centring plate is set on the bottom of the telescope mount.



Fig. 3: general view of the SLR telescope

2.3.2 The “THTI” GPS antenna

The GPS antenna is supported by a triangular plate on top of a 17 cm sided, one metre high lattice tower. This tower is bolted on the top of a load-bearing wall in the southwest corner of the terrace roof of the main OGT building. The antenna reference mark is a small domed brass mark embedded in the concrete, identified as “THTI”. Its DOMES number is 92201M009.



Fig. 4: the THTI GPS antenna on the roof

2.3.3 The “PAQB” and “PATB” DORIS antennas

During the survey, the DORIS antenna (code “PAQB”) and its supporting tower were replaced, as part of an upgrade process of the whole DORIS station, which also included a change of the beacon and meteorological station. The new antenna reference point is identified as “PATB”, and its DOMES number is 92201S010. The reference point of all the DORIS antennas is defined as the projection of the 2 GHz phase centre (located near the middle of the narrow end of the antenna) on the plane containing the red circle (Fig. 5). The tower which supports the DORIS antenna is located in the northeast corner of the terrace roof, on the intersection of two load-bearing walls. A small domed brass mark (DOMES 92201M008) is centred below the DORIS antenna reference point.

2.4 Description of the former space geodesy points

2.4.1 The “TAHI” GPS antenna

This antenna was supported by the same one-metre tower as the current GPS antenna. It was located on top of the administrative building, from April 1997 to April 1998. The ground mark on which it was centred had been installed much earlier, during the installation of the first DORIS antenna (PAPB). This mark (DOMES 92201M006), labelled "UNIV./UGP1" at that time, was connected to the DORIS antenna.

Fig. 5: the DORIS PAQB antenna reference point



2.4.2 The “PAPB” DORIS antenna

This antenna was operated between July 1995 and April 1998, on the roof of the administrative building. It was installed on a one-metre tower. Its DOMES number was 92201S007. Although the ground mark (DOMES 92201M004) was still present in October 2007, it was not included in the current survey as it was already accurately connected to TAHI in 1995.

2.5 Description of the other points

2.5.1 RM-2

RM-2 is one of the reference marks installed and surveyed by NASA/GSFC in 1997. It is a brass disk (Fig. 6) set in a 29 cm diameter concrete monument flush with the ground, in the northwest corner of the fenced area that hosts the SLR trailers (Fig. 7).



Fig. 6: the RM-2 mark



Fig. 7: a tripod set on RM-2

2.5.2 RM-3

RM-3 is one of the reference marks installed and surveyed by NASA/GSFC in 1997. It is a 5/8 inch bolt in the centre of a stainless steel plate, on top of a 33 cm diameter, 1.55 m high concrete pillar (Fig. 8). The reference point is the intersection of the top of the plate, and the axis of the bolt.



Fig. 8: a total station set on RM-3

2.5.3 TM-1

TM-1 is a temporary mark: a nail hammered into the ground (Fig. 9). We chose to create this new point rather than occupying the existing RM-1, because the latter did not allow to sight as many surrounding points. It is located near the edge of the embankment slope, in the northwest corner of the OGT compound.



Fig. 9: a tripod set on TM-1

2.5.4 TM-5

TM-5 is a tribrach set on top of the Presidency building, without any actual materialisation. It was used only as a secondary azimuth mark. Although the TM-6 mark turned out to be much more useful, we decided to use TM-5 and keep it in the adjustment all the same.

2.5.5 TM-6

TM-6 is a target pasted on the waterproof coating of the Presidency building. Its location was chosen so that all points, including the former GPS location 300 m away, would be visible from this point.

2.5.6 Other points (not occupied)

The following points, built and surveyed in 1997 by NASA/GSFC, were not observed:

- RM-1: as mentioned above, this point did not allow to see many other points, partly because of the nearby tree, the SLR trailers (which were not present during the 1997 survey), and the building.
- CAL-A and CAL-C: these calibration pillars were no longer visible from most points, because of the vegetation growth over ten years.
- CAL-B: this calibration pillar was still visible from several points, but it would have been hardly usable, because it is now protected by a metal casing to prevent the theft of the calibration target.

3 SURVEY DESCRIPTION

3.1 Survey schedule

The survey was carried out by Hervé Fagard and Jean-Claude Poyard, both with the Worldwide Networks unit of IGN-F. After the whole DORIS equipment was upgraded on October 1st and 2nd

by H.Fagard, and J-C.Poyard returned on October 2nd from Rikitea (Gambier Archipelago) where he had carried out a survey of the DORIS antenna, the survey took place between October 3rd and October 6th. The weather was mostly sunny with very few showers, which was fortunate as the SLR roof must be closed as soon as it looks like it might rain, because this operation takes several minutes.

3.2 Survey equipment

All the necessary equipment, belonging to IGN-F, had been air freighted from mainland France beforehand.

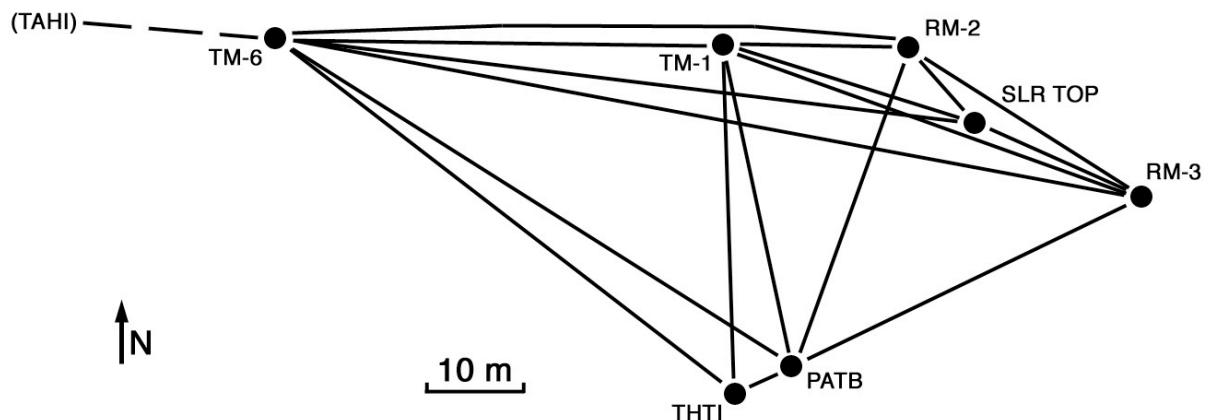
The equipment set was made up of:

- One Leica total station TC2002. This instrument, regularly calibrated by IGN's calibration unit, has a standard deviation of 0.15 mgon (angles) and 1 mm + 1 ppm (distances). For distance measurements, Leica corner cube reflectors (model GPHP1P), also calibrated, were used.
- One Zeiss Dini 10 electronic level, with 0.5 m and 2 m bar code staves.
- Two GPS receivers (Leica SR 530) and two GPS antennas (choking Leica AT504), checked by IGN's calibration unit.
- A translation stage (manufactured by IGN) used to accurately centre various items on the telescope vertical rotation axis.
- A special interface (manufactured by IGN) allowing to force-centre any geodetic instrument on a DORIS antenna supporting plate.
- Three heavy (and therefore very stable) tripods.
- Miscellaneous essential items such as tribrachs, targets, etc.

3.3 Observations

3.3.1 General survey layout

The following sketch shows the visibility between all points included in the survey:



The following observations were carried out:

- Horizontal and vertical angles, and distances were measured using the total station, set on the following points: RM-2, RM-3, TM-1, TM-6.
- Double-run spirit levelling operations were carried out, one connecting RM-2, RM-3 and the 7124 ground mark, another one connecting RM-3, PATB and THTI. Moreover, the height difference between RM-3 and the self-centring plate of the telescope was measured.
- GPS observations were carried out on all points, with occupation times ranging from 6 to almost 17 hours.

3.3.2 Survey procedures

Horizontal observations from each point were realised in two sets, one face left and one face right. A measurement was rejected if the difference between both sets was found greater than 1,5 mgon. Likewise, vertical angles were measured twice: face left and face right.

Meteorological data (temperature and pressure) were recorded locally before and after each station occupation.

All data collected by the total station were transformed to the Geolab input format using a software developed by IGN.

For each levelling measurement, the level performed two readings, and the resulting value was validated only if both readings agreed to within 0.04 mm. Likewise, a third run had to be measured if the difference between the forward and the backward run was greater than $0.1 \text{ mm} \times \sqrt{n}$ (n = number of traverse legs). This could not be achieved when connecting the DORIS and GPS marks on the roof, because of the soft coating on the terrace which affected the tripod stability. The instrument collimation was checked daily.

The GPS observations were carried out at a 30 second sampling rate, using either Leica AT504 antenna. The observation sessions are summarised in the following table:

Point	Start (UTC)	End (UTC)	Antenna height (m)
PATB	DOY 276 / 4:07	DOY 276 / 20:43	-0.376
RM-2	DOY 278 / 4:21	DOY 278 / 12:36	1.471
RM-3	DOY 277 / 4:05	DOY 277 / 16:40	0.185
SLR TOP	DOY 276 / 21:29	DOY 277 / 3:45	0.328
TAHI	DOY 277 / 18:25	DOY 278 / 2:30	1.175
TM-1	DOY 278 / 3:45	DOY 278 / 16:46	1.523
TM-5	DOY 276 / 3:18	DOY 276 / 12:54	0.000
TM-6	DOY 277 / 3:47	DOY 277 / 13:51	1.470

3.3.3 SLR reference point and ground mark

The first step consisted in materialising the vertical axis of rotation of the SLR telescope. It was first rotated upside down so that the black self-centring plate (normally located on the bottom of the telescope) was on top of it. Then the telescope was set at the zero-degree elevation angle, using a 60 cm long carpenter's level placed on top of the flat surface of the mount shroud. Since the manual locking clamp on the telescope is not strong enough to ensure the telescope does not move, we placed two C-clamps (Fig. 10) on top of and near the locking clamp to avoid any unwanted rotation.



Fig. 10: C-clamps securing the telescope

Then a translation stage was placed on top of the self-centring plate and fitted with a target (Fig. 11). The target was sighted from one nearby theodolite location – chosen such as that the line of sight was perpendicular to one of the translation axes of the translation stage – and its position on the translation stage was noted. Then the telescope was rotated horizontally by half a turn, and the offset of the target was measured. Then the translation stage was adjusted by half the offset. The same procedure was performed after the telescope was rotated 90° off its original orientation. When done, the target axis looked fixed as the telescope was rotated, when sighted with the theodolite, indicating that it located exactly on the telescope vertical rotation axis.



Fig. 11: the translation stage with a target, on the telescope



Fig. 12: measuring the telescope offset

In order to measure the vertical rotation axis offset with respect to the ground mark (CDP 7124), we sighted the target from two perpendicular theodolite locations and plunged the theodolite down to the survey disk and marked the two orthogonal lines of sight on the disk (Fig. 12). The telescope offset which resulted from this measurement was: 15 mm south, 10 mm east of the punch hole in the brass disk.

The reference point of the telescope is defined as the intersection of its vertical and horizontal rotation axes. The horizontal rotation axis is materialised by the telescope eyepiece on one of its sides. We measured the vertical offset between the top of the self-centring plate (named SLR TOP in the Geolab adjustment) and the eyepiece axis as follows:

1. The diameter of the eyepiece was measured using a calliper gauge (imperial unit version), and found equal to 1.4 inch. Therefore the radius of the viewfinder is 0.0178 m.
2. The height difference between the top of the self-centring plate, and the top of the eyepiece, was measured by spirit levelling and found equal to 0.473 m. Since this measurement had to be done in difficult conditions (almost out of range of the half-metre bar code staff), it was checked using a carpenter's level and a tape, which gave 0.474 m, hence a good confirmation.

The resulting vertical offset between the SLR reference point (named SLR AXES INT in the Geolab adjustment), and the top of the self-centring plate was therefore **0.491 m**. This value differs by 2 mm from the value (0.489 m) provided by Jim Long (NASA/GSFC) and measured by Honeywell many years ago when the MOBILAS systems were being assembled and installed in the NASA SLR network.

The following table compares the measured north, east and up we measured, with the previously known values, given in the ILRS site log (see Annex 2). All values are in metres, from the ground mark to the SLR reference point.

	ILRS site log	2007 survey	Difference
N	-0.015	-0.015	0.000
E	0.011	0.010	0.001
h	3.143	3.141	0.002

GPS observations were made on this point by installing a GPS antenna on the translation stage (Fig. 13). The antenna height was measured from the top of the self-centring plate. This point (SLR TOP in the Geolab adjustment) was labelled SLRT in the GPS file.



Fig. 13: GPS antenna centred above the SLR telescope



Fig. 14: GPS antenna on the TAHI mark

3.3.4 DORIS antenna

Before removal, the former DORIS antenna (PAQB) centring and height were checked. The 2 GHz phase centre was 0.6 mm west and 2.3 mm south of the DORIS mark, and the antenna reference point was 1.416 m above the mark.

The new antenna (PATB) was centred above the mark within 1 mm, and the reference point was 1.422 m above the mark.

The new DORIS antenna top (where the 2 GHz phase centre is located) could be sighted from a couple of points. Other measurements were carried out while the antenna was temporarily removed, and replaced either with a tribrach supporting a target or prism, or with a GPS antenna, both force-centred on the DORIS antenna supporting plate using a special interface.

3.3.5 GPS “THTI” antenna

According to the THTI site log (see Annex 3), the Ashtech choke ring antenna is exactly centred above the mark (no north nor east offset), and its ARP is located 1.047 m above the mark. Our measurements gave slightly different values: ARP was 2 mm east, and 1.045 m above the mark. Therefore we decided to define two different points in the survey:

- “THTI” is the point defined by the site log, i.e. a “virtual” point located 1.047 m below the ARP. This is the point whose coordinates are computed by the IGS analysis centres, and published in the ITRF solutions.
- “THTI MARK” is the actual mark.

3.3.6 GPS “TAHI” antenna

The ground mark of the former GPS antenna TAHI could easily be found on top of the administrative building, as well as the bolts used to fasten its supporting tower. A spare one-metre tower (the former DORIS one) was fastened very strongly on these bolts, and a GPS antenna (Fig. 14) could be accurately centred above the mark using a crafty DIY device made up of a tribrach and the special DORIS interface.

A target was also set on this point, and sighted from the roof of the Presidency building (TM-6) in order to improve the orientation of the local survey network which would otherwise lack a long distance orientation.

3.3.7 Other marks

Heavy tripods were set on TM-1, TM-6 and RM-2 (Figs 7 and 9). They were centred using a centring rod, then the total station, target or prism were centred using the forced centring device which is part of the tripod upper plate.

4 COMPUTATIONS

4.1 On-site validation

The GPS baselines were processed using Trimble Total Control (TTC), version 2.73. Then all measurements (conventional and GPS) were included in a Geolab adjustment, which showed no major outlier.

4.2 GPS baseline computation

The final computation was also done with TTC, with the following settings:

- Cutoff angle: 15°
- IGS rapid orbits
- L1 mode
- Saastamoinen tropospheric model
- Antenna phase centre variation model: NGS relative models.

4.3 Global adjustment

A global adjustment was carried out using the Microsearch Geolab software, version 2001.9.20.0, including the following data (see Annex 6) :

- all GPS baselines with the covariance matrices resulting from the TTC processing,
- the centring equations and height difference for all points located on the same vertical line,
- all the conventional observations: horizontal and vertical angles, distances, levelling,
- the DORIS (PAPB) – GPS (TAHI) baseline measured in 1995.

The ITRF2005 (2000.0) coordinates of the permanent GPS THTI were constrained (1 mm). The network orientation derives mainly from the GPS observations + horizontal angle measured on the most remote point, TAHI, whose coordinates were not constrained. The resulting coordinates for TAHI are within 5 mm of the coordinates published in the ITRF2005 official release, which confirms the correct orientation and scale of the network.

The following a priori standard deviations were used, for the observations done with the total station:

- horizontal angles: 0.8 mgon
- vertical angles: 1.2 mgon
- distances: 1 mm + 1 ppm

4.4 Results

The detailed results (Geolab output file) can be found in Annex 7. The estimated variance factor value (1.12) validates the a priori weighting strategy.

The following tables are excerpts of this file, giving the XYZ coordinates and confidence regions for the reference points of the three space geodesy techniques.

Adjusted XYZ Coordinates:

CODE	FFF	STATION	X-COORDINATE STD DEV	Y-COORDINATE STD DEV	Z-COORDINATE STD DEV
XYZ		PAPB	-5246579.9325 0.0022	-3076972.9304 0.0021	-1913777.0117 0.0020
XYZ		PAQB	-5246414.1977 0.0025	-3077266.6325 0.0026	-1913840.0216 0.0027
XYZ		PATB	-5246414.2027 0.0011	-3077266.6359 0.0011	-1913840.0213 0.0011
XYZ		SLR 7124	-5246406.8807 0.0013	-3077284.8288 0.0014	-1913814.0863 0.0015
XYZ		TAHI	-5246568.8995 0.0016	-3076989.3333 0.0014	-1913777.4275 0.0012
XYZ		THTI	-5246415.3220 0.0011	-3077260.2780 0.0011	-1913842.3840 0.0011

3D Station Confidence Regions (95.000 percent):

STATION	MAJ-SEMI (AZ, VANG)	MED-SEMI (AZ, VANG)	MIN-SEMI (AZ, VANG)
PAPB	0.0065 (103, 89)	0.0056 (310, 1)	0.0053 (220, 0)
PAQB	0.0075 (230, 0)	0.0075 (320, 0)	0.0068 (73, 90)
PATB	0.0032 (102, 89)	0.0030 (6, 0)	0.0030 (276, 1)
SLR 7124	0.0043 (299, 0)	0.0042 (29, 0)	0.0032 (175, 90)
TAHI	0.0051 (184, 90)	0.0034 (86, 0)	0.0032 (356, 0)
THTI	0.0030 (12, 0)	0.0030 (102, 0)	0.0030 (264, 90)

Since this survey was founded by a doubt on the quality of the available tie between the SLR and the GPS, a comparison was made between the value used in the ITRF2005 computation, and the one resulting from the 2007 survey. The following table gives the components in metres of the THTI → SLR MARK vector, and the difference between both survey results:

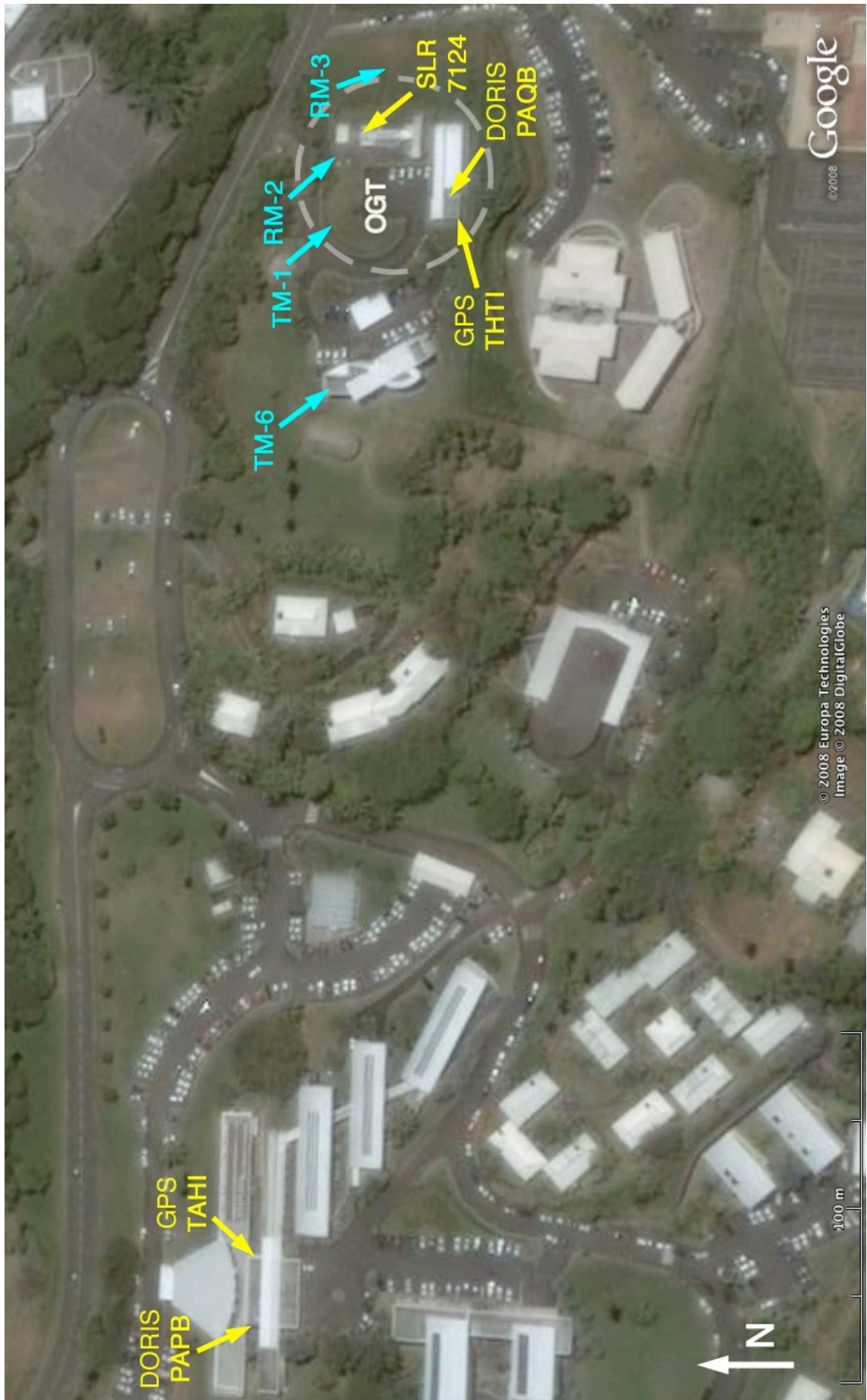
	ITRF2005 tie (1997 + 1998 surveys)	2007 survey	Difference (X / Y / Z)	<i>Difference</i> (N / E / h)
X	8.4555	8.4412	0.014	<i>-0.003</i>
Y	-24.5510	-24.5506	0.000	<i>0.007</i>
Z	28.2988	28.2975	0.001	<i>-0.012</i>

The global survey result, in the form of a SINEX file, was provided to Zuheir Altamimi, in charge of the computation of the ITRF solutions at IGN. Tests were carried out, which showed that the new values of the THTI → SLR MARK vector agree much better with the GPS and SLR solutions.

5 ACKNOWLEDGEMENTS

We thank the OGT personnel for their support during the survey, as well as for their assistance in getting the equipment cleared through customs.

Annex 1: Aerial view of the campus



Annex 2: ILRS 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/THTL_sitelog.html.

ILRS Site and System Information Form
International Laser Ranging Service

0. Form

Prepared by (Full Name) : Kenneth S. Tribble
Preparer E-mail : Kenneth.Tribble@Honeywell-tsi.com
Date Prepared : 2004-01-07
Report Type : UPDATE
Format Version : 1.0

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

Site Name : Tahiti Geodetic Observatory
IERS DOMES Number : **92201M007**
CDP Pad ID : **7124**
Subnetwork : NASA
Description : MONUMENT
Monument Description : PLATE
Monument Inscription : NONE
Mark Description : CHISELLED CROSS
Date Installed : 1997-08-01
Date Removed : (yyyy-mm-dd)
Geologic Characteristic : CONGLOMERATE
Additional Information : (multiple lines)

2. Site Location Information

City or Town : Punaauia
State or Province : Tahiti
Country : French Polynesia
Tectonic Plate : Pacific
Approximate Position
X coordinate [m]: -5246406.607
Y coordinate [m]: -3077285.162
Z coordinate [m]: -1913814.321
Latitude [deg]: 17.5768 S
Longitude [deg]: 210.3937 E
Elevation [m]: 82.171
Additional Information : (multiple lines)

3. General System Information

3.01 System Name : MOBLAS-8
4-Character Code : THTL
CDP System Number : 08
CDP Occupation Number : 02
Eccentricity to SRP (if Not Identical With SRP)
North [m]: **-0.015 +- 0.002**
East [m]: **0.011 +- 0.002**
Up [m]: **3.143 +- 0.002**
Date Measured : 1999-12-15
Date Installed : 1997-08-01
Date Removed : (yyyy-mm-dd)
Additional Information : (multiple lines)

4. Telescope Information

4.01 Receiving Telescope Type : CASSEGRAIN
Aperture [m]: 0.762
Mount : AZ-EL
Xmitting Telescope Type : REFRACTOR
Aperture [m]: 0.163
Tracking Camera Type : CCD
Model : GEN II INTENSIFIER
Manufacturer : HTSI
Field of View [deg]:
Minimum Magnitude [mag]:
Transmit/Receive Path : SEPARATE
Transmit/Receive Switch : NONE
Max Slew Rate Az [deg/s]: 20
Max Slew Rate El [deg/s]: 5

Max Used Tracking Rate Az : 5
 Max Used Tracking Rate El : 2
 Telescope Shelter : ROLL-BACK ROOF
 Daylight Filter Type : Omega Optical 532NB1 9114
 Dayl. Filt. Bandwidth [nm]: 100
 Adjustable Attenuation : RECEIVE
 Transmit Efficiency : 0.94
 Receive Efficiency : 0.76
 Date Installed : 1997-08-01
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)

5. Laser System Information

(...)

6. Receiver System

(...)

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 : 1998-11-22
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)
 GLONASS : NO
 Date Installed : (yyyy-mm-dd)
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)
 DORIS : IDS
 Date Installed : 1998-04-16
 Date Removed : (yyyy-mm-dd)
 Additional Information : PAQB
 PRARE : YES
 Date Installed : 1996-08-16
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)
 VLBI : NO
 Date Installed : (yyyy-mm-dd)
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)
 Gravimeter : NO
 Date Installed : (yyyy-mm-dd)
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)

13.02 Collocated Permanent Geodetic Systems

GPS : IGS
 Date Installed : 2000-08-25
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)
 GLONASS : NO
 Date Installed : (yyyy-mm-dd)
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)
 DORIS : IDS
 Date Installed : 1995-07-27

Date Removed : 1998-04-13
 Additional Information : PAPB
 PRARE : YES
 Date Installed : 1996-08-16
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)
 VLBI : NO
 Date Installed : (yyyy-mm-dd)
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)
 Gravimeter : NO
 Date Installed : (yyyy-mm-dd)
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)

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

Monument Name :
 Instrumentation Type : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/NONE)
 Instrumentation Status : (PERMANENT/MOBILE)
 DOMES Number : (XXXXXXXXXX)
 CDP Number : (XXXX)
 Differential Components (ITRS)
 dx [m]: (m +- m)
 dy [m]: (m +- m)
 dz [m]: (m +- m)
 Date Measured : (yyyy-mm-dd)
 Determined by :
 Date Installed : (yyyy-mm-dd)
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)

13.03.01 Eccentricities Between Other Monuments on Site

From: Monument Name : MOBLAS-8
 DOMES Number : 92201M007
 CDP Number : 7124
 To: Monument Name : PABP DORIS
 DOMES Number : 92201S007
 CDP Number : N.A.
 Differential Components (ITRS)
 dx [m]: -173.0775 +- 0.002
 dy [m]: 311.888 +- 0.002
 dz [m]: 37.0642 +- 0.002
 Date Measured : (yyyy-mm-dd)
 Determined by : IGN
 Additional Information : values in previous site log were
 in error

13.03.02 Eccentricities Between Other Monuments on Site

From: Monument Name : MOBLAS-8
 DOMES Number : 92201M007
 CDP Number : 7124
 To: Monument Name : PAQB
 DOMES Number : 92201S008
 CDP Number : N.A.
 Differential Components (ITRS)
 dx [m]: -7.3265 +- 0.002
 dy [m]: 18.193 +- 0.002
 dz [m]: -25.9328 +- 0.002
 Date Measured : (yyyy-mm-dd)
 Determined by : IGN
 Additional Information : (multiple lines)

13.03.03 Eccentricities Between Other Monuments on Site

From: Monument Name : MOBLAS-8
 DOMES Number : 92201M007
 CDP Number : 7124
 To: Monument Name : TAHI
 DOMES Number : 92201M006
 CDP Number : N.A.
 Differential Components (ITRS)
 dx [m]: -162.0445 +- 0.002
 dy [m]: 295.485 +- 0.002
 dz [m]: 36.6482 +- 0.002
 Date Measured : (yyyy-mm-dd)
 Determined by : IGN
 Additional Information : (multiple lines)

13.03.04 Eccentricities Between Other Monuments on Site

From: Monument Name : MOBLAS-8
DOMES Number : 92201M007
CDP Number : 7124
To: Monument Name : THTI
DOMES Number : 92201M009
CDP Number : N.A.
Differential Components (ITRS)
dx [m]: -8.4555 +- 0.002
dy [m]: 24.551 +- 0.002
dz [m]: -28.2988 +- 0.002
Date Measured : (yyyy-mm-dd)
Determined by : IGN
Additional Information : (multiple lines)

14. Local Events Possibly Affecting Computed Position

14.01 Date : (yyyy-mm-dd hh:mm UT)
Event : (EARTHQUAKE/CONSTRUCTION/etc)
Additional Information : (multiple lines)

15. On-Site, Point of Contact Agency Information

Agency : Tahiti Geodetic Observatory
Mailing Address : CUPF
BP 6570
98702 Faaa Aeroport
Tahiti - French Polynesia
Primary Contact
Contact Name : Keitapu Maamaatuaiahutapu
Telephone (primary) : (689) 803 805
Telephone (secondary) : (689) 577 827
Fax : (689) 803 842
E-mail : Keitapu.Maamaatuaiahutapu@ufp.pf
Secondary Contact
Contact Name : Yannick Vota
Telephone (primary) : (689) 803 841
Telephone (secondary) : (689) 707 710
Fax : (689) 803 842
E-mail : Yannick.Vota@ufp.Pf
Additional Information : (multiple lines)

16. Responsible Agency (if different from 15.)

(...)

17. More Information

URL for More Information : <http://www.ufp.pf/geos/>
Hardcopy on File
Site Map : NO
Site Diagram : NO
Horizon Mask : NO
Monument Description : NO
Site Pictures : NO
Additional Information : (multiple lines)

Annex 3: « THTI » GPS station 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://igsb.jpl.nasa.gov/network/site/thti.html>.

THTI Site Information Form

International GPS Service

See Instructions at:

ftp://igsb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0. Form

Prepared by (full name) : Jean-Paul CARDALIAGUET
Date Prepared : 2008-04-17
Report Type : UPDATE
If Update:
Previous Site Log : thti_20070913.log
Modified/Added Sections : 3.3,3.4,11

1. Site Identification of the GNSS Monument

Site Name : Tahiti
Four Character ID : **THTI**
Monument Inscription : None (IGNF brass)
IERS DOMES Number : **92201M009**
CDP Number : Not assigned
Monument Description : STEEL MAST
Height of the Monument : (m)
Monument Foundation : ROOF
Foundation Depth : (m)
Marker Description : BRASS NAIL
Date Installed : 1998-04-20
Geologic Characteristic : (BEDROCK/CLAY/CONGLOMERATE/GRAVEL/SAND/etc)
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)
: (multiple lines)

2. Site Location Information

City or Town : Papeete
State or Province :
Country : Tahiti, French Polynesia
Tectonic Plate : Pacific
Approximate Position (ITRF)
X coordinate (m) : -5246415.200
Y coordinate (m) : -3077260.429
Z coordinate (m) : -1913842.477
Latitude (N is +) : -173436.84
Longitude (E is +) : -1493622.68
Elevation (m,ellips.) : 98.04
Additional Information : Station located in the facilities of UPF
: (Universite de la Polynesie Francaise)

3. GNSS Receiver Information

- 3.1 Receiver Type : TRIMBLE 4000SSI
Satellite System : GPS
Serial Number : 380A21919
Firmware Version : 7.29
Elevation Cutoff Setting : (deg)
Date Installed : 1998-11-22
Date Removed : 2004-01-12
Temperature Stabiliz. : (none or tolerance in degrees C)
Additional Information : (multiple lines)
- 3.2 Receiver Type : ASHTECH UZ-12
Satellite System : GPS
Serial Number : 04006
Firmware Version : (A11)
Elevation Cutoff Setting : (deg)
Date Installed : 2004-01-13
Date Removed : 2007-09-17
Temperature Stabiliz. : (none or tolerance in degrees C)
Additional Information : (multiple lines)

3.3 Receiver Type : ASHTECH UZ-12
 Satellite System : GPS
 Serial Number : 04006
 Firmware Version : CN00-1A01
 Elevation Cutoff Setting : 3
 Date Installed : 2008-04-16
 Date Removed : 2008-04-16T07:00Z
 Temperature Stabiliz. : (none or tolerance in degrees C)
 Additional Information : (multiple lines)

3.4 Receiver Type : ASHTECH UZ-12
 Satellite System : GPS
 Serial Number : 48001
 Firmware Version : CN00-1A01
 Elevation Cutoff Setting : 3
 Date Installed : 2008-04-16T07:24Z
 Date Removed : (CCYY-MM-DDThh:mmZ)
 Temperature Stabiliz. : (none or tolerance in degrees C)
 Additional Information : (multiple lines)

(...)

4. GNSS Antenna Information

4.1 Antenna Type : TRM29659.00
 Serial Number : 0220111729
 Antenna Reference Point : BPA
 Marker->ARP Up Ecc. (m) : 1.047
 Marker->ARP North Ecc(m) : 000.0000
 Marker->ARP East Ecc(m) : 000.0000
 Alignment from True N :
 Antenna Radome Type : NONE
 Radome Serial Number :
 Antenna Cable Type : (vendor & type number)
 Antenna Cable Length : (m)
 Date Installed : 1998-11-22
 Date Removed : 2004-01-12
 Additional Information : (multiple lines)

4.2 Antenna Type : ASH701945E_M
 Serial Number : CR5200327039
 Antenna Reference Point : BPA
 Marker->ARP Up Ecc. (m) : 1.047
 Marker->ARP North Ecc(m) : 000.0000
 Marker->ARP East Ecc(m) : 000.0000
 Alignment from True N : (deg; + is clockwise/east)
 Antenna Radome Type : NONE
 Radome Serial Number :
 Antenna Cable Type : (vendor & type number)
 Antenna Cable Length : 30
 Date Installed : 2004-01-13
 Date Removed : (CCYY-MM-DDThh:mmZ)
 Additional Information : (multiple lines)

(...)

5. Surveyed Local Ties

5.1 Tied Marker Name : DORIS antenna ref. pt. (PAQB)
 Tied Marker Usage : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
 Tied Marker CDP Number :
 Tied Marker DOMES Number : 92201S008
 Differential Components from GNSS Marker to the tied monument (ITRS)
 dx (m) :
 dy (m) :
 dz (m) :
 Accuracy (mm) :
 Survey method : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
 Date Measured : (CCYY-MM-DDThh:mmZ)
 Additional Information :

5.2 Tied Marker Name : PRARE antenna ref. pt.
 Tied Marker Usage : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
 Tied Marker CDP Number :
 Tied Marker DOMES Number :
 Differential Components from GNSS Marker to the tied monument (ITRS)
 dx (m) :
 dy (m) :

```

    dz (m) :
Accuracy (mm) :
Survey method : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
Date Measured : (CCYY-MM-DDThh:mmZ)
Additional Information :

5.x Tied Marker Name :
Tied Marker Usage : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
Tied Marker CDP Number : (A4)
Tied Marker DOMES Number : (A9)
Differential Components from GNSS Marker to the tied monument (ITRS)
    dx (m) :
    dy (m) :
    dz (m) :
Accuracy (mm) : (mm)
Survey method : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
Date Measured : (CCYY-MM-DDThh:mmZ)
Additional Information : (multiple lines)

6. Frequency Standard

(...)

7. Collocation Information

7.1 Instrumentation Type : DORIS
    Status : PERMANENT
    Effective Dates : 1998-04-19/CCYY-MM-DD
    Notes : DORIS code

7.2 Instrumentation Type : PRARE
    Status : PERMANENT
    Effective Dates : 1998-04-19/CCYY-MM-DD
    Notes :

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 : Universite de la Polynesie Francaise
Preferred Abbreviation : UPF

Mailing Address : BP 6570 Faaa Aeroport -98702 Tahiti
                : French Polynesia

Primary Contact
Contact Name : Guilhem BARRUOL
              : Observatoire Geodesique de Tahiti
Telephone (primary) : 00 689.803 884
Telephone (secondary) :
Fax : 00 689 803 842
E-mail : barruol@upf.pf

Secondary Contact
Contact Name : Yannick VOTA
Telephone (primary) : 00 689.803 898
Telephone (secondary) :
Fax :
E-mail : yannick.vota@upf.pf
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

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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)

```

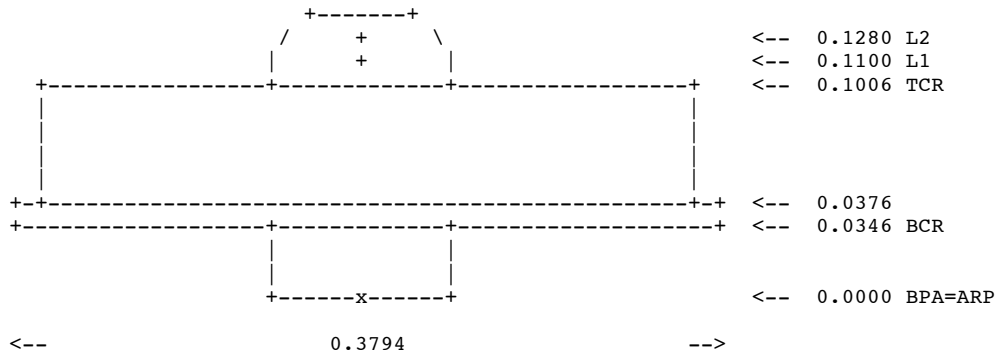
13. More Information

```

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             : X
Monument Description     : (Y)
Site Pictures            : (Y)
Additional Information   : (multiple lines)
Antenna Graphics with Dimensions

```

ASH701945E_M



Annex 4: « PATB » DORIS station 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://ids.cls.fr/html/doris/stations/station.php3?code=PAQB>.

PAPEETE DORIS site description form

0. Form

Prepared by : SIMB (DORIS installation and maintenance department)
Date prepared : 7/08/2008
Report type : UPDATE

1. Site location information

Site name : PAPEETE
Site DOMES number : 92201
Host agency : Universite de la Polynesie Francaise
City : Punaauia
State or province : Tahiti, Polynesie Francaise
Country : FRANCE (Polynesia)
Tectonic plate (PB2002) : Pacific
Geological information :

Geographical coordinates (ITRF) :
North Latitude : -17 deg 34' 37''
East Longitude : -149 deg 36' 23''
Ellipsoid height : 100 m
Approximate altitude : 86 m

2. DORIS antenna and reference point information

2.1

Four character ID : PAPB
Antenna model : Starec 52290 type
Antenna serial number : 30
IERS DOMES number : 92201S007
CNES/IGN number : 922012
CTDP number : 66
Date installed (dd/mm/yy) : 27/07/1995
Date removed (dd/mm/yy) : 13/04/1998
Antenna support type : 1 metre tower
Installed on : Top of a load bearing wall of a 3 storied building
Height above ground mark : 1.025 m
Ground mark type : Domed brass mak 12 mm diameter
Ground mark DOMES number : 92201M004
Notes :

2.2

Four character ID : PAQB
Antenna model : Starec 52290 type
Antenna serial number : 39
IERS DOMES number : 92201S008
CNES/IGN number : 922013
CTDP number : 78
Date installed (dd/mm/yy) : 16/04/1998
Date removed (dd/mm/yy) : 01/10/2007
Antenna support type : 1 metre tower
Installed on : Top of a load bearing wall of a 1 storied building
Height above ground mark : 1.415 m
Ground mark type : Domed brass mark 12 mm diameter
Ground mark DOMES number : 92201M008
Notes :

2.3

Four character ID : PATB
Antenna model : Starec 52291 type
Antenna serial number : 123
IERS DOMES number : 92201S010
CNES/IGN number : 922014
CTDP number : 279
Date installed (dd/mm/yy) : 02/10/2007
Date removed (dd/mm/yy) :
Antenna support type : 1 metre tower
Installed on : Top of a load bearing wall of a 1 storied building
Height above ground mark : 1.422 m
Ground mark type : Domed brass mark 12 mm diameter
Ground mark DOMES number : 92201
Notes :

3. DORIS beacons information

(...)

4. ITRF coordinates and velocities of the current DORIS ref. point (PATB)

Solution : ITRF2005 (tie to GPS "THTI")
Epoch : 2000.0

X = -5246414.203 m Y = -3077266.636 m Z = -1913840.021 m
Sig X = 0.002 m Sig Y = 0.002 m Sig Z = 0.002 m

VX = -0.0401 m/y VY = 0.0532 m/y VZ = 0.0338 m/y
Sig VX = .0002 m/y Sig VY = .0001 m/y Sig VZ = .0001 m/y

5. IERS co-location information

5.1

Instrument type : GPS
Status : Permanent
DOMES number of the
instrument ref. point : 92201M009
Notes :

5.2

Instrument type : SLR
Status : Permanent
DOMES number of the
instrument ref. point : 92201M007
Notes :

6. Tide gauge co-location information

6.1

Name : Papeete
Location : Harbour
GLOSS number : 140
Distance : 7 km
Notes : Tie measured 07/1995

7. Local site ties

7.1

Point description : DORIS Starec antenna reference point (PAQB)
DOMES number : 92201S008

Differential components from the current DORIS ref. point (PATB)
to the above point (in the ITRS) :
dX (m) : 0.005
dY (m) : 0.003
dZ (m) : 0.000
Accuracy (m) : 0.001
Date measured : October 2007
Additional information : Survey by IGN-F

7.2

Point description : DORIS Starec antenna reference point (PAPB)
DOMES number : 92201S007

Differential components from the current DORIS ref. point (PATB)
to the above point (in the ITRS) :
dX (m) : -165.730
dY (m) : 293.705
dZ (m) : 63.010
Accuracy (m) : 0.002
Date measured : July 1995
Additional information : Survey by IGN-F

7.3

Point description : THTI IGS station (virtual point slightly offset WRT the ground
mark)
DOMES number : 92201M009

Differential components from the current DORIS ref. point (PATB)
to the above point (in the ITRS) :
dX (m) : -1.119
dY (m) : 6.358
dZ (m) : -2.363
Accuracy (m) : 0.001

Date measured : October 2007
Additional information : Survey by IGN-F

7.4

Point description : MOBILAS-8 mark "7124"
DOMES number : 92201M007

Differential components from the current DORIS ref. point (PATB)
to the above point (in the ITRS) :

dX (m) : 7.322
dY (m) : -18.193
dZ (m) : 25.935

Accuracy (m) : 0.001
Date measured : October 2007
Additional information : Survey by IGN-F

7.5

Point description : Mark under the current DORIS antenna
DOMES number : 92201M008

Differential components from the current DORIS ref. point (PATB)
to the above point (in the ITRS) :

dX (m) : 1.169
dY (m) : 0.686
dZ (m) : 0.430

Accuracy (m) : 0.001
Date measured : October 2007
Additional information : Survey by IGN-F

7.6

Point description : GLOSS #140 Tide gauge : mark NU 5
DOMES number : 92201M005

Differential components from the current DORIS ref. point (PATB)
to the above point (in the ITRS) :

dX (m) : 623.406
dY (m) : -3 773.537
dZ (m) : 4636.646

Accuracy (m) : 0.01
Date measured : July 1995
Additional information : Survey by IGN-F

8. Meteorological Instrumentation

(...)

9. DORIS network contacts

Primary contact:

Name : Herve FAGARD
Agency : Institut Geographique National
Mailing address : Service de Geodesie et de Nivellement
: 2 Avenue PASTEUR
: 94165 SAINT-MANDE CEDEX FRANCE
Telephone : + 33 1 43 98 81 48
Fax : + 33 1 43 98 84 50
E-mail : herve (.) fagard (@) ign.fr

Secondary contact:

Name : Francois BOLDO
Agency : Institut Geographique National
Mailing address : CNES (DCT/ME/OT)
: 18 Avenue Edouard BELIN
: 31401 TOULOUSE Cedex FRANCE
Telephone : + 33 5 61 27 40 72
Fax : + 33 5 61 28 25 95
E-mail : Simb.Doris@cnes.fr

Annex 5: GPS baseline computation with TTC

Virtual PC "Windows 2000"

Trimble Total Control - OGT.ggs

File Edit View Project Process Adjust Transform Tools Options Window Help

GPS Processing

OGT.ggs

- Points
- Baselines
- Adjustment Vectors
- Total Station
- Azimuth
- Levelling
- Observation Files
- Ephemeris Files
- Ionosphere Models

	Obs-Files	Point Name	Interval (sec)	Start Time	Time Span	Type	Measured To	Antenna H
1	PATB2762.OBS	PATB	30.00	03/10/2007 04:07:30	595.00	Static	Bottom of antenna mount	-0.376
2	RM_22781.OBS	RM_2	30.00	05/10/2007 04:21:00	494.50	Static	Bottom of antenna mount	1.471
3	RM_32771.OBS	RM_3	30.00	04/10/2007 04:05:00	755.00	Static	Bottom of antenna mount	0.185
4	SLRT2764.OBS	SLRT	30.00	03/10/2007 21:29:30	375.50	Static	Bottom of antenna mount	0.328
5	TAHI2772.OBS	TAHI	30.00	04/10/2007 18:25:30	484.50	Static	Bottom of antenna mount	1.175
6	HHI2760.OBS	THTI	30.00	03/10/2007 00:00:00	1439.50	Static	Bottom of antenna mount	1.047
7	HHI2770.OBS	THTI	30.00	04/10/2007 00:00:00	1439.50	Static	Bottom of antenna mount	1.047
8	HHI2780.OBS	THTI	30.00	05/10/2007 03:45:30	780.50	Static	Bottom of antenna mount	1.523
9	TM_12780.OBS	TM_1	30.00	03/10/2007 03:18:00	576.00	Static	Bottom of antenna mount	0.000
10	TM_52761.OBS	TM_5	30.00	04/10/2007 03:47:00	604.00	Static	Bottom of antenna mount	1.470
11	TM_62770.OBS	TM_6	30.00					

Project Plot | Points | Baselines | Total Stations | Occupations | Obs-Files | Control Points | Adjustment Vectors

OGT.ggs

- Points
- Baselines
- Adjustment Vectors
- Total Station
- Azimuth
- Levelling
- Observation Files
- Ephemeris Files
- Ionosphere Models

	Obs-Files	Receiver	Antenna	Measured To	H (m)
1	PATB2762.OBS	Leica SR530	Leica AT504 w/Choke Ring	Bottom of antenna mount	-0.376
2	RM_22781.OBS	Leica SR530	Leica AT504 w/Choke Ring	Bottom of antenna mount	1.471
3	RM_32771.OBS	Leica SR530	Leica AT504 w/Choke Ring	Bottom of antenna mount	0.185
4	SLRT2764.OBS	Leica SR530	Leica AT504 w/Choke Ring	Bottom of antenna mount	0.328
5	TAHI2772.OBS	Leica SR530	Leica AT504 w/Choke Ring	Bottom of antenna mount	1.175
6	HHI2760.OBS	Ashtech Micro Z	Ashtech D/M Choke, Rev B	Bottom of antenna mount	1.047
7	HHI2770.OBS	Ashtech Micro Z	Ashtech D/M Choke, Rev B	Bottom of antenna mount	1.047
8	HHI2780.OBS	Ashtech Micro Z	Ashtech D/M Choke, Rev B	Bottom of antenna mount	1.523
9	TM_12780.OBS	Leica SR530	Leica AT504 w/Choke Ring	Bottom of antenna mount	0.000
10	TM_52761.OBS	Leica SR530	Leica AT504 w/Choke Ring	Bottom of antenna mount	1.470
11	TM_62770.OBS	Leica SR530	Leica AT504 w/Choke Ring	Bottom of antenna mount	1.470

Project Plot | Points | Baselines | Total Stations | Occupations | Obs-Files | Control Points | Adjustment Vectors

OGT.ggs

- Points
- Baselines
- Adjustment Vectors
- Total Station
- Azimuth
- Levelling
- Observation Files
- Ephemeris Files
- Ionosphere Models

	Enable	Adjust	Reference	Rover	Solution	dk (m)	dp (m)	dz (m)	Std.Dev. dk (mm)	Std.Dev. dp (mm)	Std.Dev. dz (mm)	S (m)
1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ADU	THTI	Double Diff / Fixed / L1	1.119	-6.358	2.363	0.2	0.2	0.2	6.874
2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ADU	THTI	Double Diff / Fixed / L1	5.462	-26.310	27.186	0.5	0.4	0.3	38.225
3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ADU	THTI	Double Diff / Fixed / L1	16.087	-40.540	19.633	0.4	0.3	0.2	47.830
4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ADU	THTI	Double Diff / Fixed / L1	-153.577	270.945	64.956	0.7	0.5	0.4	318.145
5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ADU	THTI	Double Diff / Fixed / L1	2.805	-19.727	35.787	0.7	0.5	0.4	40.960
6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ADU	RM_2	Double Diff / Fixed / L1	-9.951	16.940	0.299	0.7	0.5	0.4	19.648
7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ADU	THTI	Double Diff / Fixed / L1	-7.146	-2.788	36.086	0.3	0.2	0.2	36.892
8	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ADU	PATB	Double Diff / Fixed / L1	-34.391	39.321	34.326	0.6	0.4	0.3	62.507
9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ADU	THTI	Double Diff / Fixed / L1	-33.273	32.962	36.688	0.4	0.3	0.2	59.495
10	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ADU	RM_3	Double Diff / Fixed / L1	50.178	76.831	16.010	0.4	0.3	0.3	93.151
11	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ADU	THTI	Double Diff / Fixed / L1	-34.091	36.291	35.644	0.3	0.2	0.2	61.235

Project Plot | Points | Baselines | Total Stations | Occupations | Obs-Files | Control Points | Adjustment Vectors

Postprocessing Report

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OGT.ggs

User Name	Trimble Employee	Date & Time	14:15:37 8/9/2008
Coordinate System	Standard Map Projection	Zone	
Project Datum		Geoid Model	
Coordinate Units	Meter		
Distance Units	Meter		
Height Units	Meter		
Angle Units	Degrees		

Number of Baselines	11 (Solution(s): 11)
Minimum Ratio	1.8
Start Date and Time	2007/10/3 3:18 (GPS + 0.0h)
End Date and Time	2007/10/5 16:46 (GPS + 0.0h)

THTI - PATB

	<u>THTI</u>	<u>PATB</u>
Receiver / S/N	Micro Z / 304006	SR530 / 40070
Antenna / S/N / Height	ASH701945B_M / CR5200327039 / 1.1570m	LEIAT504 / Not Set / -0.2660m
Baseline Vector	1.1194m +0.2mm / -6.3577m +0.2mm / 2.3626m +0.2mm / Solutions: Fixed L1	
Time Span (GPS + 0.0h)	2007/10/3 4:07 - 2007/10/3 20:42 / 59700 Sec	
Time Information	GPS-Week: 1447 / DOY: 276 / Processing Interval: 30.00 Sec / common Epochs: 1990	
Ratio 404.5 OK PDOP: 1.2 - 14.6 / RDOP: 0.1 / RMS: 3.2 mm / Number of Satellites : 25		

THTI - SLRT

	<u>THTI</u>	<u>SLRT</u>
Receiver / S/N	Micro Z / 304006	SR530 / 40070
Antenna / S/N / Height	ASH701945B_M / CR5200327039 / 1.1570m	LEIAT504 / Not Set / 0.4380m
Baseline Vector	5.4622m +0.5mm / -26.3097m +0.4mm / 27.1862m +0.3mm / Solutions: Fixed L1	
Time Span (GPS + 0.0h)	2007/10/3 21:29 - 2007/10/3 23:59 / 9000 Sec	
Time Information	GPS-Week: 1447 / DOY: 276 / Processing Interval: 30.00 Sec / common Epochs: 300	
Ratio 309.4 OK PDOP: 1.1 - 8.2 / RDOP: 0.1 / RMS: 3.7 mm / Number of Satellites : 17		

THTI - RM 3

	<u>THTI</u>	<u>RM 3</u>
Receiver / S/N	Micro Z / 304006	SR530 / 40070
Antenna / S/N / Height	ASH701945B_M / CR5200327039 / 1.1570m	LEIAT504 / Not Set / 0.2950m
Baseline Vector	16.0866m +0.4mm / -40.5397m +0.3mm / 19.6334m +0.2mm / Solutions: Fixed L1	
Time Span (GPS + 0.0h)	2007/10/4 4:05 - 2007/10/4 16:40 / 45300 Sec	

Time Information GPS-Week: 1447 / DOY: 277 / Processing Interval: 30.00 Sec / common Epochs: 1510

Ratio 49.7 OK PDOP: 1.1 - 3.4 / RDOP: 0.1 / RMS: 3.5 mm / Number of Satellites : 25

[THTI - TAHI](#)

	<u>THTI</u>	<u>TAHI</u>
Receiver / S/N	Micro Z / 304006	SR530 / 40070
Antenna / S/N / Height	ASH701945B_M / CR5200327039 / 1.1570m	LEIAT504 / Not Set / 1.2850m
Baseline Vector	-153.5775m +0.7mm / 270.9447m +0.5mm / 64.9564m +0.4mm / Solutions: Fixed L1	
Time Span (GPS + 0.0h)	2007/10/4 18:25 - 2007/10/4 23:59 / 20040 Sec	

Time Information GPS-Week: 1447 / DOY: 277 / Processing Interval: 30.00 Sec / common Epochs: 668

Ratio 11.5 OK PDOP: 1.0 - 8.2 / RDOP: 0.1 / RMS: 5.4 mm / Number of Satellites : 18

[THTI - RM 2](#)

	<u>THTI</u>	<u>RM 2</u>
Receiver / S/N	Micro Z / 304006	SR530 / 40070
Antenna / S/N / Height	ASH701945B_M / CR5200327039 / 1.1570m	LEIAT504 / Not Set / 1.5810m
Baseline Vector	2.8049m +0.7mm / -19.7272m +0.5mm / 35.7872m +0.4mm / Solutions: Fixed L1	
Time Span (GPS + 0.0h)	2007/10/5 4:21 - 2007/10/5 12:35 / 29670 Sec	

Time Information GPS-Week: 1447 / DOY: 278 / Processing Interval: 30.00 Sec / common Epochs: 989

Ratio 4.1 OK PDOP: 1.1 - 3.1 / RDOP: 0.1 / RMS: 5.7 mm / Number of Satellites : 20

[RM 2 - TM 1](#)

	<u>RM 2</u>	<u>TM 1</u>
Receiver / S/N	SR530 / 40070	SR530 / 40083
Antenna / S/N / Height	LEIAT504 / Not Set / 1.5810m	LEIAT504 / Not Set / 1.6330m
Baseline Vector	9.9510m +0.7mm / -16.9395m +0.5mm / -0.2988m +0.4mm / Solutions: Fixed L1	
Time Span (GPS + 0.0h)	2007/10/5 4:21 - 2007/10/5 12:35 / 29670 Sec	

Time Information GPS-Week: 1447 / DOY: 278 / Processing Interval: 30.00 Sec / common Epochs: 989

Ratio 3.6 OK PDOP: 1.1 - 3.1 / RDOP: 0.1 / RMS: 6.0 mm / Number of Satellites : 20

[THTI - TM 1](#)

	<u>THTI</u>	<u>TM 1</u>
Receiver / S/N	Micro Z / 304006	SR530 / 40083
Antenna / S/N / Height	ASH701945B_M / CR5200327039 / 1.1570m	LEIAT504 / Not Set / 1.6330m
Baseline Vector	7.1458m +0.3mm / 2.7876m +0.2mm / -36.0861m +0.2mm / Solutions: Fixed L1	
Time Span (GPS + 0.0h)	2007/10/5 3:45 - 2007/10/5 16:46 / 46830 Sec	

Time Information GPS-Week: 1447 / DOY: 278 / Processing Interval: 30.00 Sec / common Epochs: 1561

Ratio 38.3 OK PDOP: 1.1 - 3.4 / RDOP: 0.1 / RMS: 3.1 mm / Number of Satellites : 25

[PATB - TM 5](#)

	PATB	TM 5
Receiver / S/N	SR530 / 40070	SR530 / 40083
Antenna / S/N / Height	LEIAT504 / Not Set / -0.2660m	LEIAT504 / Not Set / 0.1100m
Baseline Vector	34.3912m +0.6mm / -39.3209m +0.4mm / -34.3260m +0.3mm / Solutions: Fixed L1	
Time Span (GPS + 0.0h)	2007/10/3 4:07 - 2007/10/3 12:54 / 31590 Sec	
Time Information	GPS-Week: 1447 / DOY: 276 / Processing Interval: 30.00 Sec / common Epochs: 1053	
	Ratio 825.2 OK PDOP: 1.3 - 14.6 / RDOP: 0.1 / RMS: 3.6 mm / Number of Satellites : 19	

[THTI - TM 5](#)

	THTI	TM 5
Receiver / S/N	Micro Z / 304006	SR530 / 40083
Antenna / S/N / Height	ASH701945B_M / CR5200327039 / 1.1570m	LEIAT504 / Not Set / 0.1100m
Baseline Vector	33.2735m +0.4mm / -32.9624m +0.3mm / -36.6885m +0.2mm / Solutions: Fixed L1	
Time Span (GPS + 0.0h)	2007/10/3 3:18 - 2007/10/3 12:54 / 34560 Sec	
Time Information	GPS-Week: 1447 / DOY: 276 / Processing Interval: 30.00 Sec / common Epochs: 1152	
	Ratio 1135.8 OK PDOP: 1.3 - 14.6 / RDOP: 0.1 / RMS: 3.0 mm / Number of Satellites : 20	

[RM 3 - TM 6](#)

	RM 3	TM 6
Receiver / S/N	SR530 / 40070	SR530 / 40083
Antenna / S/N / Height	LEIAT504 / Not Set / 0.2950m	LEIAT504 / Not Set / 1.5800m
Baseline Vector	50.1779m +0.4mm / -76.8309m +0.3mm / -16.0096m +0.3mm / Solutions: Fixed L1	
Time Span (GPS + 0.0h)	2007/10/4 4:05 - 2007/10/4 13:51 / 35160 Sec	
Time Information	GPS-Week: 1447 / DOY: 277 / Processing Interval: 30.00 Sec / common Epochs: 1172	
	Ratio 69.8 OK PDOP: 1.1 - 2.6 / RDOP: 0.1 / RMS: 3.7 mm / Number of Satellites : 22	

[THTI - TM 6](#)

	THTI	TM 6
Receiver / S/N	Micro Z / 304006	SR530 / 40083
Antenna / S/N / Height	ASH701945B_M / CR5200327039 / 1.1570m	LEIAT504 / Not Set / 1.5800m
Baseline Vector	34.0914m +0.3mm / -36.2906m +0.2mm / -35.6443m +0.2mm / Solutions: Fixed L1	
Time Span (GPS + 0.0h)	2007/10/4 3:47 - 2007/10/4 13:51 / 36240 Sec	
Time Information	GPS-Week: 1447 / DOY: 277 / Processing Interval: 30.00 Sec / common Epochs: 1208	
	Ratio 115.2 OK PDOP: 1.1 - 2.6 / RDOP: 0.1 / RMS: 2.9 mm / Number of Satellites : 22	

Annex 6: Geolab adjustment input file

```

* TAHITI GEODETIC OBSERVATORY
* GROUND CONTROL SURVEY PERFORMED IN OCTOBER 2007

COMP ADJ
TITL TAHITI GEODETIC OBSERVATORY - OCT 2007 SURVEY
ELIP WGS 84          6378137.0000   6356752.3142   0.0000   0.0000   0.0000 m   0.000000
0.000000 0.000000 0.000000

CONF YES YES YES YES NO

* POINTS DESCRIPTION

* SLR
* SLR 7124: SLR NASA DISK (DOMES 92201M007), located under the telescope
* SLR AXES INT: intersection of the rotation axes of the telescope (= reference point)
* SLR EYEPIECE: top of the eyepiece on the side of the telescope (used for levelling only)
* SLR TOP: intersection of the self-centering plate on top of the telescope,
*           : and the telescope vertical rotation axis

* PERMANENT GPS
* TAHI: IGN domed mark for former IGS station "TAHI" (DOMES 92201M006)
*           : this mark was labelled "UNIV./UGP1" in the 1995 DORIS survey adjustment
* THTI : IGS point "THTI" = virtual point listed in the ITRF solutions (DOMES 92201M009)
*           : this point is located 1.047 m below the Chokering Antenna Reference Point
*           : (according to the IGS sitelog THTI20070913.LOG)
*           : this point is 2 mm below and 2 mm East of the actual mark THTI MARK
* THTI MARK: IGN domed mark below the antenna of the permanent IGS station "THTI"
* THTI ARP: Chokering Antenna Reference Point of the IGS station "THTI"
* THTI PRISM1: prism centred above THTI MARK
* THTI PRISM2: prism centred above THTI MARK (different height)

* DORIS
* PAPB: former DORIS Starec antenna reference point (1995-07-27 to 1998-04-19) (DOMES
92201S007)
* PAQB: former DORIS Starec antenna reference point (1998-04-19 to 2007-10-01) (DOMES
92201S008)
* PATB: current DORIS Starec antenna reference point (as of 2007-10-02) (DOMES 92201S010)
* PATB MARK: IGN domed mark below the DORIS antennas ("PAQB" then "PATB")
* PATB PRISM: prism centred above the DORIS mark
* PATB PLATE: bottom of the DORIS antenna triangular base plate (used for levelling only)

* PERMANENT MARKS
* RM-2: NASA disk flush with ground, near the north-west corner of the fenced area
* RM-3: forced centring concrete pillar east of the SLR
*           : Reference height is the top of the plate.

* TEMPORARY MARKS
* TM-1: temporary mark 1 = screw in the ground near mark RM-1
* TM-5: temporary mark 5 = tribrach on the roof of the university presidential building,
*           : used only as an azimuth mark
* TM-6: temporary mark 6 = glued target on the roof of the university presidential building

* THTI ITRF2005 (2000.0) coordinates constrained at 1 mm
3DC
XYZ 000 THTI          -5246415.322          -3077260.278          -1913842.384 m
COV CT DIAG          0          1          0          1
ELEM          0.000001          0.000001          0.000001

* Other points approximate coordinates
PLH 000 SLR 7124      S 17 34 36.504   W149 36 22.334          94.393 m          0
PLH 000 SLR AXES INT S 17 34 36.504   W149 36 22.334          97.534 m          0
PLH 110 SLR EYEPIECE S 17 34 36.504   W149 36 22.334          97.552 m          0
PLH 000 SLR TOP      S 17 34 36.504   W149 36 22.334          98.025 m          0
XYZ 000 TAHI          -5246568.903          -3076989.338          -1913777.429 m
PLH 000 THTI MARK    S 17 34 37.432   W149 36 23.197          98.040 m          0
PLH 000 THTI ARP    S 17 34 37.432   W149 36 23.197          99.084 m          0
PLH 000 THTI PRISM1 S 17 34 37.432   W149 36 23.197          98.760 m          0
PLH 000 THTI PRISM2 S 17 34 37.432   W149 36 23.197          98.762 m          0
PLH 000 PAPB        S 17 34 35.435   W149 36 34.434          74.000 m          0
PLH 000 PAPB MARK   S 17 34 35.435   W149 36 34.434          75.025 m          0
PLH 000 PAQB        S 17 34 37.336   W149 36 22.992          99.465 m          0
PLH 000 PATB        S 17 34 37.336   W149 36 22.992          99.471 m          0
PLH 000 PATB MARK   S 17 34 37.336   W149 36 22.992          98.049 m          0
PLH 000 PATB PRISM  S 17 34 37.336   W149 36 22.992          99.331 m          0
PLH 110 PATB PLATE  S 17 34 37.336   W149 36 22.992          99.073 m          0
PLH 000 RM-2        S 17 34 36.248   W149 36 22.572          94.438 m          0
PLH 000 RM-3        S 17 34 36.758   W149 36 21.735          98.431 m          0
PLH 000 TM-1        S 17 34 36.238   W149 36 23.238          94.363 m          0
PLH 000 TM-5        S 17 34 36.176   W149 36 24.732          98.421 m          0
PLH 000 TM-6        S 17 34 36.218   W149 36 24.844          97.810 m          0

```

* CENTRING EQUATIONS (2007)

* DORIS antennas excentricities and height with respect to DORIS MARK

* PATB is exactly centred above the mark

* PAQB is 0.6 mm west and 2.3 mm south of DORIS MARK

* Both antenna phase centres are defined within 2 mm

```

3DD
PLH 000 PATB MARK      s 17 34 37.336000 w149 36 22.992000      98.000
PLH 000 PAQB           s 17 34 37.336075 w149 36 22.992020      99.416
PLH 000 PATB           s 17 34 37.336000 w149 36 22.992000      99.422
COV LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
ELEM           0.000004                0.000004                0.000004
ELEM           0.000004                0.000004                0.000004
    
```

* PATB PRISM is centred above the mark

```

3DD
PLH 000 PATB MARK      s 17 34 37.336000 w149 36 22.992000      98.000
PLH 000 PATB PRISM    s 17 34 37.336000 w149 36 22.992000      99.282
COV LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
ELEM           0.000001                0.000001                0.000001
    
```

* THTI antenna excentricity with respect to THTI MARK

* THTI is 2 mm lower and 2 mm east of THTI MARK

* THTI is a virtual point located 1.047 m below THTI ARP

```

3DD
PLH 000 THTI           S 17 34 37.43226 W149 36 23.19775      97.000
PLH 000 THTI MARK     S 17 34 37.43226 W149 36 23.19782      97.002
PLH 000 THTI ARP      S 17 34 37.43226 W149 36 23.19775      98.047
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
    
```

* PRISMS centred above THTI MARK

```

3DD
PLH 000 THTI MARK     S 17 34 37.43226 W149 36 23.19782      97.000
PLH 000 THTI PRISM1  S 17 34 37.43226 W149 36 23.19782      97.719
PLH 000 THTI PRISM2  S 17 34 37.43226 W149 36 23.19782      97.722
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
    
```

* SLR offset (SLR TOP & SLR AXES INT) with respect to the SLR 7124 mark

```

2DD
PL  00  SLR 7124       s 17 34 36.504280 w149 36 22.334790
PL  00  SLR AXES INT  s 17 34 36.504768 w149 36 22.334451
PL  00  SLR TOP       s 17 34 36.504768 w149 36 22.334451
COV LG DIAG
ELEM           0.000001                0.000001                0.000001
ELEM           0.000001
    
```

* CENTRING EQUATION (1995)

* DORIS antenna centring and height with respect to the DORIS mark

```

3DD
PLH 000 PAPB MARK     s 17 34 35.444790 w149 36 34.419790      74.0000
PLH 000 PAPB          s 17 34 35.444790 w149 36 34.419790      75.0250
COV LG DIAG    0.00000    1.00000    0.00000    1.00000    0.00000
ELEM           0.000001                0.000001                0.000001
    
```

* HORIZONTAL ANGLES (2007)

```

SIGM AH      8.0
HIST NEW
DSET AH
DIR   RM-2    TM-6          0  0    0.0
DIR   RM-2    TM-5          1 33   35.0
DIR   RM-2    TM-1          0  6   48.5
DIR   RM-2    RM-3         235 16  24.8
DIR   RM-2    SLR TOP      252 80  47.5
DIR   RM-2    PATB        321 68  92.1
DSET AH
DIR   TM-1    TM-6          0  0    0.0
DIR   TM-1    TM-5          1 92   55.0
DIR   TM-1    RM-2         200  9   10.9
DIR   TM-1    SLR TOP      218  9   11.6
DIR   TM-1    RM-3         221 16   96.2
DIR   TM-1    PATB         285 66   73.3
DIR   TM-1    THTI ARP     297 05   74.2
DSET AH
    
```

DIR	TM-1	TM-6	0	0	0.0
DIR	TM-1	THTI PRISM1	297	6	5.2
DSET	AH				
DIR	RM-3	TM-6	0	0	0.0
DIR	RM-3	SLR TOP	15	6	12.0
DIR	RM-3	RM-2	24	63	27.5
DIR	RM-3	TM-1	10	61	10.9
DSET	AH				
DIR	RM-3	TM-6	0	0	0.0
DIR	RM-3	TM-5	1	30	92.6
DIR	RM-3	TM-1	10	61	8.8
DIR	RM-3	SLR TOP	15	6	9.5
DIR	RM-3	RM-2	24	63	13.6
DSET	AH				
DIR	RM-3	TM-6	0	0	0.0
DIR	RM-3	PATB	360	10	45.5
DSET	AH				
DIR	TM-6	TAHI	0	0	0.0
DIR	TM-6	TM-1	195	23	55.3
DIR	TM-6	RM-2	195	26	15.1
DIR	TM-6	SLR TOP	201	92	72.2
DIR	TM-6	RM-3	205	79	31.5
DIR	TM-6	THTI ARP	236	10	97.9
DSET	AH				
DIR	TM-6	TAHI	0	0	0.0
DIR	TM-6	TM-5	170	54	24.7
DIR	TM-6	PATB PRISM	230	16	88.2
DIR	TM-6	THTI PRISM2	236	11	5.7
DSET	AH				
DIR	TM-6	TAHI	0	0	0.0
DIR	TM-6	PATB	230	16	85.1

HIST GEN HORIZONTAL ANGLES

* VERTICAL ANGLES (2007)

SIGM ZA 12.0
HIST NEW

HI	TM-1	1.574
HI	RM-2	1.522
HI	RM-3	0.236
HI	TM-6	1.521

HT	PATB PRISM	-0.000
HT	TM-1	1.574
HT	RM-2	1.522
HT	RM-3	0.236
HT	SLR TOP	0.380
HT	TM-6	1.521
HT	THTI PRISM1	0.000
HT	THTI PRISM2	0.000

ZANG ZA	RM-2	TM-6	96	80	0.2
ZANG ZA	RM-2	TM-1	100	7	45.5
ZANG ZA	RM-2	RM-3	94	12	6.4
*ZANG ZA	RM-2	SLR TOP	85	52	16.4
ZANG ZA	TM-1	TM-6	95	44	30.8
ZANG ZA	TM-1	RM-2	99	92	44.0
ZANG ZA	TM-1	SLR TOP	94	38	37.1
ZANG ZA	TM-1	RM-3	96	31	38.0
*ZANG ZA	TM-1	THTI ARP	94	55	28.0
ZANG ZA	TM-1	TM-6	95	44	40.2
ZANG ZA	TM-1	THTI PRISM1	95	11	18.8
ZANG ZA	RM-2	TM-6	96	79	86.8
ZANG ZA	RM-3	TM-6	99	54	70.7
ZANG ZA	RM-3	SLR TOP	100	86	82.7
ZANG ZA	RM-3	RM-2	105	88	3.9
ZANG ZA	RM-3	TM-1	103	68	67.8
ZANG ZA	RM-3	TM-6	99	54	63.6
ZANG ZA	RM-3	TM-1	103	68	54.4
ZANG ZA	RM-3	SLR TOP	100	86	55.5
ZANG ZA	RM-3	RM-2	105	87	96.5
ZANG ZA	RM-3	TM-6	99	54	72.2
ZANG ZA	TM-6	TM-1	104	55	61.4
ZANG ZA	TM-6	RM-2	103	20	15.8
ZANG ZA	TM-6	SLR TOP	100	79	11.8
ZANG ZA	TM-6	RM-3	100	45	32.2
*ZANG ZA	TM-6	THTI ARP	100	25	56.8
ZANG ZA	TM-6	PATB PRISM	100	0	3.6
ZANG ZA	TM-6	THTI PRISM2	100	59	16.4

HIST GEN VERTICAL ANGLES

* DISTANCES (2007)

SIGM DP 0.001
HIST NEW

DIST DP	RM-2	TM-1	19.64646
DIST DP	RM-2	RM-3	29.35883
DIST DP	RM-2	SLR TOP	10.83980
DIST DP	TM-1	RM-2	19.64646
DIST DP	TM-1	SLR TOP	28.00181
DIST DP	TM-1	RM-3	47.18616
DIST DP	TM-1	THTI PRISM1	36.81607
DIST DP	RM-3	SLR TOP	19.29705
DIST DP	RM-3	RM-2	29.35966
DIST DP	RM-3	TM-1	47.18718
DIST DP	TM-6	TM-1	47.46440
DIST DP	TM-6	RM-2	67.07383
DIST DP	TM-6	SLR TOP	74.53396
DIST DP	TM-6	RM-3	93.15127
DIST DP	TM-6	PATB PRISM	64.52458
DIST DP	TM-6	THTI PRISM2	61.23343

HIST GEN DISTANCES

* ALL INSTRUMENT AND TARGET HEIGHTS SET TO ZERO FOR LEVELLED POINTS

HI	RM-2	0.000
HI	RM-3	0.000
HT	PATB PRISM	0.000
HT	RM-2	0.000
HT	RM-3	0.000
HT	SLR TOP	0.000
HT	THTI PRISM1	0.000
HT	THTI PRISM2	0.000

HIST NEW

* LEVELLING (2007)

* Spirit levelling

OHDF	THTI ARP	PATB PLATE	-0.01140	0.00010
OHDF	PATB PLATE	THTI ARP	0.01140	0.00010
OHDF	THTI MARK	PATB MARK	0.00990	0.00050
OHDF	PATB MARK	THTI MARK	-0.00910	0.00050
OHDF	PATB PLATE	RM-3	-0.64180	0.00010
OHDF	RM-3	PATB PLATE	0.64220	0.00010
OHDF	RM-3	SLR TOP	-0.40640	0.00014
OHDF	SLR TOP	RM-3	0.40640	0.00014
OHDF	RM-3	RM-2	-3.99370	0.00017
OHDF	RM-2	RM-3	3.99370	0.00017
OHDF	SLR TOP	SLR EYEPIECE	-0.47310	0.00010
OHDF	SLR 7124	RM-2	0.04490	0.00014
OHDF	RM-2	SLR 7124	-0.04490	0.00014

* Levelling between PATB MARK and THTI MARK measured once more

OHDF	PATB MARK	THTI MARK	-0.00890	0.00050
OHDF	THTI MARK	PATB MARK	0.00980	0.00050

* Height differences measured with a measuring tape

OHDF	THTI ARP	THTI MARK	-1.04500	0.00100
OHDF	PATB PLATE	PATB MARK	-1.02500	0.00100
OHDF	PATB	PATB PLATE	-0.39700	0.00100

* Height difference between SLR TOP and SLR EYEPIECE measured with a carpenter level and measuring tape

OHDF	SLR TOP	SLR EYEPIECE	-0.47400	0.00100
------	---------	--------------	----------	---------

* Radius of the eyepiece, from the diameter measured with a calliper gauge

OHDF	SLR EYEPIECE	SLR AXES INT	-0.01780	0.00010
------	--------------	--------------	----------	---------

* Height difference between the SLR reference point, and SLR TOP (manufacturer value)

OHDF	SLR TOP	SLR AXES INT	-0.48900	0.00100
------	---------	--------------	----------	---------

* LEVELLING BETWEEN TAHI AND THE FIRST DORIS MARK (1995)

OHDF	TAHI	PAPB MARK	0.012	0.001
------	------	-----------	-------	-------

HIST GEN LEVELLING

* GPS OBSERVATIONS (2007)

VSCA 2.64
HIST NEW

*GRP	Solution 001 day 276 A				type 06
3DD					
DXYZ	THTI	PATB	1.1194	-6.3577	2.3626
COV	CT UPPR				
ELEM	5.668817300000E-008		1.876935900000E-008		9.800387000000E-009
ELEM	3.959571400000E-008		6.736716000000E-009		
ELEM	3.863083700000E-008				
*GRP	Solution 002 day 276 A				type 06
3DD					
DXYZ	THTI	SLR TOP	5.4622	-26.3097	27.1862
COV	CT UPPR				
ELEM	2.843343300000E-007		1.367518380000E-007		7.829691000000E-008
ELEM	1.356830480000E-007		5.017924700000E-008		
ELEM	6.468063600000E-008				
*GRP	Solution 003 day 277 A				type 06
3DD					
DXYZ	THTI	RM-3	16.0866	-40.5397	19.6334
COV	CT UPPR		9		
ELEM	1.553425270000E-007		6.205306100000E-008		4.030413300000E-008
ELEM	7.985791100000E-008		1.593729600000E-008		
ELEM	4.835178000000E-008				
*GRP	Solution 004 day 277 A				type 06
3DD					
DXYZ	THTI	TAHI	-153.5775	270.9447	64.9564
COV	CT UPPR				
ELEM	5.321826840000E-007		2.467789390000E-007		1.657424590000E-007
ELEM	2.576931230000E-007		9.438153000000E-008		
ELEM	1.405779150000E-007				
*GRP	Solution 005 day 278 A				type 06
3DD					
DXYZ	THTI	RM-2	2.8049	-19.7272	35.7872
COV	CT UPPR				
ELEM	5.106643160000E-007		2.265759500000E-007		1.478560750000E-007
ELEM	2.542754720000E-007		7.055374100000E-008		
ELEM	1.551520680000E-007				
*GRP	Solution 006 day 278 A				type 06
3DD					
DXYZ	RM-2	TM-1	-9.9510	16.9395	0.2988
COV	CT UPPR				
ELEM	5.267059830000E-007		2.279082880000E-007		1.535235730000E-007
ELEM	2.648372880000E-007		6.970912600000E-008		
ELEM	1.631454590000E-007				
*GRP	Solution 007 day 278 A				type 06
3DD					
DXYZ	THTI	TM-1	-7.1458	-2.7876	36.0861
COV	CT UPPR				
ELEM	1.123139040000E-007		4.342905700000E-008		2.972454200000E-008
ELEM	5.924443800000E-008		1.112703400000E-008		
ELEM	3.775180200000E-008				
*GRP	Solution 008 day 276 A				type 06
3DD					
DXYZ	PATB	TM-5	-34.3912	39.3209	34.3260
COV	CT UPPR				
ELEM	3.162036660000E-007		1.440045040000E-007		9.444476200000E-008
ELEM	1.441653830000E-007		4.415939600000E-008		
ELEM	7.777420000000E-008				
*GRP	Solution 009 day 276 A				type 06
3DD					
DXYZ	THTI	TM-5	-33.2735	32.9624	36.6885
COV	CT UPPR				
ELEM	1.772588700000E-007		8.200668000000E-008		5.221023900000E-008
ELEM	8.435777500000E-008		2.518255800000E-008		
ELEM	4.579509700000E-008				
*GRP	Solution 010 day 277 A				type 06
3DD					
DXYZ	RM-3	TM-6	-50.1779	76.8309	16.0096
COV	CT UPPR		9		
ELEM	1.998282970000E-007		7.023286200000E-008		6.801162200000E-008
ELEM	1.010400360000E-007		3.284390400000E-008		
ELEM	7.762033000000E-008				
*GRP	Solution 011 day 277 A				type 06
3DD					
DXYZ	THTI	TM-6	-34.0914	36.2906	35.6443
COV	CT UPPR		9		

ELEM	1.168972220000E-007	4.373493300000E-008	3.900930000000E-008
ELEM	6.090110700000E-008	1.904244100000E-008	
ELEM	4.386890900000E-008		

* TAHI-PAPB GPS BASELINE (1995)

VSCA 0.3

GRP ODORGP12.208,obs#: 3 day 208 type 07

* THE FIXED DOUBLE DIFFERENCE Session: 20852

3DD

DXYZ	PAPB MARK	TAHI	10.1869	-16.8998	-0.7282
CORR CT UPPR					
ELEM	1.000000000000		0.820000000000		0.340000000000
ELEM	1.000000000000		0.370000000000		
ELEM	1.000000000000				
ELEM	0.00685200000		0.00557100000		0.00354500000

GRP ODORGP13.208,obs#: 4 day 208 type 07

* THE FIXED DOUBLE DIFFERENCE Session: 20853

3DD

DXYZ	PAPB MARK	TAHI	10.1859	-16.8990	-0.7258
CORR CT UPPR					
ELEM	1.000000000000		0.650000000000		0.660000000000
ELEM	1.000000000000		0.650000000000		
ELEM	1.000000000000				
ELEM	0.00760700000		0.00429800000		0.00383000000

HIST GEN GPS OBSERVATIONS

HIST ALL ALL MEASUREMENTS

END

Annex 7: Geolab adjustment output file

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                TAHITI GEODETIC OBSERVATORY - OCT 2007 SURVEY
Microsearch GeoLab, V2001.9.20.0                WGS 84                UNITS: m,GRAD Page 0001
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Mon Sep 8 13:33:32 2008

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Input file: D:\PMM\DORIS\Papeete_2007\OGT-global-ITRF2005-libre.iob
Output file: D:\PMM\DORIS\Papeete_2007\OGT-global-ITRF2005-libre.lst
Options file: D:\PMM\DORIS\Papeete_2007\default.gpj
  
```

PARAMETERS		OBSERVATIONS	
Description	Number	Description	Number
No. of Stations	22	Directions	38
Coord Parameters	62	Distances	16
Free Latitudes	20	Azimuths	0
Free Longitudes	20	Vertical Angles	0
Free Heights	22	Zenithal Angles	25
Fixed Coordinates	4	Angles	0
Astro. Latitudes	0	Heights	0
Astro. Longitudes	0	Height Differences	22
Geoid Records	0	Auxiliary Params.	0
All Aux. Pars.	9	2-D Coords.	0
Direction Pars.	9	2-D Coord. Diffs.	4
Scale Parameters	0	3-D Coords.	3
Constant Pars.	0	3-D Coord. Diffs.	63
Rotation Pars.	0		
Translation Pars.	0		
	-----		-----
Total Parameters	71	Total Observations	171
Degrees of Freedom =		100	

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
Optimize Band Width	Yes
Generate Initial Coordinates	Yes
Re-Transform Obs After 1st Pass	No
Geoid Interpolation Method	Bi-Quadratic

Adjusted PLH Coordinates:

CODE	FFF	STATION	LATITUDE		LONGITUDE		ELIP-HEIGHT	
			STD	DEV	STD	DEV	STD	DEV
PLH	000	PAPB	S 17 34	35.435275	W149 36	34.433872	75.0734	m 0
				0.0020		0.0020	0.0023	
PLH	000	PAPB MARK	S 17 34	35.435275	W149 36	34.433872	74.0484	m 0
				0.0016		0.0017	0.0021	
PLH	000	PAQB	S 17 34	37.333837	W149 36	22.998977	99.4663	m 0
				0.0027		0.0027	0.0024	
PLH	000	PATB	S 17 34	37.333771	W149 36	22.998964	99.4720	m 0
				0.0011		0.0011	0.0011	
PLH	000	PATB MARK	S 17 34	37.333762	W149 36	22.998957	98.0503	m 0
				0.0016		0.0016	0.0012	
PLH	110	PATB PLATE	S 17 34	37.336000	W149 36	22.992000	99.0745	m 0
				0.0000		0.0000	0.0011	
PLH	000	PATB PRISM	S 17 34	37.333760	W149 36	22.998955	99.3320	m 0
				0.0015		0.0015	0.0014	
PLH	000	RM-2	S 17 34	36.245175	W149 36	22.579013	94.4388	m 0
				0.0011		0.0011	0.0011	
PLH	000	RM-3	S 17 34	36.755111	W149 36	21.742233	98.4325	m 0
				0.0011		0.0011	0.0011	
PLH	000	SLR 7124	S 17 34	36.501191	W149 36	22.341161	94.3939	m 0
				0.0015		0.0015	0.0011	
PLH	000	SLR AXES INT	S 17 34	36.501679	W149 36	22.340822	97.5351	m 0
				0.0018		0.0019	0.0011	
PLH	110	SLR EYEPIECE	S 17 34	36.504000	W149 36	22.334000	97.5529	m 0
				0.0000		0.0000	0.0011	
PLH	000	SLR TOP	S 17 34	36.501679	W149 36	22.340822	98.0260	m 0
				0.0011		0.0011	0.0011	
PLH	000	TAHI	S 17 34	35.460144	W149 36	33.764761	74.0370	m 0
				0.0012		0.0012	0.0018	
PLH	000	THTI	S 17 34	37.429146	W149 36	23.204147	98.0394	m 0
				0.0011		0.0011	0.0011	
PLH	000	THTI ARP	S 17 34	37.429144	W149 36	23.204175	99.0859	m 0
				0.0013		0.0012	0.0011	
PLH	000	THTI MARK	S 17 34	37.429133	W149 36	23.204228	98.0410	m 0
				0.0013		0.0013	0.0012	
PLH	000	THTI PRISM1	S 17 34	37.429127	W149 36	23.204231	98.7611	m 0
				0.0014		0.0012	0.0013	
PLH	000	THTI PRISM2	S 17 34	37.429126	W149 36	23.204235	98.7629	m 0
				0.0014		0.0014	0.0014	
PLH	000	TM-1	S 17 34	36.235782	W149 36	23.245212	94.3635	m 0
				0.0011		0.0011	0.0011	
PLH	000	TM-5	S 17 34	36.173390	W149 36	24.739239	98.4220	m 0
				0.0011		0.0011	0.0013	
PLH	000	TM-6	S 17 34	36.215379	W149 36	24.850579	97.8105	m 0
				0.0011		0.0011	0.0012	

Adjusted XYZ Coordinates:

CODE	FFF	STATION	X-COORDINATE STD DEV	Y-COORDINATE STD DEV	Z-COORDINATE STD DEV
XYZ		PAPB	-5246579.9325 0.0022	-3076972.9304 0.0021	-1913777.0117 0.0020
XYZ		PAPB MARK	-5246579.0897 0.0020	-3076972.4361 0.0018	-1913776.7021 0.0017
XYZ		PAQB	-5246414.1977 0.0025	-3077266.6325 0.0026	-1913840.0216 0.0027
XYZ		PATB	-5246414.2027 0.0011	-3077266.6359 0.0011	-1913840.0213 0.0011
XYZ		PATB MARK	-5246413.0336 0.0014	-3077265.9504 0.0016	-1913839.5918 0.0016
XYZ		PATB PLATE	-5246413.7541 0.0009	-3077266.6108 0.0005	-1913839.9666 0.0003
XYZ		PATB PRISM	-5246414.0876 0.0014	-3077266.5686 0.0015	-1913839.9787 0.0015
XYZ		RM-2	-5246412.5163 0.0011	-3077280.0032 0.0011	-1913806.5964 0.0011
XYZ		RM-3	-5246399.2327 0.0011	-3077300.8179 0.0011	-1913822.7479 0.0011
XYZ		SLR 7124	-5246406.8807 0.0013	-3077284.8288 0.0014	-1913814.0863 0.0015
XYZ		SLR AXES INT	-5246409.4547 0.0014	-3077286.3503 0.0017	-1913815.0492 0.0018
XYZ		SLR EYEPIECE	-5246409.3490 0.0009	-3077286.5214 0.0005	-1913815.1226 0.0003
XYZ		SLR TOP	-5246409.8584 0.0011	-3077286.5870 0.0011	-1913815.1974 0.0011
XYZ		TAHI	-5246568.8995 0.0016	-3076989.3333 0.0014	-1913777.4275 0.0012
XYZ		THTI	-5246415.3220 0.0011	-3077260.2780 0.0011	-1913842.3840 0.0011
XYZ		THTI ARP	-5246416.1830 0.0012	-3077260.7820 0.0012	-1913842.7000 0.0013
XYZ		THTI MARK	-5246415.3246 0.0012	-3077260.2768 0.0013	-1913842.3841 0.0013
XYZ		THTI PRISM1	-5246415.9169 0.0013	-3077260.6241 0.0013	-1913842.6014 0.0014
XYZ		THTI PRISM2	-5246415.9184 0.0014	-3077260.6248 0.0014	-1913842.6019 0.0014
XYZ		TM-1	-5246422.4687 0.0011	-3077263.0660 0.0011	-1913806.2984 0.0011
XYZ		TM-5	-5246448.5950 0.0012	-3077227.3153 0.0011	-1913805.6954 0.0011
XYZ		TM-6	-5246449.4169 0.0012	-3077223.9912 0.0011	-1913806.7414 0.0011

Residuals (critical value = 3.690, 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	THTI			-5246415.32200 0.0007	0.0000 0.0000	0.0000 *
YCT	THTI			-3077260.27800 0.0006	-0.0000 0.0000	-0.0000 *
ZCT	THTI			-1913842.38400 0.0013	0.0000 0.0000	0.0000 *
ELAT		PATB MARK	PAQB	0 00 0.000075 0.0020	0.0000 0.0000	0.0000 0.00*
ELON		PATB MARK	PAQB	0 00 0.000020 0.0020	0.0000 0.0000	0.0000 0.00*
EHGT		PATB MARK	PAQB	1.41600 0.0020	-0.0000 0.0000	-0.0000 0.00*
ELAT		PATB MARK	PATB	0 00 0.000000 0.0020	-0.0003 0.0016	-0.1732 196.32
ELON		PATB MARK	PATB	0 00 0.000000 0.0020	-0.0002 0.0016	-0.1215 137.20
EHGT		PATB MARK	PATB	1.42200 0.0020	-0.0004 0.0019	-0.2051 273.39
ELAT		PATB MARK	PATB PRISM	0 00 0.000000 0.0010	0.0001 0.0004	0.1732 54.44
ELON		PATB MARK	PATB PRISM	0 00 0.000000 0.0010	0.0000 0.0004	0.1215 38.04
EHGT		PATB MARK	PATB PRISM	1.28200 0.0010	-0.0003 0.0006	-0.5733 264.86
ELAT		THTI	THTI MARK	0 00 0.000000 0.0010	0.0004 0.0007	0.5808 139779.6
ELON		THTI	THTI MARK	0 00 0.000070 0.0010	-0.0003 0.0007	-0.4404 110113.1
EHGT		THTI	THTI MARK	0.00200 0.0010	-0.0004 0.0008	-0.4624 133530.9
ELAT		THTI	THTI ARP	0 00 0.000000 0.0010	0.0001 0.0006	0.0870 53.55
ELON		THTI	THTI ARP	0 00 0.000000 0.0010	-0.0008 0.0009	-0.9491 800.84
EHGT		THTI	THTI ARP	1.04700 0.0010	-0.0005 0.0009	-0.5555 489.18
ELAT		THTI MARK	THTI PRISM1	0 00 0.000000 0.0010	0.0002 0.0006	0.2930 246.77
ELON		THTI MARK	THTI PRISM1	0 00 0.000000 0.0010	-0.0001 0.0007	-0.1635 153.46
EHGT		THTI MARK	THTI PRISM1	0.71900 0.0010	0.0011 0.0007	1.5292 1585.20
ELAT		THTI MARK	THTI PRISM2	0 00 0.000000 0.0010	0.0002 0.0006	0.3804 316.61
ELON		THTI MARK	THTI PRISM2	0 00 0.000000 0.0010	-0.0002 0.0006	-0.3510 290.24
EHGT		THTI MARK	THTI PRISM2	0.72200 0.0010	-0.0001 0.0006	-0.1621 137.01
ELAT		SLR 7124	SLR AXES INT	0 00 0.000488 0.0010	0.0000 0.0001	0.0000 0.00
ELON		SLR 7124	SLR AXES INT	0 00 0.000339 0.0010	-0.0000 -0.0000	-0.0000 0.00
ELAT		SLR 7124	SLR TOP	0 00 0.000488 0.0010	-0.0000 0.0000	-0.0000 0.00
ELON		SLR 7124	SLR TOP	0 00 0.000339 0.0010	-0.0000 0.0001	-0.0000 0.00
ELAT		PAPB MARK	PAPB	0 00 0.000000 0.0010	-0.0000 0.0000	-0.0000 0.00*
ELON		PAPB MARK	PAPB	0 00 0.000000 0.0010	-0.0000 0.0000	-0.0000 0.00*
EHGT		PAPB MARK	PAPB	1.02500 0.0010	-0.0000 0.0000	-0.0000 0.00*

DIR	RM-2	TM-6	0 0	0.0	-8.3	-1.2
				8.0	6.9	
DIR	RM-2	TM-5	1 33	35.0	-1.6	-0.2
				8.0	6.8	
DIR	RM-2	TM-1	0 6	48.5	-3.6	-0.6
				8.0	6.0	
DIR	RM-2	RM-3	235 16	24.8	-3.5	-0.6

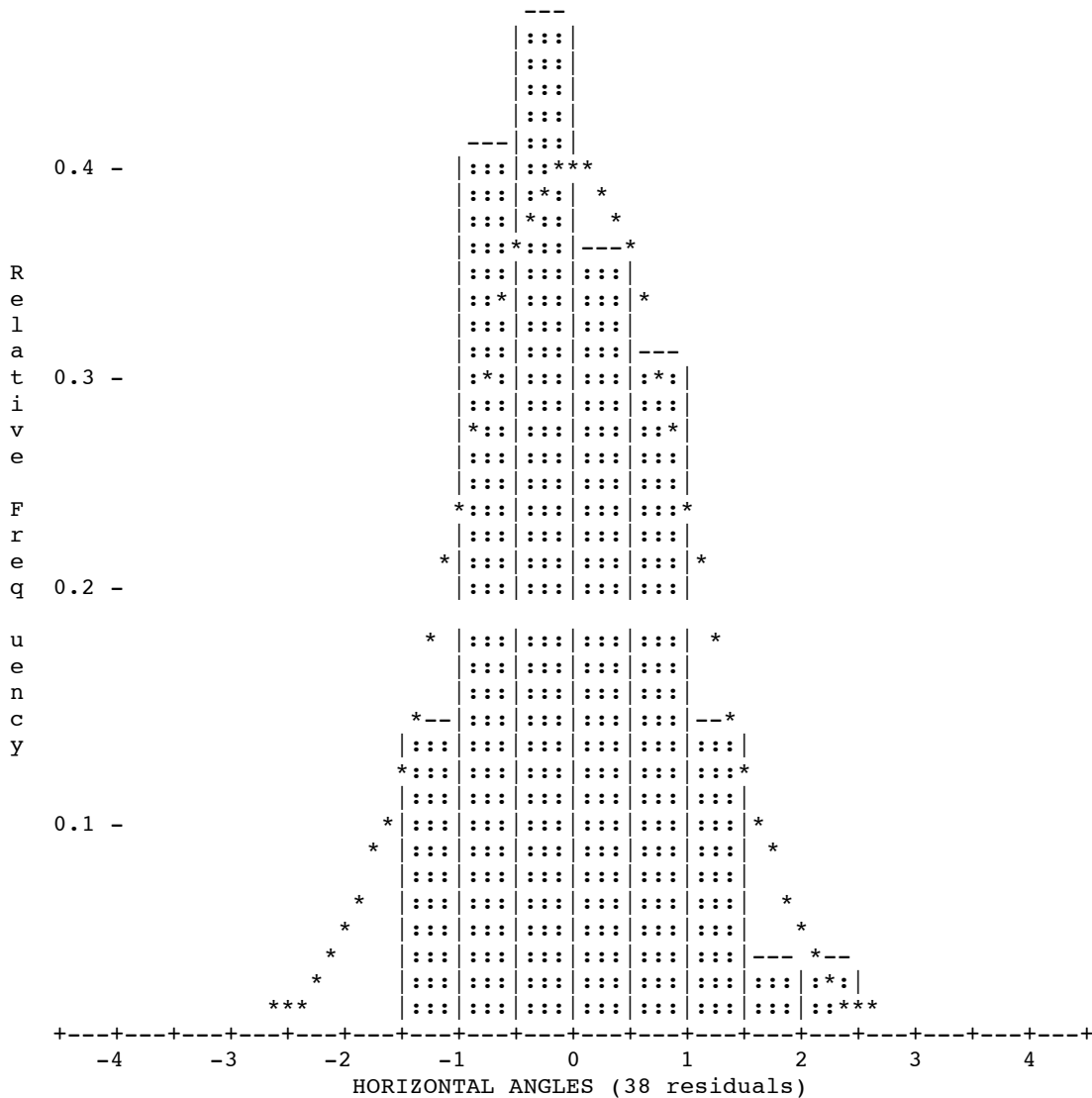
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 TAHITI GEODETIC OBSERVATORY - OCT 2007 SURVEY
 Microsearch GeoLab, V2001.9.20.0 WGS 84 UNITS: m,GRAD Page 0005
 =====

Residuals (critical value = 3.690, 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	
				8.0	6.0		
DIR		RM-2	SLR TOP	252 80	47.5	9.0	2.4
				8.0	3.7		
DIR		RM-2	PATB	321 68	92.1	8.0	1.3
				8.0	6.2		
DIR		TM-1	TM-6	0 0	0.0	-5.2	-0.8
				8.0	6.6		
DIR		TM-1	TM-5	1 92	55.0	5.5	0.8
				8.0	6.5		
DIR		TM-1	RM-2	200 9	10.9	8.3	1.4
				8.0	6.1		
DIR		TM-1	SLR TOP	218 9	11.6	2.5	0.4
				8.0	6.5		
DIR		TM-1	RM-3	221 16	96.2	-7.0	-1.0
				8.0	6.9		
DIR		TM-1	PATB	285 66	73.3	-0.8	-0.1
				8.0	6.1		
DIR		TM-1	THTI ARP	297 5	74.2	-3.3	-0.9
				8.0	3.6		
DIR		TM-1	TM-6	0 0	0.0	0.4	0.2
				8.0	2.5		
DIR		TM-1	THTI PRISM1	297 6	5.2	-0.4	-0.2
				8.0	2.5		
DIR		RM-3	TM-6	0 0	0.0	-1.4	-0.2
				8.0	6.4		
DIR		RM-3	SLR TOP	15 6	12.0	9.7	1.6
				8.0	6.0		
DIR		RM-3	RM-2	24 63	27.5	-9.3	-1.4
				8.0	6.6		
DIR		RM-3	TM-1	10 61	10.9	0.9	0.1
				8.0	6.7		
DIR		RM-3	TM-6	0 0	0.0	-6.1	-0.9
				8.0	6.8		
DIR		RM-3	TM-5	1 30	92.6	0.3	0.0
				8.0	6.8		
DIR		RM-3	TM-1	10 61	8.8	-1.7	-0.2
				8.0	7.0		
DIR		RM-3	SLR TOP	15 6	9.5	7.5	1.2
				8.0	6.0		
DIR		RM-3	RM-2	24 63	13.6	-0.1	-0.0
				8.0	6.8		
DIR		RM-3	TM-6	0 0	0.0	-4.9	-1.0
				8.0	5.1		
DIR		RM-3	PATB	360 10	45.5	4.9	1.0
				8.0	5.1		
DIR		TM-6	TAHI	0 0	0.0	-2.9	-0.4
				8.0	6.7		
DIR		TM-6	TM-1	195 23	55.3	-5.9	-0.8
				8.0	7.0		
DIR		TM-6	RM-2	195 26	15.1	5.4	0.8
				8.0	7.1		
DIR		TM-6	SLR TOP	201 92	72.2	3.7	0.5
				8.0	7.1		
DIR		TM-6	RM-3	205 79	31.5	-1.0	-0.1
				8.0	7.1		
DIR		TM-6	THTI ARP	236 10	97.9	0.7	0.1

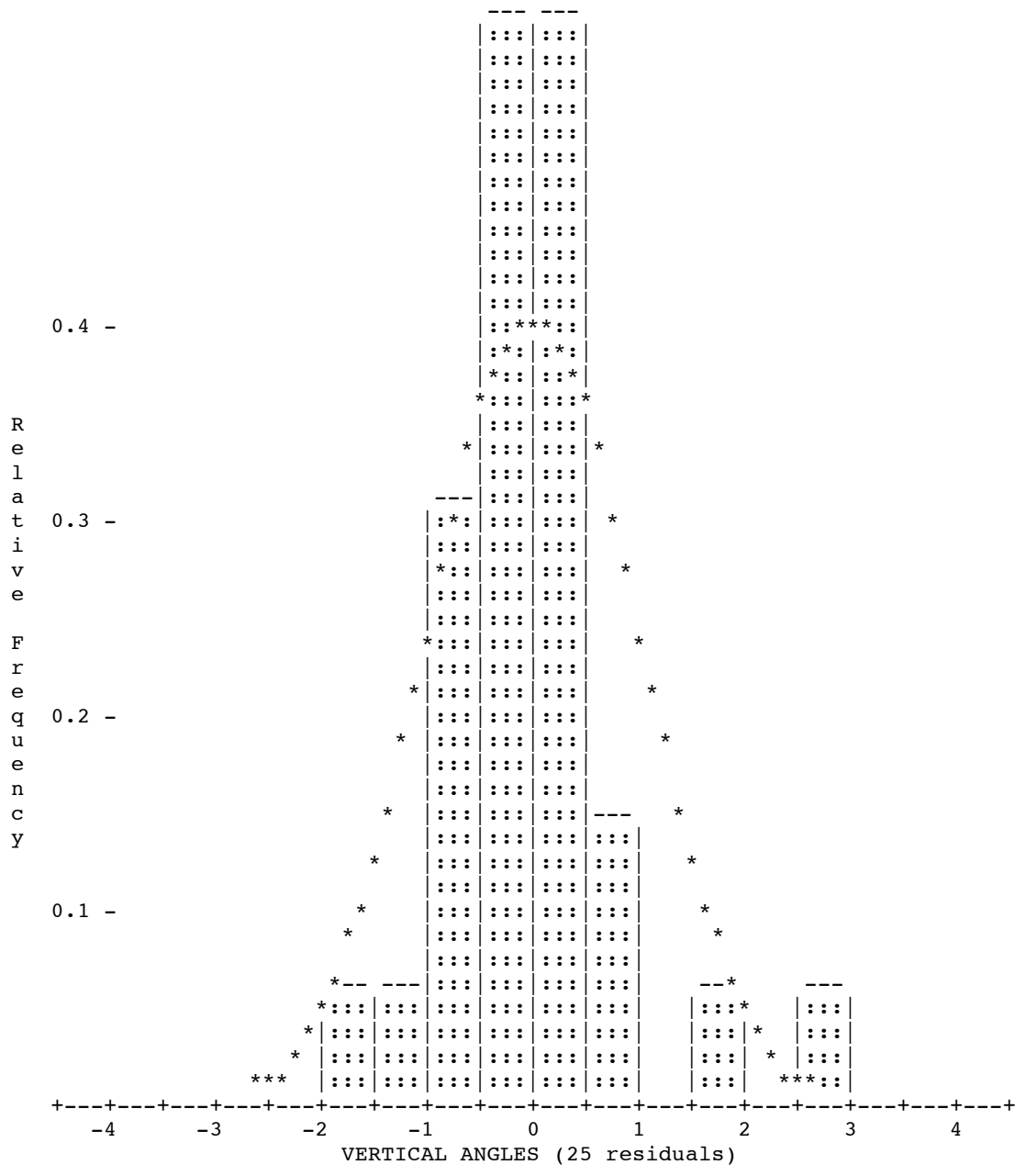
DIR	TM-6	TAHI	0 0	8.0	5.1	
				0.0	-1.7	-0.4
DIR	TM-6	TM-5	170 54	8.0	4.0	
				24.7	0.9	0.9
DIR	TM-6	PATB PRISM	230 16	8.0	0.9	
				88.2	0.6	0.2
DIR	TM-6	THTI PRISM2	236 11	8.0	2.6	
				5.7	0.3	0.1
DIR	TM-6	TAHI	0 0	8.0	3.6	
				0.0	-4.8	-0.9
DIR	TM-6	PATB	230 16	8.0	5.3	
				85.1	4.8	0.9
				8.0	5.3	

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 TAHITI GEODETIC OBSERVATORY - OCT 2007 SURVEY
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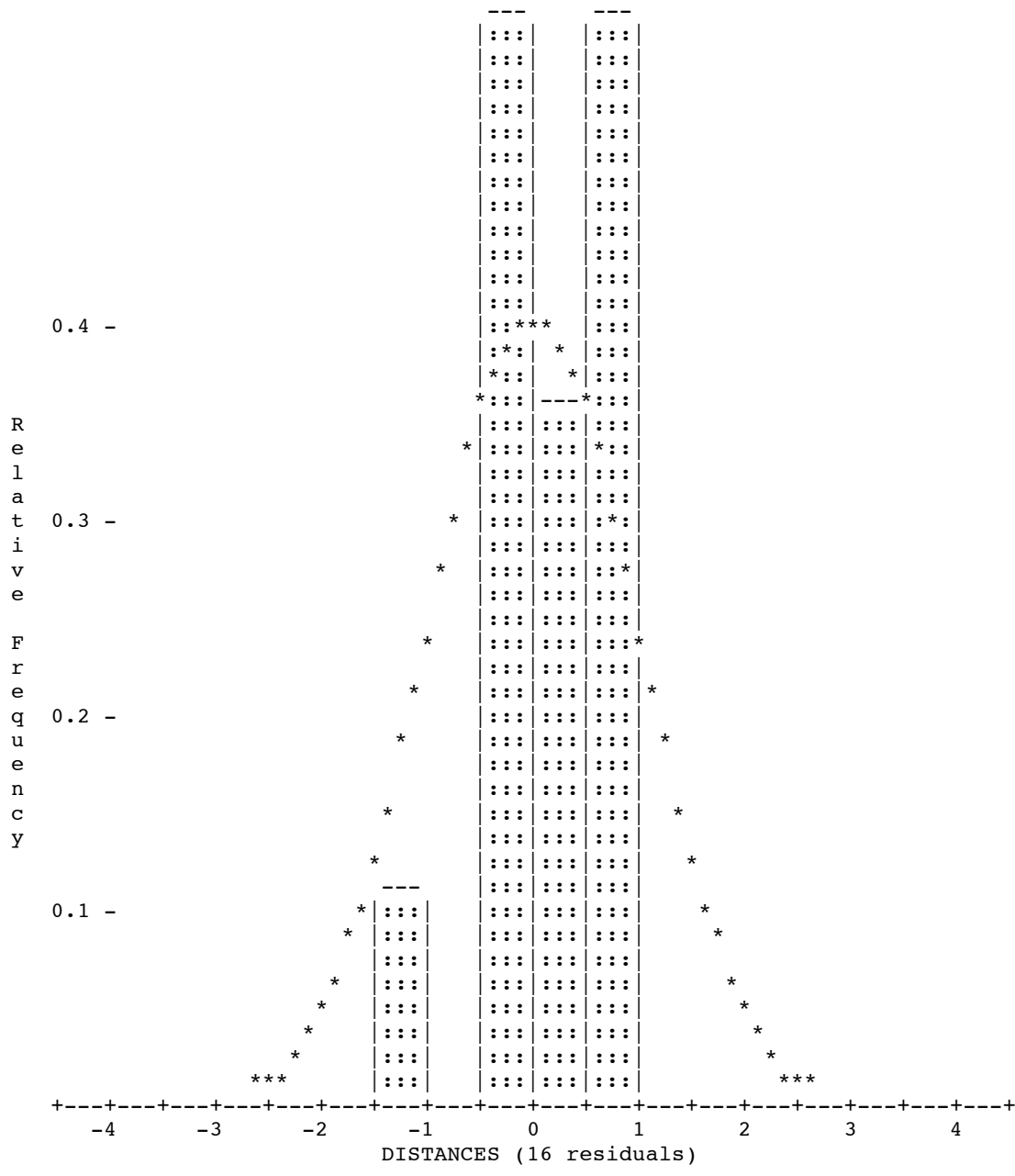
Residuals (critical value = 3.690, N,E,Up for 3D):
 NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION		RESIDUAL	STD RES
				STD DEV	STD DEV	STD DEV	PPM
ZANG		RM-2	TM-6	96 79	90.7	3.0	0.3
					12.0	11.5	
ZANG		RM-2	TM-1	100 24	30.4	-8.2	-0.8
					12.0	10.1	
ZANG		RM-2	RM-3	91 35	68.9	1.8	0.2
					12.0	11.8	
ZANG		TM-1	TM-6	95 37	21.8	-10.5	-1.0
					12.0	11.0	
ZANG		TM-1	RM-2	99 75	59.1	-4.2	-0.4
					12.0	10.1	
ZANG		TM-1	SLR TOP	91 69	15.0	28.0	2.6
					12.0	10.9	
ZANG		TM-1	RM-3	94 51	51.0	0.4	0.0
					12.0	11.7	
ZANG		TM-1	TM-6	95 37	31.2	-1.1	-0.1
					12.0	11.0	
ZANG		TM-1	THTI PRISM1	92 40	86.5	-9.6	-1.5
					12.0	6.3	
ZANG		RM-2	TM-6	96 79	77.3	-10.4	-0.9
					12.0	11.5	
ZANG		RM-3	TM-6	100 42	52.8	-2.3	-0.2
					12.0	11.7	
ZANG		RM-3	SLR TOP	101 34	32.6	22.1	1.9
					12.0	11.6	
ZANG		RM-3	RM-2	108 64	41.4	5.6	0.5
					12.0	11.8	
ZANG		RM-3	TM-1	105 48	54.8	0.7	0.1
					12.0	11.7	
ZANG		RM-3	TM-6	100 42	45.7	-9.4	-0.8
					12.0	11.7	
ZANG		RM-3	TM-1	105 48	41.4	-12.7	-1.1
					12.0	11.7	
ZANG		RM-3	SLR TOP	101 34	5.4	-5.1	-0.4
					12.0	11.6	
ZANG		RM-3	RM-2	108 64	34.0	-1.8	-0.2
					12.0	11.8	
ZANG		RM-3	TM-6	100 42	54.3	-0.8	-0.1
					12.0	11.7	
ZANG		TM-6	TM-1	104 62	70.4	-2.0	-0.2
					12.0	11.0	
ZANG		TM-6	RM-2	103 20	25.3	6.3	0.5
					12.0	11.5	
ZANG		TM-6	SLR TOP	99 81	65.9	2.6	0.2
					12.0	11.6	
ZANG		TM-6	RM-3	99 57	50.1	-4.1	-0.4
					12.0	11.7	
ZANG		TM-6	PATB PRISM	98 49	99.7	5.0	0.6
					12.0	8.6	
ZANG		TM-6	THTI PRISM2	99 1	3.5	1.4	0.2
					12.0	8.5	



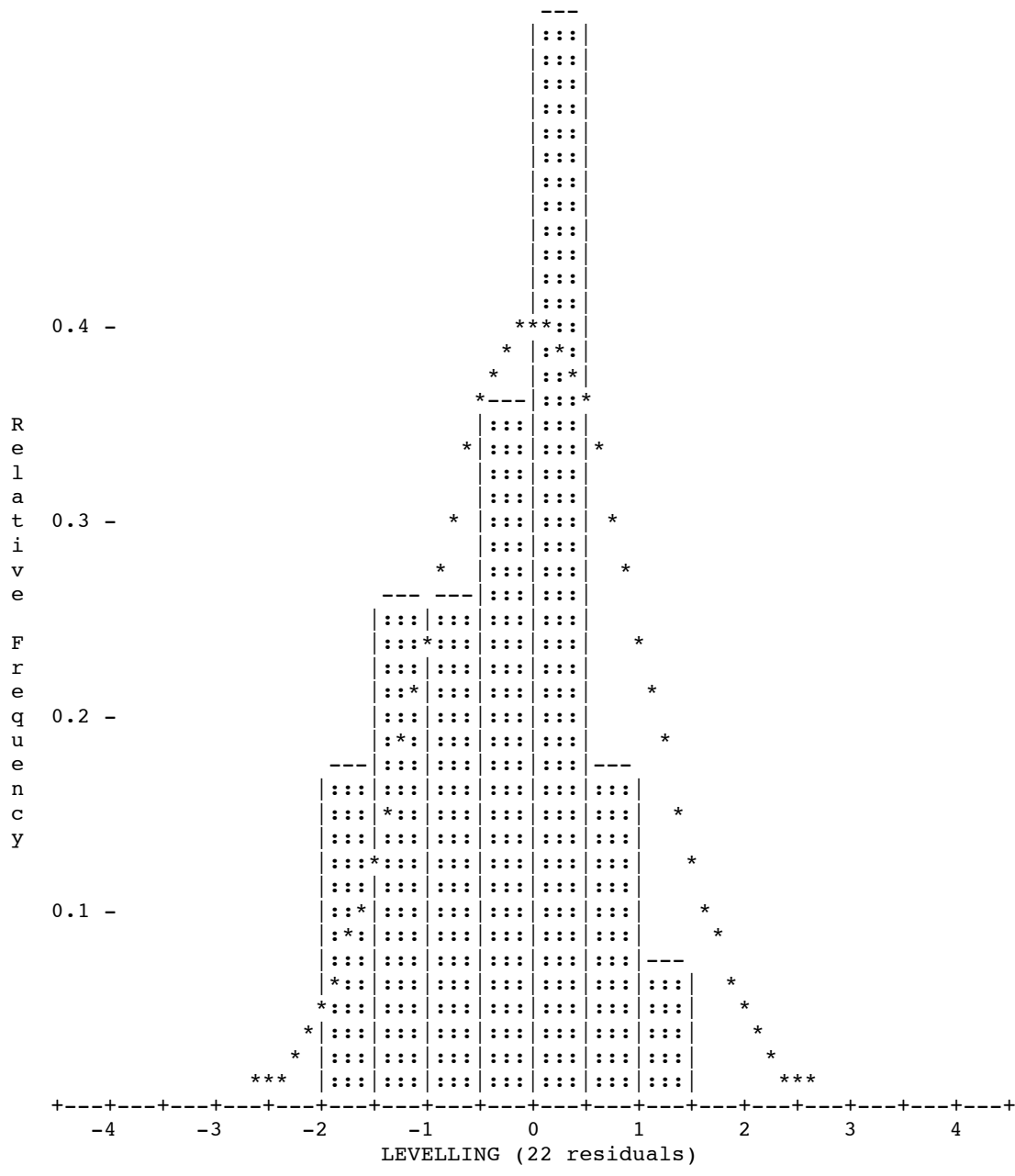
Residuals (critical value = 3.690, N,E,Up for 3D):
 NOTE: Observation values shown are reduced to mark-to-mark.

TYPE AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIST	RM-2	TM-1	19.64653 0.0010	0.0005 0.0010	0.5356 26.25
DIST	RM-2	RM-3	29.50520 0.0010	0.0003 0.0009	0.3750 11.75
DIST	RM-2	SLR TOP	11.15304 0.0010	-0.0001 0.0010	-0.1001 8.55
DIST	TM-1	RM-2	19.64653 0.0010	0.0005 0.0010	0.5356 26.25
DIST	TM-1	SLR TOP	28.13220 0.0010	0.0005 0.0009	0.5408 18.21
DIST	TM-1	RM-3	47.28240 0.0010	0.0008 0.0009	0.8971 17.58
DIST	TM-1	THTI PRISM1	36.97004 0.0010	0.0002 0.0006	0.2987 4.94
DIST	RM-3	SLR TOP	19.29949 0.0010	-0.0009 0.0009	-1.0370 49.16
DIST	RM-3	RM-2	29.50600 0.0010	-0.0005 0.0009	-0.4901 15.36
DIST	RM-3	TM-1	47.28340 0.0010	-0.0002 0.0009	-0.1819 3.57
DIST	TM-6	TM-1	47.46821 0.0010	0.0001 0.0009	0.1622 3.15
DIST	TM-6	RM-2	67.07383 0.0010	0.0009 0.0009	0.9697 13.30
DIST	TM-6	SLR TOP	74.52845 0.0010	0.0009 0.0009	0.9500 11.67
DIST	TM-6	RM-3	93.15090 0.0010	-0.0004 0.0009	-0.4532 4.40
DIST	TM-6	PATB PRISM	64.54243 0.0010	-0.0000 0.0004	-0.0101 0.06
DIST	TM-6	THTI PRISM2	61.23816 0.0010	0.0003 0.0006	0.5015 4.99



Residuals (critical value = 3.690, N,E,Up for 3D):
 NOTE: Observation values shown are reduced to mark-to-mark.

TYPE AT	FROM	TO	OBSERVATION	RESIDUAL	STD RES
			STD DEV	STD DEV	PPM
OHDF	THTI ARP	PATB PLATE	-0.01140	-0.0000	-0.0000
			0.0001	0.0000	0.46*
OHDF	PATB PLATE	THTI ARP	0.01140	0.0000	0.0000
			0.0001	0.0000	0.46*
OHDF	THTI MARK	PATB MARK	0.00990	-0.0006	-1.2725
			0.0005	0.0004	82.77
OHDF	PATB MARK	THTI MARK	-0.00910	-0.0002	-0.5562
			0.0005	0.0004	36.18
OHDF	PATB PLATE	RM-3	-0.64180	-0.0002	-0.0002
			0.0001	0.0000	5.13*
OHDF	RM-3	PATB PLATE	0.64220	-0.0002	-0.0002
			0.0001	0.0000	4.64*
OHDF	RM-3	SLR TOP	-0.40640	-0.0001	-0.6305
			0.0001	0.0001	3.48
OHDF	SLR TOP	RM-3	0.40640	0.0001	0.6305
			0.0001	0.0001	3.48
OHDF	RM-3	RM-2	-3.99370	0.0000	0.0299
			0.0002	0.0001	0.13
OHDF	RM-2	RM-3	3.99370	-0.0000	-0.0299
			0.0002	0.0001	0.13
OHDF	SLR TOP	SLR EYEPIECE	-0.47310	0.0000	0.0000
			0.0001	0.0000	18.54*
OHDF	SLR 7124	RM-2	0.04490	0.0000	0.0000
			0.0001	0.0000	0.00*
OHDF	RM-2	SLR 7124	-0.04490	-0.0000	-0.0000
			0.0001	0.0000	0.00*
OHDF	PATB MARK	THTI MARK	-0.00890	-0.0004	-1.0133
			0.0005	0.0004	65.91
OHDF	THTI MARK	PATB MARK	0.00980	-0.0005	-1.0439
			0.0005	0.0004	67.90
OHDF	THTI ARP	THTI MARK	-1.04500	0.0001	0.1420
			0.0010	0.0009	118.50
OHDF	PATB PLATE	PATB MARK	-1.02500	0.0009	1.0081
			0.0010	0.0009	831.46
OHDF	PATB	PATB PLATE	-0.39700	-0.0005	-0.5543
			0.0010	0.0009	1064.18
OHDF	SLR TOP	SLR EYEPIECE	-0.47400	0.0009	0.9141
			0.0010	0.0010	1752.60
OHDF	SLR EYEPIECE	SLR AXES INT	-0.01780	0.0000	0.0000
			0.0001	0.0000	87.39*
OHDF	SLR TOP	SLR AXES INT	-0.48900	-0.0019	-1.8902
			0.0010	0.0010	3812.94
OHDF	TAHI	PAPB MARK	0.01200	-0.0005	-1.6780
			0.0010	0.0003	26.44



Residuals (critical value = 3.690, 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
DXCT	THTI	PATB	1.11940	0.0001	0.6934
			0.0002	0.0001	14.98
DYCT	THTI	PATB	-6.35770	0.0001	0.8980
			0.0001	0.0001	14.18
DZCT	THTI	PATB	2.36260	0.0001	0.4279
			0.0005	0.0002	15.29
DXCT	THTI	SLR TOP	5.46220	-0.0001	-0.3476
			0.0003	0.0003	2.87
DYCT	THTI	SLR TOP	-26.30970	0.0001	0.4310
			0.0003	0.0003	3.19
DZCT	THTI	SLR TOP	27.18620	-0.0016	-1.9561
			0.0009	0.0008	42.03
DXCT	THTI	RM-3	16.08660	0.0019	4.2972
			0.0004	0.0004	40.30
DYCT	THTI	RM-3	-40.53970	0.0016	3.0460
			0.0005	0.0005	32.86
DZCT	THTI	RM-3	19.63340	-0.0030	-1.4743
			0.0021	0.0020	62.30
DXCT	THTI	TAHI	-153.57750	0.0001	0.0001
			0.0003	0.0000	0.23*
DYCT	THTI	TAHI	270.94470	0.0000	0.0000
			0.0004	0.0000	0.04*
DZCT	THTI	TAHI	64.95640	-0.0000	-0.0000
			0.0013	0.0000	0.00*
DXCT	THTI	RM-2	2.80490	-0.0002	-0.6126
			0.0003	0.0003	4.00
DYCT	THTI	RM-2	-19.72720	-0.0013	-4.0616
			0.0003	0.0003	32.90
DZCT	THTI	RM-2	35.78720	-0.0017	-1.4425
			0.0012	0.0012	41.59
DXCT	RM-2	TM-1	-9.95100	-0.0000	-0.0327
			0.0002	0.0003	0.42
DYCT	RM-2	TM-1	16.93950	0.0013	3.6753
			0.0003	0.0004	67.00
DZCT	RM-2	TM-1	0.29880	0.0025	2.0331
			0.0013	0.0012	128.05
DXCT	THTI	TM-1	-7.14580	-0.0002	-2.9421
			0.0001	0.0001	4.72
DYCT	THTI	TM-1	-2.78760	-0.0001	-0.7537
			0.0001	0.0001	2.62
DZCT	THTI	TM-1	36.08610	0.0011	2.5274
			0.0006	0.0005	30.83
DXCT	PATB	TM-5	-34.39120	0.0003	1.1875
			0.0003	0.0002	4.46
DYCT	PATB	TM-5	39.32090	-0.0002	-0.8620
			0.0003	0.0003	3.52
DZCT	PATB	TM-5	34.32600	0.0011	1.5072
			0.0010	0.0007	17.75
DXCT	THTI	TM-5	-33.27350	-0.0001	-0.9710
			0.0002	0.0001	1.48
DYCT	THTI	TM-5	32.96240	0.0000	0.3887
			0.0002	0.0001	0.80
DZCT	THTI	TM-5	36.68850	-0.0006	-1.4147
			0.0007	0.0004	10.08
DXCT	RM-3	TM-6	-50.17790	-0.0007	-2.7546
			0.0004	0.0002	7.18
DYCT	RM-3	TM-6	76.83090	0.0004	0.5855
			0.0006	0.0006	4.06
DZCT	RM-3	TM-6	16.00960	0.0082	3.5326
			0.0024	0.0023	87.83

DXCT	THTI	TM-6	-34.09140	-0.0001	-0.4130
			0.0002	0.0002	1.60
DYCT	THTI	TM-6	36.29060	0.0015	3.2809
			0.0004	0.0005	24.22
DZCT	THTI	TM-6	35.64430	0.0052	2.9981
			0.0018	0.0017	85.29

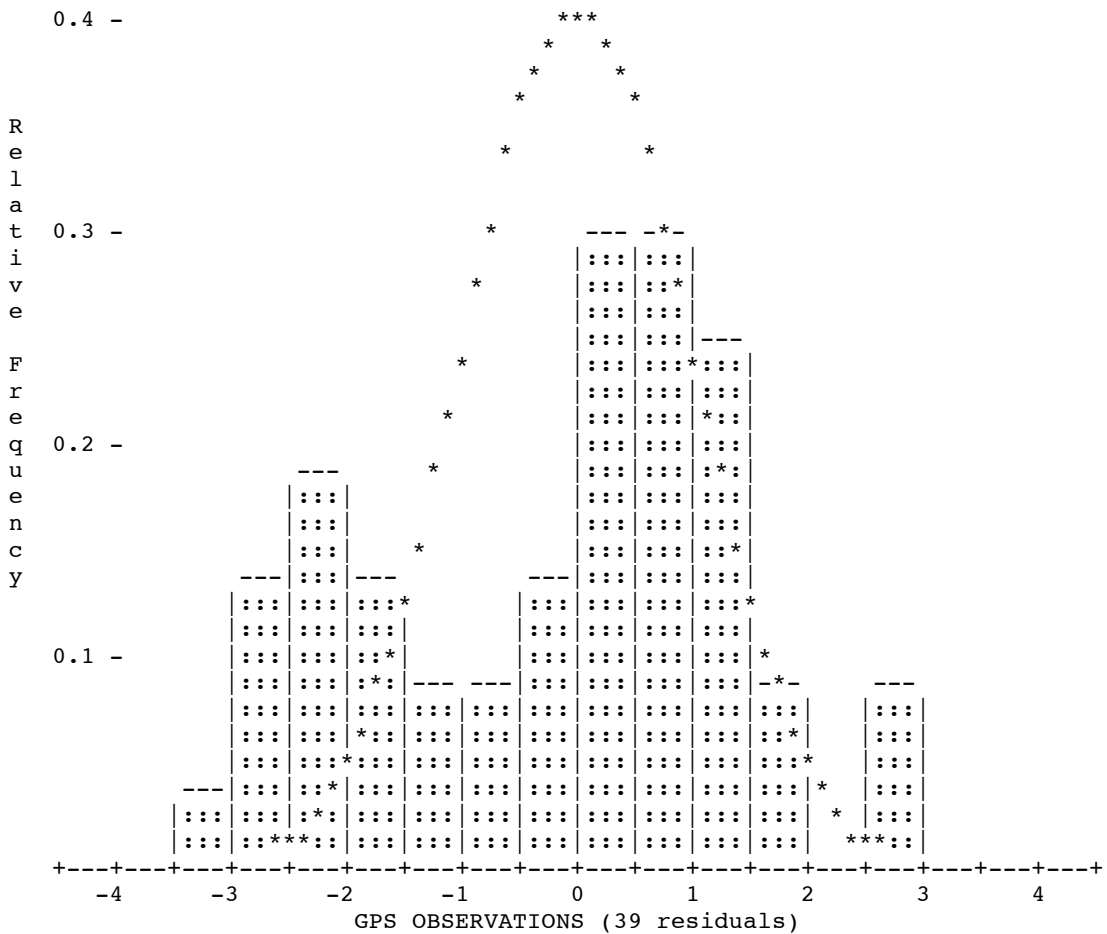
GROUP: ODORGP12.208,obs#: 3 day 208

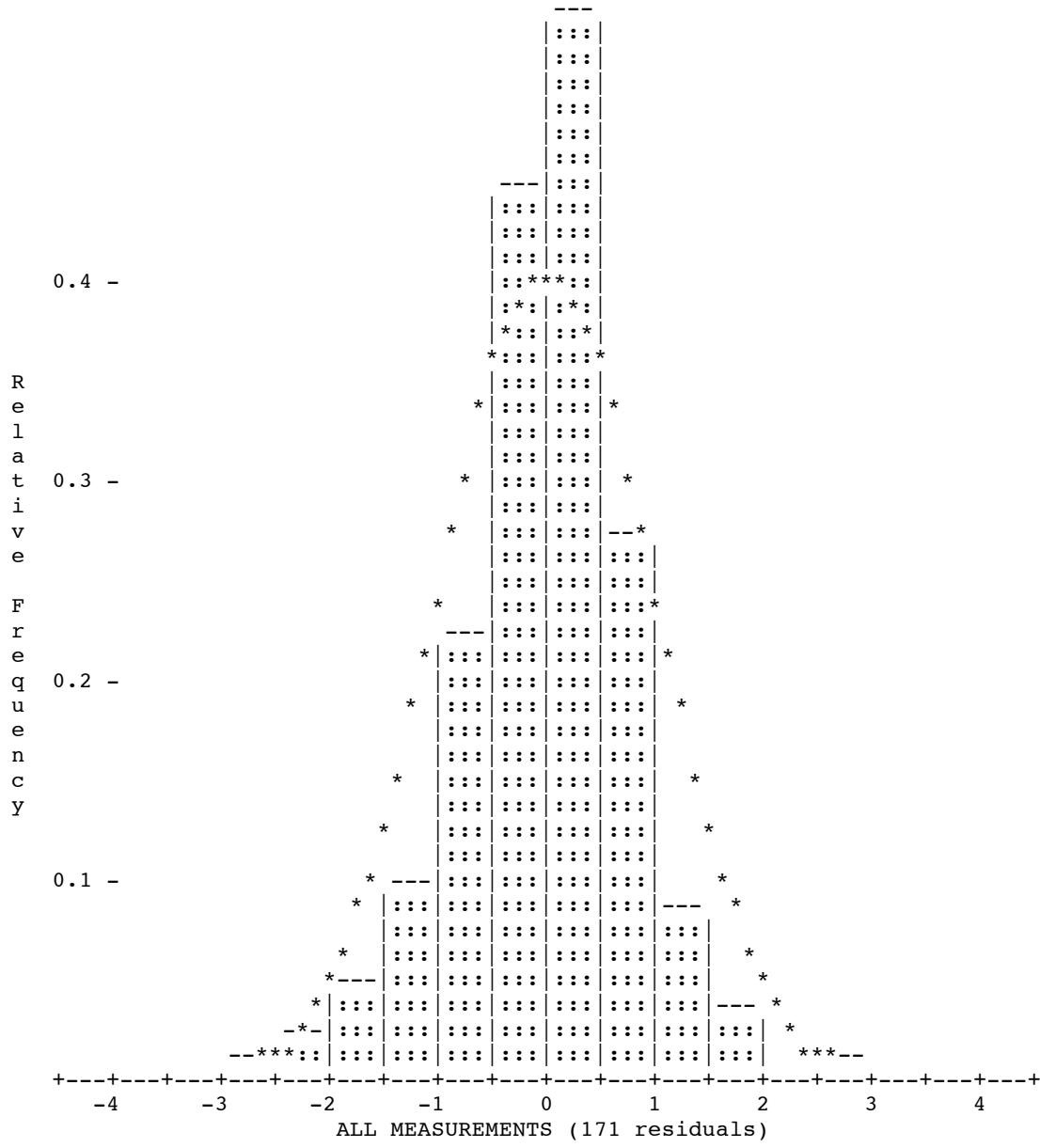
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Residuals (critical value = 3.690, N,E,Up for 3D):

NOTE: Observation values shown are reduced to mark-to-mark.

TYPE AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DXCT	PAPB MARK	TAHI	10.18690 0.0012	0.0014 0.0015	0.9710 72.75
DYCT	PAPB MARK	TAHI	-16.89980 0.0010	-0.0006 0.0007	-0.8218 28.95
DZCT	PAPB MARK	TAHI	-0.72820 0.0041	-0.0047 0.0039	-1.2054 240.29
GROUP: ODORGP13.208,obs#: 4 day 208					
DXCT	PAPB MARK	TAHI	10.18590 0.0011	-0.0010 0.0014	-0.7247 50.12
DYCT	PAPB MARK	TAHI	-16.89900 0.0020	0.0006 0.0021	0.2968 31.62
DZCT	PAPB MARK	TAHI	-0.72580 0.0043	-0.0045 0.0041	-1.0952 225.70





 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	3.6903
Number of Flagged Residuals	2
Convergence Criterion	0.0001
Final Iteration Counter Value	3
Confidence Level Used	95.0000
Estimated Variance Factor	1.1195
Number of Degrees of Freedom	100

 Chi-Square Test on the Variance Factor:

8.6406e-01 < 1.0000 < 1.5083e+00 ?

THE TEST PASSES

 NOTE: All confidence regions were computed using the following factors:

Variance factor used	=	1.1195
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.

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

STATION	MAJOR SEMI-AXIS	AZ	MINOR SEMI-AXIS	VERTICAL
PAPB	0.0049	130	0.0047	0.0046
PAPB MARK	0.0042	130	0.0039	0.0041
PAQB	0.0066	50	0.0065	0.0048
PATB	0.0027	6	0.0026	0.0022
PATB MARK	0.0041	50	0.0040	0.0024
PATB PLATE	0.0000	0	0.0000	0.0022
PATB PRISM	0.0037	51	0.0036	0.0028
RM-2	0.0027	116	0.0026	0.0022
RM-3	0.0028	119	0.0027	0.0022
SLR 7124	0.0037	119	0.0037	0.0022
SLR AXES INT	0.0045	119	0.0045	0.0022
SLR EYEPIECE	0.0000	0	0.0000	0.0022
SLR TOP	0.0027	119	0.0026	0.0022
TAHI	0.0029	86	0.0028	0.0036
THTI	0.0026	0	0.0026	0.0021
THTI ARP	0.0033	168	0.0028	0.0022
THTI MARK	0.0032	6	0.0031	0.0024
THTI PRISM1	0.0033	180	0.0030	0.0025
THTI PRISM2	0.0034	54	0.0033	0.0028
TM-1	0.0027	88	0.0026	0.0022
TM-5	0.0027	70	0.0026	0.0025
TM-6	0.0028	70	0.0026	0.0023

3D Station Confidence Regions (95.000 percent):

STATION	MAJ-SEMI (AZ,VANG)	MED-SEMI (AZ,VANG)	MIN-SEMI (AZ,VANG)
PAPB	0.0065 (103, 89)	0.0056 (310, 1)	0.0053 (220, 0)
PAPB MARK	0.0058 (103, 89)	0.0048 (310, 1)	0.0045 (220, 0)
PAQB	0.0075 (230, 0)	0.0075 (320, 0)	0.0068 (73, 90)
PATB	0.0032 (102, 89)	0.0030 (6, 0)	0.0030 (276, 1)
PATB MARK	0.0046 (230, 0)	0.0046 (320, 0)	0.0034 (73, 90)
PATB PLATE	0.0032 (0, 90)	0.0000 (90, 0)	0.0000 (0, 0)
PATB PRISM	0.0042 (231, 0)	0.0041 (321, 0)	0.0040 (93, 90)
RM-2	0.0032 (330, 88)	0.0031 (116, 2)	0.0030 (206, 1)
RM-3	0.0032 (316, 78)	0.0032 (118, 11)	0.0031 (209, 4)
SLR 7124	0.0043 (299, 0)	0.0042 (29, 0)	0.0032 (175, 90)
SLR AXES INT	0.0052 (299, 0)	0.0052 (29, 0)	0.0032 (175, 90)
SLR EYEPIECE	0.0032 (0, 90)	0.0000 (90, 0)	0.0000 (0, 0)
SLR TOP	0.0032 (343, 88)	0.0031 (119, 1)	0.0030 (209, 1)
TAHI	0.0051 (184, 90)	0.0034 (86, 0)	0.0032 (356, 0)
THTI	0.0030 (12, 0)	0.0030 (102, 0)	0.0030 (264, 90)
THTI ARP	0.0037 (348, 0)	0.0032 (78, 0)	0.0032 (188, 90)
THTI MARK	0.0036 (6, 0)	0.0036 (276, 0)	0.0034 (133, 90)
THTI PRISM1	0.0038 (360, 0)	0.0036 (206, 90)	0.0035 (90, 0)
THTI PRISM2	0.0039 (243, 89)	0.0039 (54, 1)	0.0038 (144, 0)
TM-1	0.0032 (307, 88)	0.0030 (88, 1)	0.0030 (178, 1)
TM-5	0.0035 (322, 89)	0.0031 (70, 0)	0.0030 (160, 1)
TM-6	0.0033 (245, 88)	0.0032 (70, 2)	0.0030 (340, 0)

Mon Sep 8 13:33:36 2008