



**SERVICE
DE GEODESIE
ET NIVELLEMENT**



C. Velut



CO-LOCATION SURVEY REPORT

Kourou, French Guiana

Surveyed on February 2011

Reported on August 2011

CR/G 270

N° archive 28373

Date de création 11/08/2011

N° de version 1

Mots Clé

Station permanente ; GNSS; Kourou; REGINA; DORIS; ITRF; colocalisation; rattachement ; Guyane française

Résumé

Le présent rapport décrit le rattachement de précision réalisé en février 2011 sur le site de la station de poursuite Galliot (Kourou, Guyane française).

Validation

	Fonction	Nom	Visa
Commanditaire	Chef de l'unité RSI	Bruno Garayt	11/01/2012 – signé
Rédacteur principal	Responsable opérations REGINA	Charles Velut	12/08/2011 – signé
Correcteur	Responsable de production	Jean-Claude Poyard	12/12/2011 – signé
Approbateur	Chef de service	Alain Harmel	16/01/2012 – signé
Vérificateur	Responsable qualité	Thierry Person	25/01/2012 – signé

Diffusion

Organisme, service	Nom	Numérique	Papier
IGN / DPR	Philippe Gerbe	oui	-
IGN / DPR	Didier Moisset	oui	-
IGN / MODSP	François Becirspahic	oui	-
IGN / SG / SDOG / CDOC	Richard Grimm	oui	-
IGN / DT / SR / LAREG	Olivier Jamet	oui	-
IGN / ENSG / DPTS	Serge Botton	oui	-
IGN / DPR / SGN	Alain Harmel	oui	-
IGN / DPR / SGN	RQ / Thierry Person	oui	-
IGN / DPR / SGN / PMC	Resp.Doc / Xavier della Chiesa	non	3
IGN / DPR / SGN / PMT	François L'Ecu	oui	-
IGN / DPR / SGN	Chefs de départements	oui	-
IGN / DT / SR / LAREG	Zuheir Altamimi	non	1
IGN / DT / SR / LAREG	Xavier Collilieux	oui	-
IGN / DPR / SGN	Bruno Garayt	non	1
IGN / DPR / SGN	Jérôme Saunier	oui	-
IGN / DPR / SGN	Charles Velut	oui	1
IGN / DPR / SGN	Jean-Claude Poyard	oui	1
IGN / DPR / SGN	Thomas Donal	oui	-
CNES / DCT / ME / NC	Alain Brissaud	oui	-
CNES / DCT / ME / NC	Jean-Paul Cardaliaguet	oui	-
CNES / CG / SDO / AM	Jean-François Laroye	oui	-

Summary

1.	Introduction.....	5
1.1.	Subject	5
1.2.	Glossary.....	5
2.	Site description	6
2.1.	Galliot Station site description	6
2.2.	Co-location description.....	7
2.2.1.	DORIS station.....	7
2.2.2.	GNSS	9
3.	Survey description	10
3.1.	Organization.....	10
3.2.	Equipments.....	10
3.2.1.	Instruments	10
3.2.1.1.	GNSS REGINA permanent station.....	10
3.2.1.2.	Additional survey instruments.....	10
3.2.1.3.	Survey accessories	10
3.3.	Polygon network.....	11
3.4.	GNSS observations.....	13
4.	Survey computations.....	14
4.1.	GNSS process	14
4.1.1.	IGS data	14
4.1.2.	Daily processing steps	16
4.1.3.	Session Combination	16
4.1.3.1.	Root Mean Square errors	17
4.1.3.2.	Repeatability.....	17
4.1.3.3.	Results.....	18
4.2.	Global Adjustment	18
4.2.1.	Constraints	19
4.2.2.	Parameters	19
4.2.3.	Results	20
4.2.3.1.	Adjusted coordinates and confidence regions	20
4.2.3.2.	Sinex file.....	20
5.	Annex 1: DORIS Starec reference point schetch	21
6.	Annex 2: DORIS station (KRUB) sitelog file	22
7.	Annex 3: GNSS station (KOUG) sitelog file	25
8.	Annex 4: global adjustment observations file	30
9.	Annex 5: global adjustment results file	36
10.	Annex 6: SINEX file.....	54

1. Introduction

1.1. Subject

This report describes the co-location survey conducted at the Galliot station (French Guiana). This station, operated by the “Centre Spatial Guyanais”, is a ground station used to track the Ariane launchers. The local tie survey operation takes place in February 2011, during the onsite installation of a new REGINA station and the DORIS station renovation.

The ITRS is a world-wide spatial reference system providing a common reference frame for points on the surface of the Earth. At the time of this survey, the realization of the ITRS was ITRF2005.

The ITRF2005 point coordinates are obtained by the combination of individual terrestrial reference frame solutions computed from the observations of the different space geodetic techniques located on sites distributed around the whole Earth:

- Very Long Baseline Interferometry (VLBI)
- Satellite Laser Ranging (SLR)
- Global Navigation Satellite System (GNSS)
- Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS)

Two very important components of this combination of space geodesy solutions are the co-location sites, where multiple space geodesy techniques are located in close proximity, and the local tie survey, which provides an accurate ground connection between the different space geodesy systems.

1.2. Glossary

CNES : «Centre National d’Études Spatiales» (France)

CSG : «Centre Spatial Guyanais»

DOMES : reference number IERS/ITRS

DORIS : «Détermination d’Orbite et Radio positionnement Intégré par Satellite» ; Doppler Orbitography and Radio positioning Integrated by Satellite

ESA : European Space Agency

GNSS : Global Navigation Satellite System

IDS : International DORIS Service

IGN : «Institut Géographique National» (France)

IGS : International GNSS Service

REGINA : Réseau GNSS pour l’IGS et la Navigation

Please refer to the online geodetic glossary below:

http://www.ngs.noaa.gov/CORS-Proxy/Glossary/xml/NGS_Glossary.xml

2. Site description

The site is located near Kourou, in the French Guiana.



Source: <http://www.geoportail.fr/>

2.1. Galliot Station site description

The Galliot site is located on the “Montagne des Pères”, about fifteen kilometres from the Technical Centre. Built on the southern peak of the “Montagne des Pères” in Kourou, nearly 20 km from the launch complexes, the Galliot site is in direct view of the launcher.



Aerial view (source CNES)

2.2. Co-location description

The site is equipped since 1986 with a DORIS station. A full renovation of this station was done in February 2011.

The existing IGS station named KOUR is about 25km away from the Galliot site.


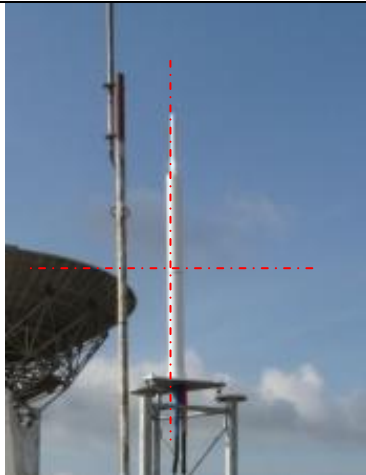

A new GNSS station, part of the REGINA network and to be proposed to the IGS tracking network, was installed at the Galliot site in February 2011.

2.2.1. DORIS station

The current DORIS station is designated KRWB by the IDS and the station refers to the KRWB antenna reference point. The KRWB station is mounted on a stainless steel plate fixture attached on top of a 2 metres galvanized steel mast. This mast is installed on the building roof of the Galliot station.

The DORIS antenna KRUB has been removed on February 21th from KRUB site and installed few meters above. The new DORIS station name is KRWB.


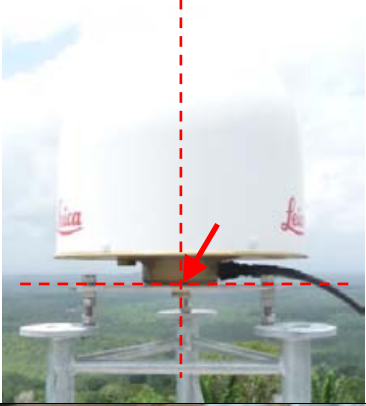

Tableau 1 : DORIS stations information

Four character ID	KRUA	KRUB	KRWB
DORIS antenna reference point	97301S005	97301S004	97301S006
On site date	from 05/12/1986 to 24/06/1992	from 25/06/1992 to 21/02/2011	Since 01/03/2011
Global view	none		
Ground mark DOMES number	none	DORIS 2 mark 97301M401	DORIS 3 mark 97301M403
Reference point view	none		
Ground mark view	none		

2.2.2. GNSS

Since February 2011, a permanent GNSS station, part of the REGINA project, is installed at the Galliot station. This station is proposed to become an IGS station. The GNSS station is named KOUG. It is mounted on a stainless steel plate fixture attached on top of a 1 metre galvanized steel mast. This mast is installed on top of a metallic pile of the building. The reference point is defined as the intersection of the hole axis and top of the steel plate. The “ground mark” of the station is a needle mark on the metallic plate and presents a difficult access. For this reason, it has no DOMES number assigned.

Tableau 2 : GNSS station information

Four character ID	KOUG	
On site date	from 25/02/11	
Global view		
Reference point DOMES number	97301M402	
Reference point view		
Ground mark view, no DOMES number		

3. Survey description

3.1. Organization

The local ties survey of Galliot co-location site is a cooperative project on which the two following agencies participated:

- Centre National d'Études Spatiales (CNES)
- Institut Géographique National (IGN)

This survey was conducted during the DORIS antenna monumentation renovation and the GNSS station installation, part of the REGINA network.

The team gathered 3 members: Jean-Paul Cardaliaguet (CNES) operating for REGINA installation, Jean-Claude Poyard and Charles Velut (IGN), for DORIS renovation and local tie survey.

Also, this project took advantage of support from the "Centre Spatial Guyanais", personnel and facilities.

The survey took place from February 21 to February 25, 2011.

3.2. Equipments

All of the survey instruments used for this project are owned by CNES or IGN. Part of survey equipments, as tripods, was lent by SATTAS, a survey company based in Kourou.

3.2.1. Instruments

3.2.1.1. GNSS REGINA permanent station

Quantity	Name	Type
1	GNSS Receiver	Leica GRX 1200 Pro
1	GNSS antenna choke ring	Leica AR 25 Rev. 3
1	GNSS antenna radom	LEIT

3.2.1.2. Additional survey instruments

A Leica total station (TCRA 1201) was used. This total station, is yearly calibrated at IGN's calibration unit, has a standard deviation of 0.3 mgon about angles and 1 mm + 1.5 ppm about distances.

For the GPS observations, two Leica GNSS receivers GX1230GG with Leica AX1202GG antennas were used.

Quantity	Name	Type
2	GNSS Receiver	LEICA GX1230GG
2	GNSS antenna	AX 10202
1	Total station	TCRA1201

3.2.1.3. Survey accessories

Two Leica accurate corner cube reflectors (GPHP1P), which are calibrated with the total station, were used to determine distances.

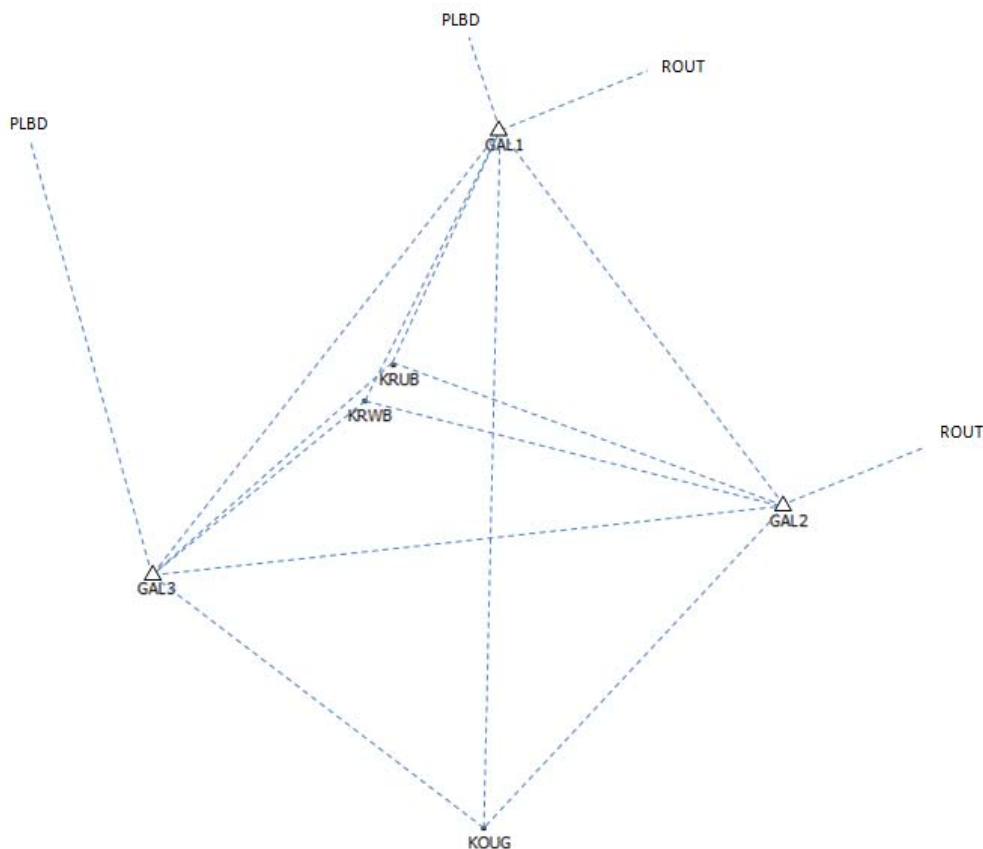
Quantity	Name	Type
2	Corner cube reflector	GPHP1P
2	optical plummet	Leica for GPH1P
3	Tripods	
1	Meteo station	
1	Target mount 200 mm	

3.3. Polygon network

All the survey was conducted in order to provide the highest accuracy in the determination of the 3D vectors between the observing instruments.

All the visible lines of sight were observed with the tacheometer. Horizontal directions and zenith angles were observed in data sets, each set consisting in one reading in both direct and reverse theodolite positions. Distance measurements were observed at least once over each line. Meteorological data (atmospheric pressure and temperature) used to correct the distances, were recorded at the beginning of each station occupation.

Figure 1 : polygon scheme



Three temporary stations (GAL1, GAL2 & GAL3) were installed on the building roof where the DORIS and REGINA stations are. Two other stations (PLBD & ROUT) were installed with a sight line from the roof (about 1.5 km and 1.8 km away) for the polygonal orientation.



Figure 2: polygon measurements on the roof



Figure 3: station PLBD for polygon orientation

3.4. GNSS observations

The set up strategy mixes GPS and conventional observations. The GPS observations are used to get the polygon's orientation.

The RINEX observations files correspond to a 30-second sampling rate for 5 station sets of GNSS C1/L1/P2/L2 measurements spanning from February 21th to 25th, 2011.

Figure 4: GNSS measurements on survey stations

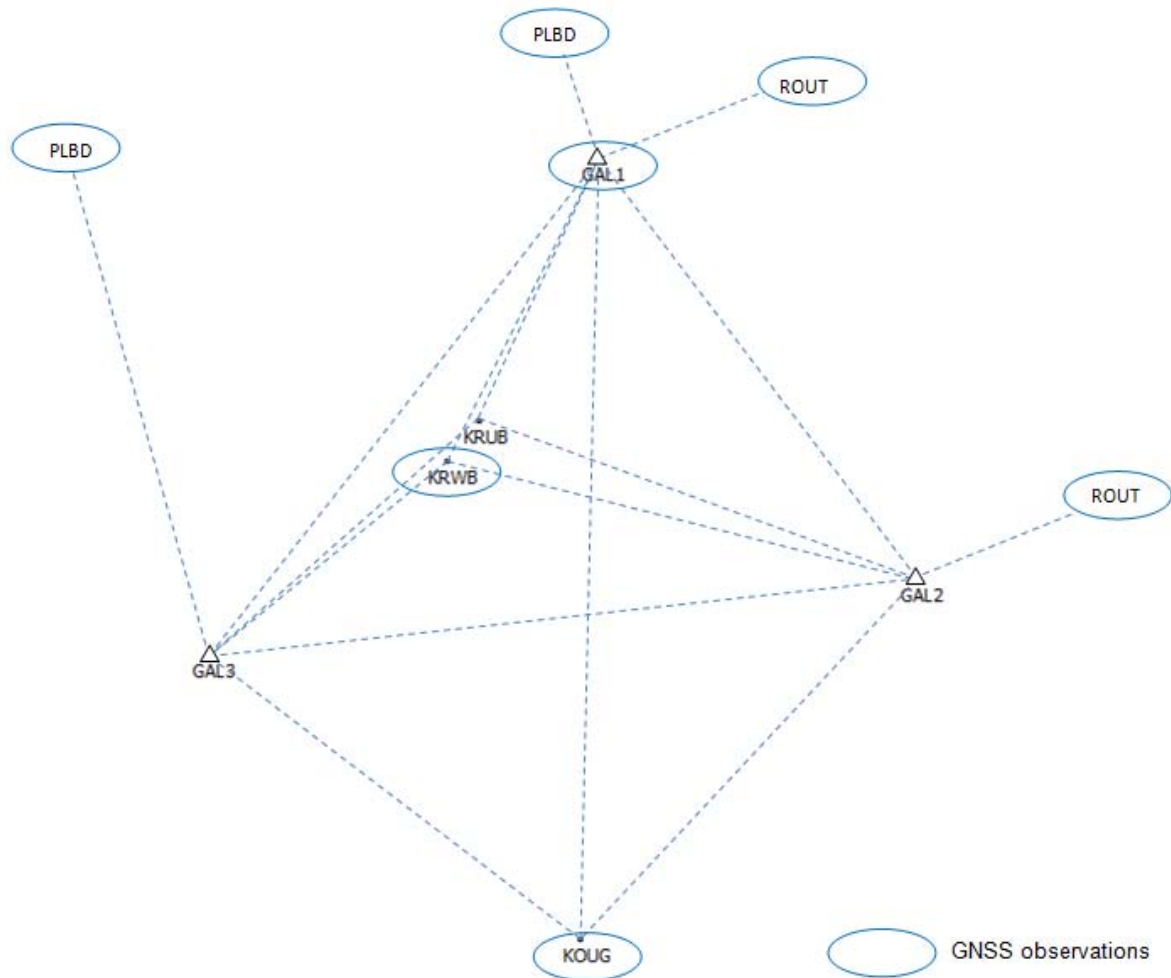


Tableau 3: GNSS antenna type and heights

GNSS name	Antenna type / radome	Antenna height (m)
GAL1	LEIAX1202GG NONE	0.000
KOUG	LEIAR25.R3 LEIT	0.000
KRWB (plate)	LEIAX1202GG NONE	0.015
N1D1 = ROUT	LEIAX1202GG NONE	0.000
PLBD	LEIAX1202GG NONE	0.000

4. Survey computations

4.1. GNSS process

The processing of a GNSS observation campaign is achieved by the use of IGS data and products expressed in ITRF2005 via IGS05:

- Ephemeris and Earth Orientation Parameters.
- GNSS observations, coordinates and velocities of IGS reference stations. The observation data of IGS stations in a 5000 km radius from Kourou area were used.
- Antenna calibration stemming from igs05.atx.

In a few words, the computation process is twofold: a first step is to generate session (e.g. daily) quasi free network solutions, and the second step is to combine these solutions in order to obtain final coordinates in the properly defined reference frame.

Attention may be drawn to the daily processing including very distant stations. The use of a high level software such as the Bernese is required with a thoroughly fixed parameterization. The parameterization implemented in our processing suits the processing of mean, long and very long baselines, i.e. between 5 km and 5000 km. The only limitation concerns the duration of observation sessions which must be longer than 2 hours. These baseline characteristics lead to special parameterization in:

- phase preprocessing (L1&L2 combination)
- estimation of troposphere parameters
- ambiguity resolution with the quasi ionosphere-free QIF strategy

The validation of the computation will be presented in the following way:

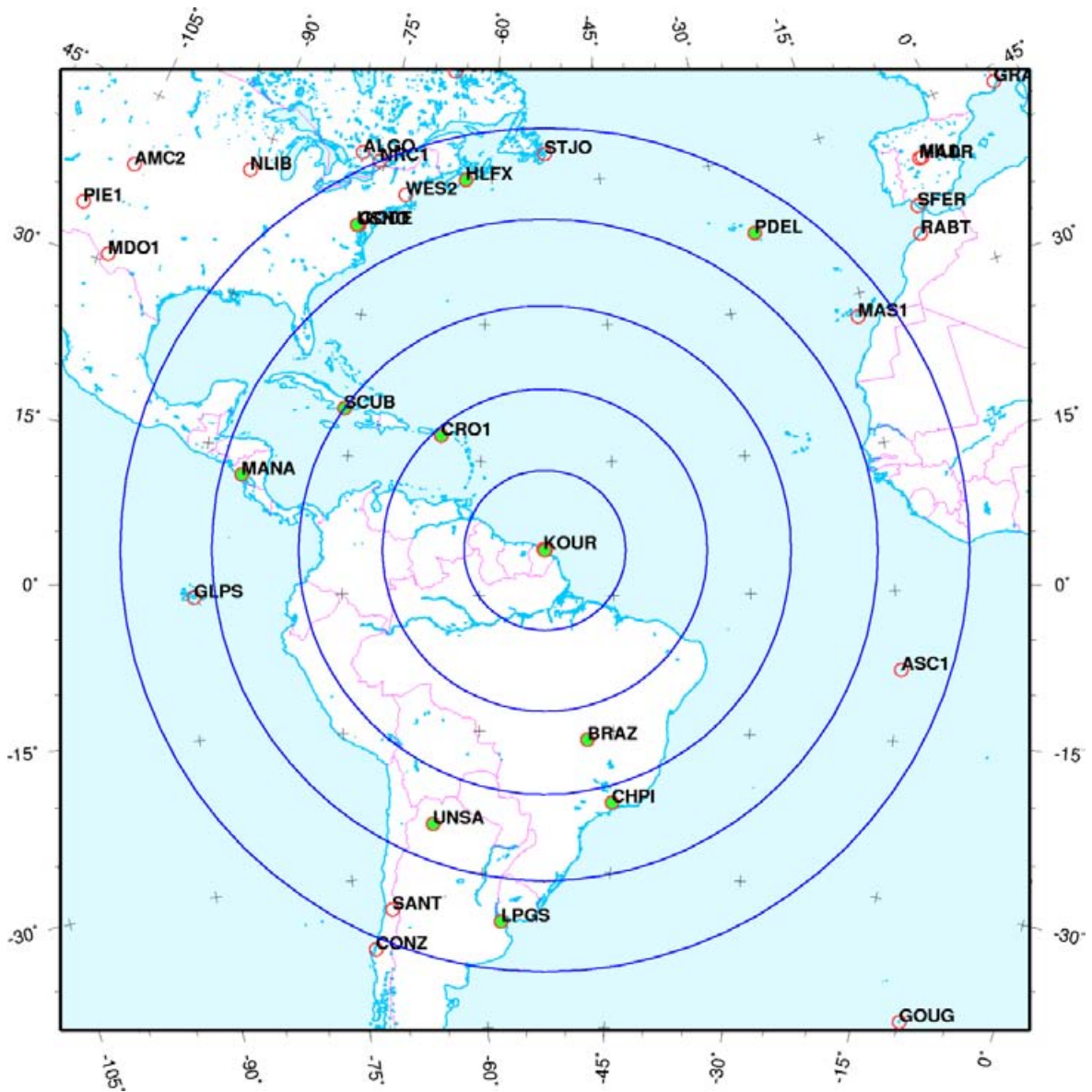
- Assessment of the Root Mean Square errors of the combined solution.
- Assessment of consistency between the daily solutions (repeatability).
- Assessment of alignment of the combined solution to the IGS05 reference frame.

4.1.1. IGS data

All observations, orbits and earth rotation parameters data were retrieved from the IGS Global Data Center at IGN.

The following map shows the IGS05 Reference Frame stations within a 5000 km radius from Kourou area used in the process.

Figure 5 : map of IGS05 Reference Frame Stations used in the processing (green points)



4.1.2. Daily processing steps

Import step

- Import of the data (RINEX → Bernese)
- Import of the orbits (Precise → Bernese standard)
- Import of the Earth rotation parameters (IGS erp → Bernese format)

Preprocessing step

- Computation of receivers' clocks
- Network definition (single difference file creation)
- Check of phase data (cycle slip detection and repair)

Processing steps through ionosphere-free double difference processing

- Pass 1: approximate coordinates and troposphere delays (network)
- Pass 2: ambiguity resolution via quasi ionosphere-free QIF process (baselines)
- Pass 3: free coordinates / troposphere delays estimates (network)
- Save normal equations for further combination

Interpretation of the results

- Ambiguity fixing results
- Variance factor range
- Helmert adaptation from IGS stations computed coordinates to actual ones

4.1.3. Session Combination

Once all daily solutions are obtained, related normal equations are merged in a least squares process in order to provide a final reference free combined solution. Moreover, each input normal equation system is processed with the same options as the combined one. The coordinate residuals of the individual solutions with respect to the combined solution are computed. The Root Mean Square errors and the consistency between the daily solutions (repeatability) are assessed.

4.1.3.1. Root Mean Square errors

Tableau 4: station Root Mean Square errors of the combined solution (mm in North, East and Up component).

Station / Domes number		E RMS (mm)	N RMS (mm)	U RMS (mm)
BRAZ 41606M001		1.9	2.6	3
CHPI 41609M003		1.9	2.8	2.8
CRO1 43201M001		1.8	1.8	3.4
GODE 40451M123		2.1	2.3	3
HLFX 40120M001		1.8	2.6	3
KOUR 97301M210		1.8	1.9	3.4
LPGS 41510M001		1.7	3.2	2.7
MANA 41201S001		2.5	1.7	3.1
PDEL 31906M004		2.6	2.1	2.9
SCUB 40701M001		2.1	1.8	3.3
UNSA 41514M001		1.8	2.9	3
USNO 40451S003		2.1	2.3	3
GAL1 GAL1_____		1.9	1.9	4.1
KOUG KOUG_____		1.8	1.9	3.7
KRVB KRVB_____		1.9	2	4.2
N1D1 N1D13_____		2	2	4.8
PLBD PLBD_____		1.8	1.9	3.4

4.1.3.2. Repeatability

Tableau 5: statistics on daily shifts to the solution (mm in North, East and Up component)

Station / Domes number	#	Rms N	Min N	Max N	Rms E	Min E	Max E	Rms U	Min U	Max U
BRAZ 41606M001	5	3.4	-6	2.3	2.4	-2.2	3.4	4.5	-4	7.5
CHPI 41609M003	5	1.4	-1.8	1.5	8.4	-16.4	3.4	24.5	-7.9	47.1
CRO1 43201M001	5	1.2	-1.1	2	2.2	-1	4.2	3.6	-4.1	5.4
GODE 40451M123	5	0.8	-1	0.4	3.4	-6.5	1.5	2.6	-3	2.6
HLFX 40120M001	5	1	-0.9	1.2	2.7	-5.4	0.7	4.7	-7.8	1.9
KOUR 97301M210	5	1.2	-1.2	1.6	2.1	-2	2.6	7.4	-11.2	7.7
LPGS 41510M001	5	3.8	-3.9	5.4	2.4	-3.7	1.3	7.2	-8.8	9.8
MANA 41201S001	5	1.6	-2.1	1.7	3.6	-3.8	5.9	4.6	-3.5	6
PDEL 31906M004	5	4.4	-2.5	8	1.8	-1.8	3	8.4	-10.9	8.3
SCUB 40701M001	5	1.4	-2.4	1	2.9	-1.5	5.4	6	-4.8	10.1
UNSA 41514M001	5	6.4	-9.1	8	5.3	-5.2	7.9	20.9	-40.8	6.1
USNO 41514M001	5	1.1	-1.4	1.5	1.7	-3	0.9	5.1	-7.2	4.2
GAL1 GAL1_____	1	1.8	1.8	1.8	2	2	2	3.4	3.4	3.4
KOUG KOUG_____	1	3	-3	-3	0.9	-0.9	-0.9	5.8	-5.8	-5.8
KRVB KRVB_____	1	0.9	0.9	0.9	1.2	1.2	1.2	7.3	7.3	7.3
N1D1 N1D13_____	1	1.9	1.9	1.9	2.7	2.7	2.7	0.9	0.9	0.9
PLBD PLBD_____	4	1.2	-0.5	1.8	2	-0.1	3.3	7.1	-5.7	8.9

4.1.3.3. Results

The combined solution is Helmert-aligned to IGS05 at mid-epoch of observations (2011-055). Residuals are checked to assess consistency of this solution. The two stations with higher residuals were rejected from the Helmert process.

Tableau 6: Helmert residuals

Station name	Residuals N (mm)	Residuals E (mm)	Residuals U (mm)	Rejected
BRAZ	-5	2.2	1.7	
CHPI	-8.7	-2.5	-5	
CRO1	2.3	-1.4	-14	
GODE	2.8	0.6	-3.1	
HLFX	0.2	0.9	5.4	
KOUR	-1.1	-4	9.8	
LPGS	7	0.9	-7.2	
MANA	20.2	-12.9	45.5	*
PDEL	-9.4	6.1	-38.5	*
SCUB	-4.9	-1.9	4.1	
UNSA	4.4	6.7	7.6	
USNO	2.1	-0.8	0.6	

Tableau 7: coordinates in IGS05/EPOCH: 2011-02-24 0:17:30 / i.e.2011-055

Point Name	X (m)	Y (m)	Z (m)	P (DMS)	L (DMS)	H (m)
GAL1	3855262.7309	-5049730.2579	563066.6085	N 5 5 55.34920	W 52 38 23.08199	107.8282
KOUG	3855263.3423	-5049731.9977	563040.4158	N 5 5 54.49482	W 52 38 23.10048	107.2474
KRVB (plate)	3855260.1865	-5049735.2438	563056.6374	N 5 5 55.01888	W 52 38 23.24587	109.3514
N1D1	3856600.9957	-5048506.9419	563348.5659	N 5 6 4.95484	W 52 37 24.44489	-26.4604
PLBD	3854767.9642	-5049964.4456	564408.9132	N 5 6 39.20388	W 52 38 40.46381	113.6425

4.2. Global Adjustment

The final computation has been carried out by a 3D Least Squares Adjustment with the Microsearch GeoLab 2001 (version 2001.9.20.0) software.

The input file is available at the “Annex 4: global adjustment observations file “and includes :

- Theodolite observations : horizontal and zenith angles, distances
- Height differences : measurements between points
- Centering equations : relative position between points.

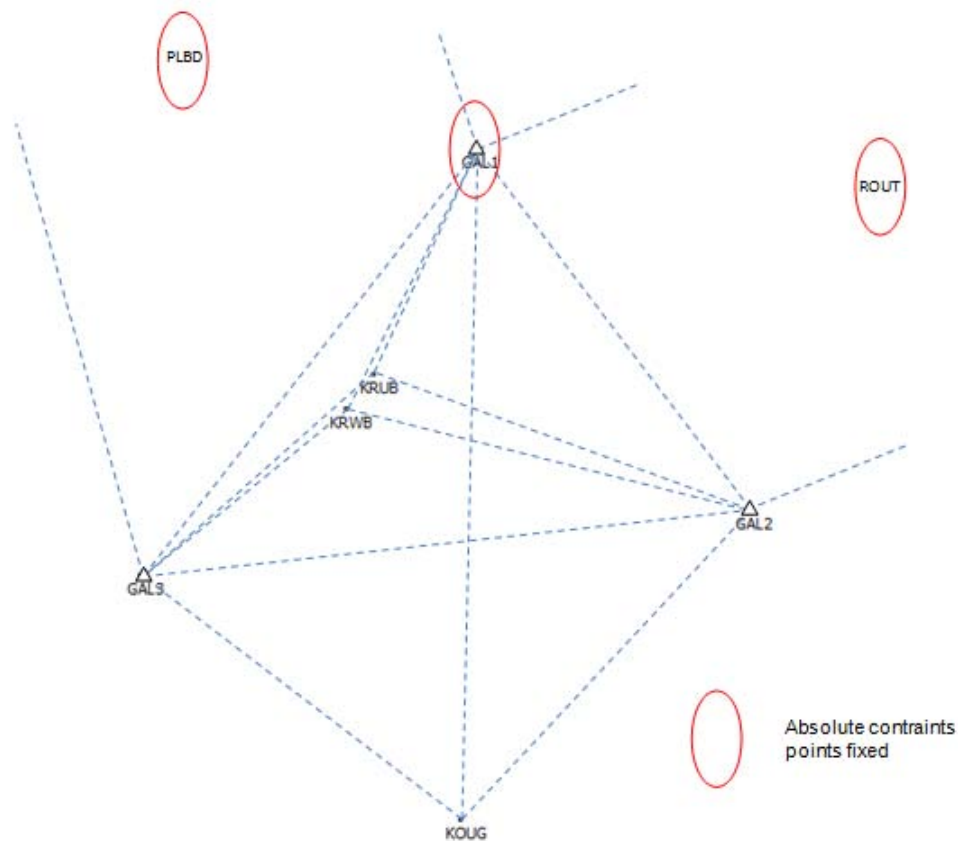
4.2.1. Constraints

Three points were fixed: one station (GAL1) of the polygon and the two orientation's stations (PLBD & ROUT) were fixed.

Tableau 8: point names used

GNSS Name	Global adjustment name
GAL1	GAL1
KOUG	KOUG
KRVB	KRVB
N1D1	ROUT
PLBD	PLBD

Figure 6: coordinates constraints



4.2.2. Parameters

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

- 1.3 mgon for horizontal and vertical angles
- 1 mm for distances

4.2.3. Results

Results are coordinates and a covariance matrix of our survey work (Annex 5: global adjustment results file).

Tableau 9: calculation name used

Point label	Status 24/02/2011	Point Name ITRF	DOMES number	Calculation name
DORIS antenna ref. pt. (Starec type)	removed	KRUB	97301S004	KRUB
DORIS 2 mark (ground mark)	In place	none	97301M401	KOLDB
DORIS antenna ref. pt. (Starec type)	In place	KRWB	97301S006	KRWB
DORIS 3 mark (ground mark)	In place	none	97301M403	KRVBB
REGINA antenna ref. pt. BPA=ARP	In place	KOUG	97301M402	KOUG

4.2.3.1. Adjusted coordinates and confidence regions

The results of the adjustment are the coordinates of all points as well as their confidence ellipsoids in the IGS05 at the mean epoch of the observations (i.e. epoch 2011:055).

The table below provides the 3D coordinates and confidence region at 95% of the points of interest.

```
=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, V2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0005
=====
```

Adjusted XYZ Coordinates:

CODE	FFF STATION	X-COORDINATE STD DEV	Y-COORDINATE STD DEV	Z-COORDINATE STD DEV
XYZ	KOLDB	3855259.7162 0.0008	-5049732.8645 0.0009	563057.8017 0.0007
XYZ	KOUG	3855263.3492 0.0008	-5049732.0025 0.0009	563040.4107 0.0006
XYZ	KRUB	3855261.1737 0.0008	-5049734.7778 0.0009	563058.0031 0.0006
XYZ	KRVBB	3855258.9448 0.0008	-5049733.6146 0.0009	563056.4526 0.0007
XYZ	KRWB	3855260.4127 0.0008	-5049735.5386 0.0009	563056.6687 0.0007

```
=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, V2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0033
=====
```

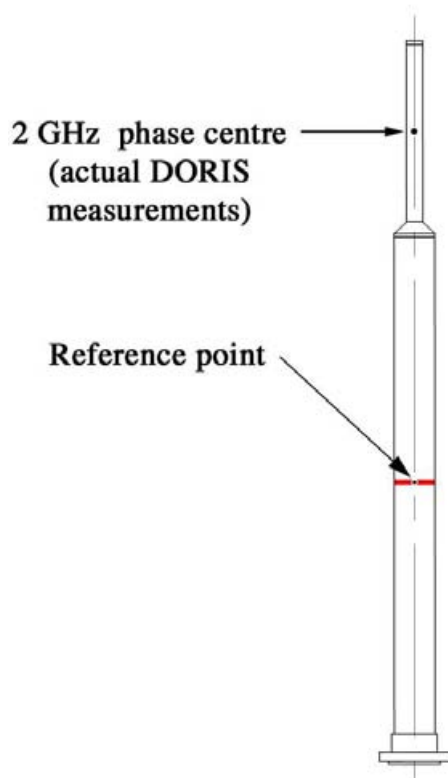
3D Station Confidence Regions (95.000 percent):

STATION	MAJ-SEMI (AZ,VANG)	MED-SEMI (AZ,VANG)	MIN-SEMI (AZ,VANG)
KOLDB	0.0030 (156, 90)	0.0020 (35, 0)	0.0016 (305, 0)
KOUG	0.0030 (192, 90)	0.0018 (2, 0)	0.0017 (92, 0)
KRUB	0.0030 (122, 90)	0.0017 (216, 0)	0.0016 (306, 0)
KRVBB	0.0030 (149, 90)	0.0021 (40, 0)	0.0016 (310, 0)
KRWB	0.0030 (20, 90)	0.0020 (204, 0)	0.0019 (114, 0)

4.2.3.2. Sinex file

The whole covariance matrix was computed, then it was possible to extract from it the covariance submatrix for the main points of interest, for the ITRF computation. This covariance submatrix has been converted into the SINEX format using the « geotosnx » tool provided by Z. Altamimi. The resulting SINEX file is presented in Annex 6: SINEX file.

5. Annex 1: DORIS Starec reference point sketch



6. Annex 2: DORIS station (KRUB) sitelog file

KOUROU DORIS site description form

0. Form

Prepared by : SIMB (DORIS installation and maintenance department)
Date prepared : 13/07/2005
Report type : UPDATE

1. Site location information

Site name : KOUROU
Site DOMES number : 97301
Host agency : Centre Spatial Guyanais
City : Kourou
State or province : Guyane
Country : FRANCE (French Guiana)
Tectonic plate :
Geological information :

Geographical coordinates (ITRF) :
North Latitude : 5 deg 5' 55''
East Longitude : -52 deg 38' 23''
Ellipsoid height : 110 m
Approximate altitude : 150 m

2. DORIS antenna and reference point information

2.1

Four character ID : KRUA
Antenna model : Starec
Antenna serial number : 19
IERS DOMES number : 97301S005
CNES/IGN number : 973012
CTDP number : 16
Date installed (dd/mm/yy) : 05/12/1986
Date removed (dd/mm/yy) : 24/06/1992
Antenna support type : 0.6 m tubular mast
Installed on : Top of the metallic structure of a two storied
: building
Height above ground mark : 2.398 m
Ground mark type : Axis of the central tube of the base plate
Ground mark DOMES number : 97301
Notes :

2.2

Four character ID : KRUB
Antenna model : Starec
Antenna serial number : 19
IERS DOMES number : 97301S004
CNES/IGN number : 973012
CTDP number : 131
Date installed (dd/mm/yy) : 25/06/1992
Date removed (dd/mm/yy) :
Antenna support type : Guyed 2 metre tower
Installed on : Terrace roof of a building (9 meters high)
Height above ground mark : 2.420 m
Ground mark type : Brass mark 12 mm diameter
Ground mark DOMES number : 97301M401
Notes :

3. DORIS beacons information

3.1

Beacon serial number : 86 27 016
Beacon model : 1.0
USO serial number : 1.403
4 Char. ID of the REF point : KRUB
Date installed (dd/mm/yy) : 06/12/1986
Date removed (dd/mm/yy) : 10/11/1992

3.2

Beacon serial number : 91 50 062
Beacon model : 1.0
USO serial number : ?
4 Char. ID of the REF point : KRVB
Date installed (dd/mm/yy) : 11/10/1992
Date removed (dd/mm/yy) :

3.3

Beacon serial number : 91 50 061
Beacon model : 1.0
USO serial number : ?
4 Char. ID of the REF point : KRUB
Date installed (dd/mm/yy) : 11/10/1992
Date removed (dd/mm/yy) :

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

Solution : ITRF2000
Epoch : 1997.0

X = 3855261.278 m Y = -5049734.807 m Z = 563057.788 m
Sig X = 0.007 m Sig Y = 0.007 m Sig Z = 0.004 m

VX = -0.0027 m/y VY = -0.0039 m/y VZ = 0.0122 m/y
Sig VX = 0.0007 m/y Sig VY = 0.0008 m/y Sig VZ = 0.0003 m/y

5. IERS colocation information

5.1

Instrument type : GPS
Status : Permanent
DOMES number of the
instrument ref. point : 97301M210
Notes :

6. Tide Gauge colocation information

6.1

Name : Cayenne
Location : Cayenne
GLOSS number : 202
Distance : 48 km
Notes :

7. Local site ties

7.1

Point description : Mark under the DORIS antenna
DOMES number : 97301M401

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

dx (m) : -1.463
dy (m) : 1.916
dz (m) : -0.215

Accuracy (m) : 0.01
Date measured :
Additional information :

7.2

Point description : DORIS Alcatel antenna reference point (KRUA)
DOMES number : 97301S005

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

dx (m) : -546.150
dy (m) : -243.018
dz (m) : 1689.742

Accuracy (m) : 0.02
Date measured :
Additional information :

7.3

Point description : Pillar under Rogue antenna (IGS point KOUR)
DOMES number : 97301M210

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

dx (m) : -15669.795
dy (m) : -9832.776
dz (m) : 16899.100

Accuracy (m) : 0.05
Date measured : May 1995
Additional information :

8. Meteorological Instrumentation

8.1 Humidity sensor

Model : MUC.1 + transmitter M-UTN3
Manufacturer : SPSI
Accuracy :

Notes :

8.2 Pressure sensor

Model : TP/FQ/02
Manufacturer : ORION
Accuracy :
Height : -0.8 m above the current DORIS ref. point (KRUB)
Notes :

8.3 Temperature sensor

Model : Constructed for DORIS beacons
Manufacturer : CEIS-TM
Accuracy :
Notes :

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 (ED/AL/MA)
: 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

7. Annex 3: GNSS station (KOUG) sitelog file

KOUG Site Information Form
International GPS Service
See Instructions at:
ftp://igsceb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0. Form

Prepared by (full name) : Jean-Paul CARDALIAGUET
Date Prepared : 2011-05-31
Report Type : UPDATE
If Update:
Previous Site Log : koug_20110225.log
Modified/Added Sections : 3.1,3.2

1. Site Identification of the GNSS Monument

Site Name : KOUROU
Four Character ID : KOUG
Monument Inscription : None (IGNF brass)
IERS DOMES Number : 97301M402
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 : 2011-02-23
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 : installed on top of a building
: metallic structure

2. Site Location Information

City or Town : Kourou
State or Province : Guyane
Country : FRANCE (French Guiana)
Tectonic Plate :
Approximate Position (ITRF)
X coordinate (m) : 3855263.365
Y coordinate (m) : -5049732.020
Z coordinate (m) : 563040.436
Latitude (N is +) : +050554.49
Longitude (E is +) : -0523823.10
Elevation (m,ellips.) : 107.28
Additional Information : ITRF2005 with epoch 2011.15
: Station located in the facilities
: of "galliot" CNES site
: (Centre National d'Etudes Spatiales)

3. GNSS Receiver Information

- 3.1 Receiver Type : LEICA GRX1200+GNSS
Satellite System : GPS+GLONASS
Serial Number : 496250
Firmware Version : 8.01
Elevation Cutoff Setting : 3
Date Installed : 2011-02-25T09:00Z
Date Removed : 2011-05-30T14:00Z
Temperature Stabiliz. : 18-24
Additional Information : Measurement engine: v 4.010.S9
: GALILEO + SBAS satellite system
- 3.2 Receiver Type : LEICA GRX1200+GNSS
Satellite System : GPS+GLONASS
Serial Number : 496250
Firmware Version : 8.20
Elevation Cutoff Setting : 3
Date Installed : 2011-05-30T16:00Z
Date Removed : (CCYY-MM-DDThh:mmZ)
Temperature Stabiliz. : 18-24
Additional Information : Measurement engine: v 4.007
: GPS+ GLONASS + SBAS satellite system
- 3.x Receiver Type : (A20, from rcvr_ant.tab; see instructions)

Satellite System : (GPS/GLONASS/GPS+GLONASS)
Serial Number : (A5)
Firmware Version : (A11)
Elevation Cutoff Setting : (deg)
Date Installed : (CCYY-MM-DDThh:mmZ)
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 : LEIAR25.R3 LEIT
Serial Number : 10180007
Antenna Reference Point : BPA
Marker->ARP Up Ecc. (m) : 000.0000
Marker->ARP North Ecc(m) : 000.0000
Marker->ARP East Ecc(m) : 000.0000
Alignment from True N : 0
Antenna Radome Type : LEIT
Radome Serial Number : 765734
Antenna Cable Type : LEICA
Antenna Cable Length : 70
Date Installed : 2011-02-25T09:00Z
Date Removed : (CCYY-MM-DDThh:mmZ)
Additional Information : Nanufactured 2010
: HW REV 3.00

4.x Antenna Type : (A20, from rcvr_ant.tab; see instructions)
Serial Number : (A*, but note the first A5 is used in SINEX)
Antenna Reference Point : (BPA/BCR/XXX from "antenna.gra"; see instr.)
Marker->ARP Up Ecc. (m) : (F8.4)
Marker->ARP North Ecc(m) : (F8.4)
Marker->ARP East Ecc(m) : (F8.4)
Alignment from True N : (deg; + is clockwise/east)
Antenna Radome Type : (A4 from rcvr_ant.tab; see instructions)
Radome Serial Number :
Antenna Cable Type : (vendor & type number)
Antenna Cable Length : (m)
Date Installed : (CCYY-MM-DDThh:mmZ)
Date Removed : (CCYY-MM-DDThh:mmZ)
Additional Information : (multiple lines)

5. Surveyed Local Ties

5.1 Tied Marker Name : DORIS antenna ref. pt. (KRUB)
Tied Marker Usage : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
Tied Marker CDP Number :
Tied Marker DOMES Number : 97301S004
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

6.1 Standard Type : INTERNAL
Input Frequency :
Effective Dates : 2011-01-13/CCYY-MM-DD
Notes : (multiple lines)

6.x Standard Type : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
Input Frequency : (if external)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)

Notes : (multiple lines)

7. Collocation Information

7.1 Instrumentation Type : DORIS
Status : PERMANENT
Effective Dates : 1992-06-25/2010-02-21
Notes : DORIS KRUB

7.2 Instrumentation Type : DORIS
Status : PERMANENT
Effective Dates : 1992-02-25/CCYY-MM-DD
Notes : DORIS ???

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

8.1.1 Humidity Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval :
Accuracy (% rel h) : (% rel h)
Aspiration : (UNASPIRATED/NATURAL/FAN/etc)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : CCYY-MM-DD/CCYY-MM-DD
Notes : (multiple lines)

8.1.x Humidity Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval : (sec)
Accuracy (% rel h) : (% rel h)
Aspiration : (UNASPIRATED/NATURAL/FAN/etc)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)

8.2.1 Pressure Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval :
Accuracy : (mbar)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : CCYY-MM-DD/CCYY-MM-DD
Notes : (multiple lines)

8.2.x Pressure Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval : (sec)
Accuracy : (hPa)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)

8.3.1 Temp. Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval :
Accuracy : (deg C)
Aspiration : (UNASPIRATED/NATURAL/FAN/etc)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : CCYY-MM-DD/CCYY-MM-DD
Notes : (multiple lines)

8.3.x Temp. Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval : (sec)
Accuracy : (hPa)
Aspiration : (UNASPIRATED/NATURAL/FAN/etc)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)

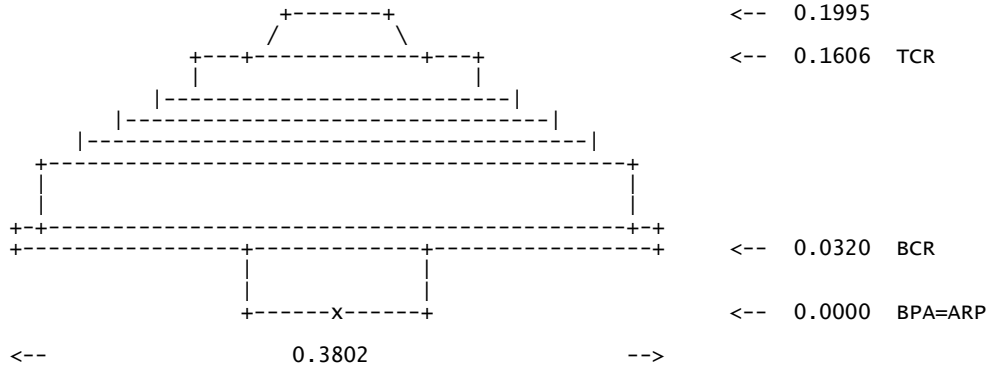
- Notes : (multiple lines)
- 8.4.1 Water Vapor Radiometer :
Manufacturer :
Serial Number :
Distance to Antenna : (m)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : CCYY-MM-DD/CCYY-MM-DD
Notes : (multiple lines)
- 8.4.x Water Vapor Radiometer :
Manufacturer :
Serial Number :
Distance to Antenna : (m)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)
- 8.5.1 Other Instrumentation : (multiple lines)
- 8.5.x Other Instrumentation :
9. Local Ongoing Conditions Possibly Affecting Computed Position
- 9.1.x Radio Interferences : (TV/CELL PHONE ANTENNA/RADAR/etc)
Observed Degradations : (SN RATIO/DATA GAPS/etc)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Additional Information : (multiple lines)
- 9.2.x Multipath Sources : (METAL ROOF/DOME/VLBI ANTENNA/etc)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Additional Information : (multiple lines)
- 9.3.x Signal Obstructions : (TREES/BUILDINGS/etc)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Additional Information : (multiple lines)
10. Local Episodic Effects Possibly Affecting Data Quality
- 10.x Date : (CCYY-MM-DD/CCYY-MM-DD)
Event : (TREE CLEARING/CONSTRUCTION/etc)
11. On-Site, Point of Contact Agency Information
- Agency : Centre National d'Etudes Spatiales
Preferred Abbreviation : CNES
- Mailing Address : MONTAGNE DES PERES\GALLIOT
: Kourou 97310 Guyane Française
- Primary Contact
Contact Name : Jean-François LAROYE
: CG/SDO/AM
Telephone (primary) : 0594.33.58.18
Telephone (secondary) :
Fax : 0594.33.44.14
E-mail : jean-francois.laroye@cnes.fr
- Secondary Contact
Contact Name : Etienne Mayjonnade
Telephone (primary) : 05 94 33 31 64
Telephone (secondary) :
Fax : 05 94 33 35 33
E-mail : Etienne.Mayjonnade@cnes.fr
Additional Information : (multiple lines)
12. Responsible Agency (if different from 11.)
- Agency : Centre National d'Etudes Spatiales
Preferred Abbreviation : CNES
Mailing Address : CNES DCT/OP/EM - 18, avenue Edouard Belin
: 31401 Toulouse cedex 09 - France
- Primary Contact
Contact Name : Jean-Paul Cardaliaguet
Telephone (primary) : (33) 5.61.27.31.98
Telephone (secondary) :
Fax : (33) 5 61 28 15 36
E-mail : jean-paul.cardaliaguet@cnes.fr
- Secondary Contact
Contact Name : Alain Brissaud
Telephone (primary) : (33) 5.61.28.23.66
Telephone (secondary) :
Fax : (33) 5 61 28 15 36

E-mail : alain.brissaud@cnes.fr
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

LEIAR25.R3
antenna center of phase N/E/H :
LEIAR25.R3 LEIT L1 0.0002 0.0001 0.1617 2
LEIAR25.R3 LEIT L2 0.0002 -0.0006 0.1588



8. Annex 4: global adjustment observations file

* CO-LOCATION SURVEY
* FRENCH GUIANA (SPATIAL CENTER)
* KOUROU, MONTAGNE DES PERES
* GALLIOT STATION
* SURVEYED ON FEBRUARY 2011

* PARAMETERS
COMP ADJ
ELIP GRS 80 6378137.0000 6356752.3141 0.0 0.0 0.0
MAXI 10
CONF YES YES YES YES NO
PSOL NO YES
PMIS NO NO
PRES YES NO
PADJ NO NO YES NO YES NO NO NO
VARF YES YES NO
RTST TAU MAX
LUNT m 1.000000000000
CONV 0.0001
CLEV 95
ANGT GRD
LDEC 4

* ITRF ACRONYMS, n° DOMES and POINTS DESCRIPTION *

* DORIS old antenna*****
* KRUB : 97301S004 DORIS antenna ref. pt. (Starec type)
* no acronym : 97301M401 DORIS 2 mark (ground mark)
* DORIS current antenna*****
* KRWB : 97301S006 DORIS antenna ref. pt. (Starec type)
* no acronym : 97301M403 DORIS 3 mark (ground mark)
* GNSS permanent antenna*****
* KOUG : 97301M402 REGINA antenna ref. pt. BPA=ARP(Leica AR25 R3 type)
* no acronym : no DOMES REGINA ground mark

* Measured points *
* name duration instrumentation type description *

* GAL1 temporary GNSS station ARP
* GAL1A temporary tacheometer station intersection of total station rotation axis
* GAL2A temporary tacheometer station intersection of total station rotation axis
* GAL3A temporary tacheometer station intersection of total station rotation axis
* KOLD permanent GNSS station ARP
* KOLDB permanent prism mount ground mark center & top
* KOLDBA1 temporary prism mount antenna base plate top
* KOLDBA2 temporary prism mount antenna base plate top
* KOLDBB1 temporary prism mount antenna base plate top
* KOLDBB2 temporary prism mount antenna base plate top
* KOLDBC1 temporary prism mount antenna base plate top
* KOLDBC2 temporary prism mount antenna base plate top
* KOLDC temporary prism mount antenna base plate center axis
* KRVB permanent GNSS station ARP
* KRVBA temporary tacheometer station intersection of total station rotation axis
* KRVBB permanent prism mount ground mark center & top
* KRVBBA1 temporary prism mount antenna base plate top
* KRVBBA2 temporary prism mount antenna base plate top
* KRVBBB1 temporary prism mount antenna base plate top
* KRVBBB2 temporary prism mount antenna base plate top
* KRVBBC1 temporary prism mount antenna base plate top
* KRVBBC2 temporary prism mount antenna base plate top
* KRVBC temporary prism mount antenna base plate center axis
* PLBD temporary GNSS station ARP
* REGI permanent GNSS station ARP
* REGIA temporary tacheometer station intersection of total station rotation axis
* REGIB permanent prism mount ground mark center & top
* REGIBA1 temporary prism mount antenna base plate top
* REGIBA2 temporary prism mount antenna base plate top
* REGIBB1 temporary prism mount antenna base plate top

```
* REGIBB2 temporary prism mount antenna base plate top
* REGIBC1 temporary prism mount antenna base plate top
* REGIBC2 temporary prism mount antenna base plate top
* ROUT temporary GNSS station ARP
```

```
*****
* GNSS Observations *
* Global Bernese computation *
* LOCAL GEODETIC DATUM: IGS05 EPOCH: 2011-02-24 0:17:30 *
*****
```

```
3DC
PLH 000 REGI n 5 5 54.494817 w 52 38 23.100483 107.2474 m
PLH 111 GAL1 n 5 5 55.349199 w 52 38 23.081986 107.8282 m
PLH 000 KRVB n 5 5 55.018884 w 52 38 23.245873 109.3514 m
PLH 111 ROUT n 5 6 4.954835 w 52 37 24.444894 -26.4604 m
PLH 111 PLBD n 5 6 39.203883 w 52 38 40.463813 113.6425 m
COV LG DIAG
ELEM 0.0001 0.0001 0.0001 m
ELEM 0.0001 0.0001 0.0001 m
ELEM 0.0001 0.0001 0.0001 m
ELEM 0.0001 0.0001 0.0001 m
ELEM 0.0001 0.0001 0.0001 m
```

```
*****
* APPROACHED COORDINATES *
*****
```

```
PLH 000 GAL2A N 5 5 54.88905 W 52 38 22.73439 107.7912 m 0
PLH 000 GAL3A N 5 5 54.80617 W 52 38 23.50688 107.8774 m 0
PLH 000 KOLDB N 5 5 55.06312 W 52 38 23.21122 107.2788 m 0
PLH 000 KOLDBA1 N 5 5 55.06347 W 52 38 23.21300 109.5016 m 0
PLH 000 KOLDBA2 N 5 5 55.06090 W 52 38 23.21135 109.5017 m 0
PLH 000 KOLDBB1 N 5 5 55.06366 W 52 38 23.20970 109.5018 m 0
PLH 000 KOLDBB2 N 5 5 55.06371 W 52 38 23.21283 109.5018 m 0
PLH 000 KOLDBC1 N 5 5 55.06089 W 52 38 23.21145 109.5019 m 0
PLH 000 KOLDBC2 N 5 5 55.06359 W 52 38 23.20973 109.5018 m 0
PLH 000 KRVBB N 5 5 55.01900 W 52 38 23.24592 107.2865 m 0
PLH 000 KRVBBA1 N 5 5 55.02249 W 52 38 23.24835 109.5252 m 0
PLH 000 KRVBBA2 N 5 5 55.02246 W 52 38 23.24832 109.5252 m 0
PLH 000 KRVBBB1 N 5 5 55.01930 W 52 38 23.24168 109.5253 m 0
PLH 000 KRVBBB2 N 5 5 55.01933 W 52 38 23.24166 109.5251 m 0
PLH 000 KRVBBC1 N 5 5 55.01519 W 52 38 23.24774 109.5251 m 0
PLH 000 KRVBBC2 N 5 5 55.01526 W 52 38 23.24774 109.5251 m 0
PLH 000 REGIB N 5 5 54.49481 W 52 38 23.10050 106.1983 m 0
PLH 000 REGIBA1 N 5 5 54.49894 W 52 38 23.09968 107.4473 m 0
PLH 000 REGIBA2 N 5 5 54.49900 W 52 38 23.09965 107.4474 m 0
PLH 000 REGIBB1 N 5 5 54.49193 W 52 38 23.09739 107.4474 m 0
PLH 000 REGIBB2 N 5 5 54.49198 W 52 38 23.09725 107.4475 m 0
PLH 000 REGIBC1 N 5 5 54.49331 W 52 38 23.10451 107.4474 m 0
PLH 000 REGIBC2 N 5 5 54.49353 W 52 38 23.10445 107.4475 m 0
PLH 000 KRWB n 5 5 55.018884 w 52 38 23.245873 109.3514 m 0
PLH 000 KOUG N 5 5 54.494817 W 52 38 23.100483 107.2474 m 0
PLH 000 KRUB N 5 5 55.06312 W 52 38 23.21122 107.2788 m 0
```

HIST NEW

```
*****
* centering and instrument height *
*****
```

```
* REGIA 0.238 m above REGI
* KOUG = REGI
3DD
PLH 000 REGIA n 5 5 54.494817 w 52 38 23.100483 107.4854 m
PLH 000 REGI n 5 5 54.494817 w 52 38 23.100483 107.2474 m
PLH 000 KOUG n 5 5 54.494817 w 52 38 23.100483 107.2474 m
COV LG DIAG 0.00000 1.00000 0.00000 1.00000 0.00000
ELEM 0.00000025 0.00000025 0.000001
ELEM 0.00000001 0.00000001 0.00000001
* GAL1A 0.050 m above GAL1
3DD
PLH 000 GAL1 n 5 5 55.349199 w 52 38 23.081986 107.8282 m
PLH 000 GAL1A n 5 5 55.349199 w 52 38 23.081986 107.8782 m
COV LG DIAG 0.00000 1.00000 0.00000 1.00000 0.00000
ELEM 0.00000025 0.00000025 0.000001
* KRVBA 0.250 m above KRVB
```

* KRVBC 0.178 m above KRVB
* KRWB 0.391 m above KRVB
3DD
PLH 000 KRVB n 5 5 55.018884 w 52 38 23.245873 109.3514 m
PLH 000 KRVBA n 5 5 55.018884 w 52 38 23.245873 109.6014 m
PLH 000 KRVBC n 5 5 55.018884 w 52 38 23.245873 109.5294 m
PLH 000 KRWB n 5 5 55.018884 w 52 38 23.245873 109.7424 m
COV LG DIAG 0.00000 1.00000 0.00000 1.00000 0.00000
ELEM 0.00000025 0.00000025 0.000001
ELEM 0.00000025 0.00000025 0.000001
ELEM 0.00000001 0.00000001 0.00000001
* KOLDC 0.178 m above KOLD
* KRUB 0.391 m above KOLD
3DD
PLH 000 KOLDC n 5 5 55.063120 w 52 38 23.211220 109.4798 m
PLH 000 KOLD n 5 5 55.063120 w 52 38 23.211220 109.3018 m
PLH 000 KRUB n 5 5 55.063120 w 52 38 23.211220 109.6928 m
COV LG DIAG 0.00000 1.00000 0.00000 1.00000 0.00000
ELEM 0.00000025 0.00000025 0.000001
ELEM 0.00000001 0.00000001 0.00000001

HIST GEN DXYZ
HIST NEW

* PLATE INDIRECT LEVELLING: TARGET HEIGHT 0.2 METERS

OHDF REGI REGIBA1 0.000 0.0002
OHDF REGI REGIBA2 0.000 0.0002
OHDF REGI REGIBB1 0.000 0.0002
OHDF REGI REGIBB2 0.000 0.0002
OHDF REGI REGIBC1 0.000 0.0002
OHDF REGI REGIBC2 0.000 0.0002

* PLATE INDIRECT LEVELLING: TARGET HEIGHT 0.2 METERS

OHDF KRVB KRVBBA1 0.000 0.0002
OHDF KRVB KRVBBA2 0.000 0.0002
OHDF KRVB KRVBBB1 0.000 0.0002
OHDF KRVB KRVBBB2 0.000 0.0002
OHDF KRVB KRVBBC1 0.000 0.0002
OHDF KRVB KRVBBC2 0.000 0.0002

* PLATE INDIRECT LEVELLING: TARGET HEIGHT 0.2 METERS

OHDF KOLD KOLDBA1 0.000 0.0002
OHDF KOLD KOLDBA2 0.000 0.0002
OHDF KOLD KOLDBB1 0.000 0.0002
OHDF KOLD KOLDBB2 0.000 0.0002
OHDF KOLD KOLDBC1 0.000 0.0002
OHDF KOLD KOLDBC2 0.000 0.0002

HIST GEN DN

* target height *

* GROUND MARK MEASUREMENT: TARGET HEIGHT 0.2 METERS

HT REGIB 0.200 m
HT KOLDB 0.200 m
HT KRVBB 0.200 m
HT REGIBA1 0.200 m
HT REGIBA2 0.200 m
HT REGIBB1 0.200 m
HT REGIBB2 0.200 m
HT REGIBC1 0.200 m
HT REGIBC2 0.200 m
HT KRVBBA1 0.200 m
HT KRVBBA2 0.200 m
HT KRVBBB1 0.200 m
HT KRVBBB2 0.200 m
HT KRVBBC1 0.200 m
HT KRVBBC2 0.200 m
HT KOLDBA1 0.200 m
HT KOLDBA2 0.200 m
HT KOLDBB1 0.200 m
HT KOLDBB2 0.200 m
HT KOLDBC1 0.200 m
HT KOLDBC2 0.200 m

* TOTAL STATION OBSERVATIONS: horizontal angle

SIGM AH 13
HIST NEW

DSET AH

DIR	GAL3A	PLBD	0 0	0.0
DIR	GAL3A	GAL1A	65 61	63.8
DIR	GAL3A	GAL2A	116 49	86.0
DIR	GAL3A	REGIA	164 81	87.0
DIR	GAL3A	REGIB	164 82	2.8
DIR	GAL3A	KOLDB	77 81	99.1
DIR	GAL3A	KRVBB	79 81	54.8
DIR	GAL3A	KOLDC	77 86	41.4
DIR	GAL3A	KRVBC	79 80	77.9

DSET AH

DIR	GAL3A	PLBD	0 0	0.0
DIR	GAL3A	GAL1A	65 61	47.1
*DIR	GAL3A	GAL2A	116 50	11.0
DIR	GAL3A	REGIA	164 81	95.0
DIR	GAL3A	REGIBA1	164 34	92.6
DIR	GAL3A	REGIBB1	164 87	0.6
DIR	GAL3A	REGIBC1	165 27	40.2
DIR	GAL3A	REGIB	164 82	18.7
DIR	GAL3A	KOLDB	77 82	18.7
DIR	GAL3A	KRVBB	79 81	38.1
DIR	GAL3A	KOLDC	77 86	9.2
DIR	GAL3A	KOLDBA1	77 58	77.1
DIR	GAL3A	KOLDBB1	77 91	61.8
DIR	GAL3A	KOLDBC1	78 7	9.4
DIR	GAL3A	KRVBC	79 80	72.3
DIR	GAL3A	KRVBBA1	79 1	27.3
DIR	GAL3A	KRVBBB1	80 27	2.0
DIR	GAL3A	KRVBBC1	80 15	72.2

DSET AH

DIR	GAL1A	PLBD	0 0	0.0
DIR	GAL1A	ROUT	113 77	13.9
DIR	GAL1A	GAL2A	182 81	6.5
DIR	GAL1A	REGIA	225 45	59.0
DIR	GAL1A	GAL3A	266 41	98.0
DIR	GAL1A	KOLDB	251 12	75.6
DIR	GAL1A	KRVBB	253 45	97.8
DIR	GAL1A	KOLDC	251 10	55.6
DIR	GAL1A	KRVBC	253 46	46.3

DSET AH

DIR	GAL2A	PLBD	0 0	0.0
DIR	GAL2A	ROUT	113 42	77.3
DIR	GAL2A	REGIA	272 1	73.0
DIR	GAL2A	GAL3A	317 50	3.7
DIR	GAL2A	GAL1A	383 2	33.2
DIR	GAL2A	KOLDC	346 45	92.6
DIR	GAL2A	KRVBC	340 8	40.5

DSET AH

DIR	GAL2A	PLBD	0 0	0.0
DIR	GAL2A	ROUT	113 42	87.0
DIR	GAL2A	REGIA	272 1	77.3
DIR	GAL2A	REGIBA2	272 28	40.3
DIR	GAL2A	REGIBB2	271 50	83.3
DIR	GAL2A	REGIBC2	272 25	58.9
DIR	GAL2A	GAL3A	317 49	95.1
DIR	GAL2A	GAL1A	383 2	51.8
DIR	GAL2A	KOLDC	346 45	74.9
DIR	GAL2A	KOLDBA2	346 24	77.1
DIR	GAL2A	KOLDBB2	346 51	39.5
DIR	GAL2A	KOLDBC2	346 63	38.5
DIR	GAL2A	KRVBC	340 8	23.1
DIR	GAL2A	KRVBBA2	340 41	33.9
DIR	GAL2A	KRVBBB2	340 24	88.4
DIR	GAL2A	KRVBBC2	339 59	36.6

DSET AH

DIR	KRVBA	ROUT	0 0	0.0
DIR	KRVBA	GAL2A	26 42	59.8
DIR	KRVBA	REGIA	93 35	61.9
DIR	KRVBA	GAL1A	340 0	69.6

DSET AH

DIR	KRVBA	ROUT	0 0	0.0
-----	-------	------	-----	-----

DIR	KRVBA	GAL2A	26 42	59.8
DIR	KRVBA	REGIA	93 35	48.9
DIR	KRVBA	GAL1A	340 0	69.6

HIST GEN HORIZONTAL ANGLE

* TOTAL STATION OBSERVATIONS: vertical angle

SIGM ZA 13
HIST NEW

ZANG ZA	GAL3A	GAL1A	100 1	78.8	
ZANG ZA	GAL3A	GAL2A	100 22	80.3	
ZANG ZA	GAL3A	REGIA	101 58	70.4	
ZANG ZA	GAL3A	REGIB	105 95	99.5	
ZANG ZA	GAL3A	KOLDB	102 10	76.9	
ZANG ZA	GAL3A	KRVBB	102 40	22.2	
ZANG ZA	GAL3A	KOLDC	91 58	6.9	
ZANG ZA	GAL3A	KRVBC	90 10	3.6	
ZANG ZA	GAL3A	GAL1A	100 1	52.3	20
ZANG ZA	GAL3A	GAL2A	100 22	70.6	
ZANG ZA	GAL3A	REGIA	101 58	61.5	
ZANG ZA	GAL3A	REGIBA1	101 74	46.0	
ZANG ZA	GAL3A	REGIBB1	101 72	26.6	
ZANG ZA	GAL3A	REGIBC1	101 74	53.2	
ZANG ZA	GAL3A	REGIB	105 95	99.3	
ZANG ZA	GAL3A	KOLDB	102 10	35.3	
ZANG ZA	GAL3A	KRVBB	102 39	82.8	
ZANG ZA	GAL3A	KOLDC	91 58	3.9	
ZANG ZA	GAL3A	KOLDBA1	91 44	85.4	
ZANG ZA	GAL3A	KOLDBB1	91 50	14.2	
ZANG ZA	GAL3A	KOLDBC1	91 43	31.6	
ZANG ZA	GAL3A	KRVBC	90 9	59.1	
ZANG ZA	GAL3A	KRVBBA1	89 96	90.2	
ZANG ZA	GAL3A	KRVBBB1	90 5	87.3	
ZANG ZA	GAL3A	KRVBBC1	89 84	66.5	
ZANG ZA	GAL1A	GAL2A	100 28	31.8	
ZANG ZA	GAL1A	REGIA	100 93	46.5	
ZANG ZA	GAL1A	GAL3A	99 97	79.5	
ZANG ZA	GAL1A	KOLDB	102 57	86.6	
ZANG ZA	GAL1A	KRVBB	102 15	46.5	
ZANG ZA	GAL1A	KOLDC	89 49	42.9	
ZANG ZA	GAL1A	KRVBC	90 89	29.3	
ZANG ZA	GAL2A	REGIA	101 17	90.9	
ZANG ZA	GAL2A	GAL3A	99 77	6.9	
ZANG ZA	GAL2A	GAL1A	99 71	49.0	
ZANG ZA	GAL2A	KOLDC	93 15	7.9	
ZANG ZA	GAL2A	KRVBC	93 32	34.7	
ZANG ZA	GAL2A	REGIA	101 17	87.1	
ZANG ZA	GAL2A	REGIBA2	101 33	19.5	
ZANG ZA	GAL2A	REGIBB2	101 32	11.4	
ZANG ZA	GAL2A	REGIBC2	101 31	15.8	
ZANG ZA	GAL2A	GAL3A	99 76	95.3	
ZANG ZA	GAL2A	GAL1A	99 71	39.9	
ZANG ZA	GAL2A	KOLDC	93 14	89.3	
ZANG ZA	GAL2A	KOLDBA2	93 5	23.1	
ZANG ZA	GAL2A	KOLDBB2	93 8	34.5	
ZANG ZA	GAL2A	KOLDBC2	93 4	35.8	
ZANG ZA	GAL2A	KRVBC	93 32	22.3	
ZANG ZA	GAL2A	KRVBBA2	93 27	38.3	
ZANG ZA	GAL2A	KRVBBB2	93 18	27.3	
ZANG ZA	GAL2A	KRVBBC2	93 24	68.1	
ZANG ZA	KRVBA	GAL2A	106 95	17.2	
ZANG ZA	KRVBA	REGIA	107 91	57.0	
ZANG ZA	KRVBA	GAL1A	109 49	70.8	
ZANG ZA	KRVBA	GAL2A	106 95	17.2	
ZANG ZA	KRVBA	REGIA	107 91	49.1	
ZANG ZA	KRVBA	GAL1A	109 49	70.8	

HIST GEN VERTICAL ANGLE

* TOTAL STATION OBSERVATIONS: distance

*DISTances

SIGM DP 0.001

HIST NEW

DIST DP GAL3A	GAL1A	21.20470
DIST DP GAL3A	GAL2A	23.92973
DIST DP GAL3A	REGIA	15.75811
DIST DP GAL3A	REGIB	15.82216
DIST DP GAL3A	KOLDB	12.05836
DIST DP GAL3A	KRVBB	10.37002
DIST DP GAL3A	KOLDC	12.14782
DIST DP GAL3A	KRVBC	10.48782
DIST DP GAL3A	GAL1A	21.20495
DIST DP GAL3A	GAL2A	23.92953
DIST DP GAL3A	REGIA	15.75791
DIST DP GAL3A	REGIBA1	15.70231
DIST DP GAL3A	REGIBB1	15.88861
DIST DP GAL3A	REGIBC1	15.68891
DIST DP GAL3A	REGIB	15.82241
DIST DP GAL3A	KOLDB	12.05831
DIST DP GAL3A	KRVBB	10.36987
DIST DP GAL3A	KOLDC	12.14792
DIST DP GAL3A	KOLDBA1	12.12602
DIST DP GAL3A	KOLDBB1	12.20582
DIST DP GAL3A	KOLDBC1	12.11062
DIST DP GAL3A	KRVBC	10.48777
DIST DP GAL3A	KRVBBA1	10.50137
DIST DP GAL3A	KRVBBB1	10.59718
DIST DP GAL3A	KRVBBC1	10.37547
DIST DP GAL1A	GAL2A	17.73870
DIST DP GAL1A	REGIA	26.25867
DIST DP GAL1A	GAL3A	21.20434
DIST DP GAL1A	KOLDB	9.65895
DIST DP GAL1A	KRVBB	11.33974
DIST DP GAL1A	KOLDC	9.79650
DIST DP GAL1A	KRVBC	11.45089
DIST DP GAL2A	REGIA	16.55005
DIST DP GAL2A	GAL3A	23.93018
DIST DP GAL2A	GAL1A	17.73798
DIST DP GAL2A	KOLDC	15.71793
DIST DP GAL2A	KRVBC	16.34449
DIST DP GAL2A	REGIA	16.55010
DIST DP GAL2A	REGIBA2	16.43950
DIST DP GAL2A	REGIBB2	16.54710
DIST DP GAL2A	REGIBC2	16.66300
DIST DP GAL2A	GAL3A	23.93008
DIST DP GAL2A	GAL1A	17.73783
DIST DP GAL2A	KOLDC	15.71768
DIST DP GAL2A	KOLDBA2	15.70418
DIST DP GAL2A	KOLDBB2	15.77608
DIST DP GAL2A	KOLDBC2	15.68568
DIST DP GAL2A	KRVBC	16.34459
DIST DP GAL2A	KRVBBA2	16.44330
DIST DP GAL2A	KRVBBB2	16.22199
DIST DP GAL2A	KRVBBC2	16.37239
DIST DP KRVBA	GAL2A	16.35131
DIST DP KRVBA	REGIA	16.84352
DIST DP KRVBA	GAL1A	11.46189
DIST DP KRVBA	GAL2A	16.35131
DIST DP KRVBA	REGIA	16.84363
DIST DP KRVBA	GAL1A	11.46189

HIST GEN DISTANCE
HIST ALL FULL OBSERVATION
END

9. Annex 5: global adjustment results file

```
=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch Geolab, V2001.9.20.0          GRS 80          UNITS: m,GRAD Page 0001
=====
Mon Dec 5 13:27:04 2011
```

```
Input file: D:\REGINA\2011\KOUROU\RATTACHEMENT\CALCUL FINAL\KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Output file: D:\REGINA\2011\KOUROU\RATTACHEMENT\CALCUL FINAL\KOUROU ITRF COLOCATION SURVEY 2011 - v11.lst
Options file: C:\Program Files\Microsearch\GeoLab\default.gpj
```

PARAMETERS		OBSERVATIONS	
Description	Number	Description	Number
No. of Stations	37	Directions	66
Coord Parameters	102	Distances	57
Free Latitudes	34	Azimuths	0
Free Longitudes	34	Vertical Angles	0
Free Heights	34	Zenithal Angles	57
Fixed Coordinates	9	Angles	0
Astro. Latitudes	0	Heights	0
Astro. Longitudes	0	Height Differences	18
Geoid Records	0	Auxiliary Params.	0
All Aux. Pars.	7	2-D Coords.	0
Direction Pars.	7	2-D Coord. Diffs.	0
Scale Parameters	0	3-D Coords.	15
Constant Pars.	0	3-D Coord. Diffs.	24
Rotation Pars.	0		
Translation Pars.	0		
	-----		-----
Total Parameters	109	Total Observations	237
Degrees of Freedom =		128	

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

```
=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch Geolab, V2001.9.20.0          GRS 80          UNITS: m,GRAD Page 0002
=====
```

```
Optimize Band Width          | Yes
Generate Initial Coordinates | Yes
Re-Transform Obs After 1st Pass | Yes
Geoid Interpolation Method    | Bi-Quadratic
```


=====

KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0003

=====

Adjusted PLH Coordinates:

CODE	FFF	STATION			LATITUDE STD DEV			LONGITUDE STD DEV		ELIP-HEIGHT STD DEV			
PLH	111	GAL1	N	5	5	55.34920	W	52	38	23.08199	107.8282	m	0
						0.0000				0.0000	0.0000		
PLH	000	GAL1A	N	5	5	55.34920	W	52	38	23.08199	107.8783	m	0
						0.0005				0.0005	0.0010		
PLH	000	GAL2A	N	5	5	54.88887	W	52	38	22.73430	107.7994	m	0
						0.0006				0.0006	0.0011		
PLH	000	GAL3A	N	5	5	54.80598	W	52	38	23.50680	107.8856	m	0
						0.0006				0.0006	0.0011		
PLH	000	KOLD	N	5	5	55.06251	W	52	38	23.21122	109.3100	m	0
						0.0008				0.0008	0.0011		
PLH	000	KOLDB	N	5	5	55.06293	W	52	38	23.21113	107.2870	m	0
						0.0007				0.0006	0.0011		
PLH	000	KOLDBA1	N	5	5	55.06327	W	52	38	23.21292	109.3098	m	0
						0.0009				0.0010	0.0011		
PLH	000	KOLDBA2	N	5	5	55.06072	W	52	38	23.21127	109.3099	m	0
						0.0008				0.0012	0.0011		
PLH	000	KOLDBB1	N	5	5	55.06347	W	52	38	23.20962	109.3101	m	0
						0.0009				0.0010	0.0011		
PLH	000	KOLDBB2	N	5	5	55.06353	W	52	38	23.21275	109.3100	m	0
						0.0008				0.0012	0.0011		
PLH	000	KOLDBC1	N	5	5	55.06070	W	52	38	23.21136	109.3101	m	0
						0.0009				0.0010	0.0011		
PLH	000	KOLDBC2	N	5	5	55.06341	W	52	38	23.20965	109.3100	m	0
						0.0008				0.0012	0.0011		
PLH	000	KOLDC	N	5	5	55.06251	W	52	38	23.21122	109.4875	m	0
						0.0006				0.0006	0.0011		
PLH	000	KOUG	N	5	5	54.49463	W	52	38	23.10040	107.2549	m	0
						0.0006				0.0006	0.0011		
PLH	000	KRUB	N	5	5	55.06251	W	52	38	23.21122	109.7005	m	0
						0.0006				0.0006	0.0011		
PLH	000	KRVB	N	5	5	55.01882	W	52	38	23.24585	109.3333	m	0
						0.0007				0.0007	0.0011		
PLH	000	KRVBA	N	5	5	55.01882	W	52	38	23.24583	109.5817	m	0
						0.0006				0.0006	0.0011		
PLH	000	KRVBB	N	5	5	55.01882	W	52	38	23.24582	107.2947	m	0
						0.0007				0.0006	0.0011		
PLH	000	KRVBBA1	N	5	5	55.02229	W	52	38	23.24827	109.3334	m	0
						0.0009				0.0010	0.0011		
PLH	000	KRVBBA2	N	5	5	55.02228	W	52	38	23.24824	109.3334	m	0
						0.0007				0.0012	0.0011		
PLH	000	KRVBBB1	N	5	5	55.01911	W	52	38	23.24160	109.3335	m	0
						0.0009				0.0010	0.0011		
PLH	000	KRVBBB2	N	5	5	55.01915	W	52	38	23.24158	109.3333	m	0
						0.0007				0.0012	0.0011		
PLH	000	KRVBBC1	N	5	5	55.01500	W	52	38	23.24765	109.3333	m	0

=====

KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0004

=====

Adjusted PLH Coordinates:

CODE	FFF	STATION			LATITUDE STD DEV			LONGITUDE STD DEV		ELIP-HEIGHT STD DEV			
						0.0009				0.0010	0.0011		
PLH	000	KRVBBC2	N	5	5	55.01508	W	52	38	23.24766	109.3332	m	0
						0.0007				0.0012	0.0011		
PLH	000	KRVBC	N	5	5	55.01883	W	52	38	23.24586	109.5104	m	0
						0.0006				0.0006	0.0011		
PLH	000	KRWB	N	5	5	55.01882	W	52	38	23.24585	109.7243	m	0
						0.0007				0.0007	0.0011		
PLH	111	PLBD	N	5	6	39.20388	W	52	38	40.46381	113.6425	m	0
						0.0000				0.0000	0.0000		
PLH	000	REGI	N	5	5	54.49463	W	52	38	23.10040	107.2557	m	0
						0.0008				0.0008	0.0011		
PLH	000	REGIA	N	5	5	54.49463	W	52	38	23.10040	107.4929	m	0
						0.0006				0.0006	0.0011		
PLH	000	REGIB	N	5	5	54.49462	W	52	38	23.10042	106.2065	m	0
						0.0008				0.0009	0.0011		
PLH	000	REGIBA1	N	5	5	54.49875	W	52	38	23.09960	107.2556	m	0
						0.0009				0.0011	0.0011		
PLH	000	REGIBA2	N	5	5	54.49882	W	52	38	23.09957	107.2556	m	0
						0.0010				0.0010	0.0011		
PLH	000	REGIBB1	N	5	5	54.49173	W	52	38	23.09731	107.2557	m	0
						0.0009				0.0011	0.0011		
PLH	000	REGIBB2	N	5	5	54.49180	W	52	38	23.09716	107.2558	m	0
						0.0010				0.0010	0.0011		
PLH	000	REGIBC1	N	5	5	54.49312	W	52	38	23.10443	107.2556	m	0

PLH 000 REGIBC2	N 5 5	54.49335	W 52 38	23.10436	107.2558	m	0
		0.0009		0.0011	0.0011		
PLH 111 ROUT	N 5 6	4.95484	W 52 37	24.44489	-26.4604	m	0
		0.0010		0.0010	0.0011		
		0.0000		0.0000	0.0000		

=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0005
=====

Adjusted XYZ Coordinates:

CODE	FFF	STATION	X-COORDINATE STD DEV	Y-COORDINATE STD DEV	Z-COORDINATE STD DEV		
XYZ		GAL1	3855262.7309 0.0000	-5049730.2579 0.0000	563066.6085 0.0000	m	0
XYZ		GAL1A	3855262.7612 0.0008	-5049730.2976 0.0009	563066.6130 0.0005	m	0
XYZ		GAL2A	3855271.9880 0.0008	-5049724.7354 0.0009	563052.5216 0.0006	m	0
XYZ		GAL3A	3855253.2653 0.0008	-5049739.4222 0.0009	563049.9932 0.0006	m	0
XYZ		KOLD	3855260.9376 0.0009	-5049734.4686 0.0010	563057.9684 0.0008	m	0
XYZ		KOLDB	3855259.7162 0.0008	-5049732.8645 0.0009	563057.8017 0.0007	m	0
XYZ		KOLDBA1	3855260.8947 0.0010	-5049734.4985 0.0011	563057.9919 0.0009	m	0
XYZ		KOLDBA2	3855260.9394 0.0011	-5049734.4733 0.0011	563057.9139 0.0008	m	0
XYZ		KOLDBB1	3855260.9752 0.0010	-5049734.4367 0.0011	563057.9977 0.0009	m	0
XYZ		KOLDBB2	3855260.8984 0.0011	-5049734.4950 0.0011	563057.9996 0.0008	m	0
XYZ		KOLDBC1	3855260.9372 0.0010	-5049734.4753 0.0011	563057.9132 0.0009	m	0
XYZ		KOLDBC2	3855260.9745 0.0011	-5049734.4373 0.0011	563057.9961 0.0008	m	0
XYZ		KOLDC	3855261.0449 0.0008	-5049734.6092 0.0009	563057.9842 0.0006	m	0
XYZ		KOUG	3855263.3492 0.0008	-5049732.0025 0.0009	563040.4107 0.0006	m	0
XYZ		KRUB	3855261.1737 0.0008	-5049734.7778 0.0009	563058.0031 0.0006	m	0
XYZ		KRVB	3855260.1763 0.0008	-5049735.2291 0.0009	563056.6340 0.0007	m	0
XYZ		KRVBA	3855260.3267 0.0008	-5049735.4255 0.0009	563056.6559 0.0006	m	0
XYZ		KRVBB	3855258.9448 0.0008	-5049733.6146 0.0009	563056.4526 0.0007	m	0
XYZ		KRVBBA1	3855260.1114 0.0010	-5049735.2668 0.0011	563056.7402 0.0009	m	0
XYZ		KRVBBA2	3855260.1121 0.0012	-5049735.2663 0.0011	563056.7397 0.0007	m	0
XYZ		KRVBBB1	3855260.2799 0.0010	-5049735.1492 0.0011	563056.6426 0.0009	m	0
XYZ		KRVBBB2	3855260.2803 0.0012	-5049735.1486 0.0011	563056.6439 0.0007	m	0
XYZ		KRVBBC1	3855260.1384	-5049735.2712	563056.5169	m	0

=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0006
=====

Adjusted XYZ Coordinates:

CODE	FFF	STATION	X-COORDINATE STD DEV	Y-COORDINATE STD DEV	Z-COORDINATE STD DEV		
XYZ		KRVBBC2	3855260.1381 0.0012	-5049735.2710 0.0011	563056.5194 0.0007	m	0
XYZ		KRVBC	3855260.2831 0.0008	-5049735.3695 0.0009	563056.6498 0.0006	m	0
XYZ		KRWB	3855260.4127 0.0008	-5049735.5386 0.0009	563056.6687 0.0007	m	0
XYZ		PLBD	3854767.9642 0.0000	-5049964.4455 0.0000	564408.9132 0.0000	m	0
XYZ		REGI	3855263.3497 0.0009	-5049732.0031 0.0010	563040.4108 0.0008	m	0
XYZ		REGIA	3855263.4930 0.0008	-5049732.1910 0.0009	563040.4319 0.0006	m	0
XYZ		REGIB	3855262.7151 0.0010	-5049731.1729 0.0010	563040.3172 0.0008	m	0
XYZ		REGIBA1	3855263.3625 0.0011	-5049731.9791 0.0010	563040.5369 0.0009	m	0
XYZ		REGIBA2	3855263.3631	-5049731.9785	563040.5389	m	0

XYZ	REGIBB1	3855263.4301	0.0010	-5049731.9517	0.0011	563040.3222	0.0010	0
			0.0011		0.0010		0.0009	
XYZ	REGIBB2	3855263.4337	0.0010	-5049731.9488	0.0011	563040.3243	0.0010	0
			0.0011		0.0010		0.0009	
XYZ	REGIBC1	3855263.2534	0.0010	-5049732.0818	0.0011	563040.3646	0.0010	0
			0.0011		0.0010		0.0009	
XYZ	REGIBC2	3855263.2549	0.0010	-5049732.0801	0.0011	563040.3716	0.0010	0
			0.0011		0.0010		0.0009	
XYZ	ROUT	3856600.9957	0.0000	-5048506.9419	0.0000	563348.5659	0.0000	0
			0.0000		0.0000		0.0000	

=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch Geolab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0007
=====

Residuals (critical value = 3.787):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
ELAT REGI			N 5 05 54.49482 0.0100	-0.0057 0.0100	-0.5746
ELON REGI			W 52 38 23.10048 0.0100	0.0025 0.0100	0.2521
EHGT REGI			107.24740 0.0100	0.0083 0.0099	0.8314
ELAT GAL1			N 5 05 55.34920 0.0100	0.0000 0.0100	0.0000
ELON GAL1			W 52 38 23.08199 0.0100	0.0000 0.0100	0.0000
EHGT GAL1			107.82820 0.0100	0.0000 0.0100	0.0000
ELAT KRVB			N 5 05 55.01888 0.0100	-0.0018 0.0100	-0.1825
ELON KRVB			W 52 38 23.24587 0.0100	0.0008 0.0100	0.0833
EHGT KRVB			109.35140 0.0100	-0.0181 0.0099	-1.8165
ELAT ROUT			N 5 06 4.95484 0.0100	0.0000 0.0100	0.0000
ELON ROUT			W 52 37 24.44489 0.0100	0.0000 0.0100	0.0000
EHGT ROUT			-26.46040 0.0100	0.0000 0.0100	0.0000
ELAT PLBD			N 5 06 39.20388 0.0100	0.0000 0.0100	0.0000
ELON PLBD			W 52 38 40.46381 0.0100	0.0000 0.0100	0.0000
EHGT PLBD			113.64250 0.0100	0.0000 0.0100	0.0000
ELAT	REGIA	REGI	0 00 0.00000 0.0005	0.0000 -0.0000	0.0000 60.37
ELON	REGIA	REGI	0 00 0.00000 0.0005	-0.0000 0.0007	-0.0094 26.49
EHGT	REGIA	REGI	-0.23800 0.0010	0.0008 0.0007	1.0596 3218.75
ELAT	REGIA	KOUG	0 00 0.00000 0.0001	-0.0000 0.0000	-0.0000 0.00*
ELON	REGIA	KOUG	0 00 0.00000 0.0001	0.0000 0.0000	0.0000 0.00*
EHGT	REGIA	KOUG	-0.23800 0.0001	-0.0000 0.0000	-0.0000 0.00*
ELAT	GAL1	GAL1A	0 00 0.00000 0.0005	0.0000 -0.0000	0.0000 286.34

=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch Geolab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0008
=====

Residuals (critical value = 3.787):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
ELON	GAL1	GAL1A	0 00 0.00000 0.0005	-0.0000 0.0001	-0.1701 233.06
EHGT	GAL1	GAL1A	0.05000 0.0010	0.0001 0.0001	1.0830 1956.49
ELAT	KRVB	KRVBA	0 00 0.00000 0.0005	-0.0001 0.0003	-0.3304 421.59
ELON	KRVB	KRVBA	0 00 0.00000 0.0005	0.0004 0.0003	1.0628 1412.60
EHGT	KRVB	KRVBA	0.25000 0.0010	-0.0017 0.0010	-1.6999 6723.34

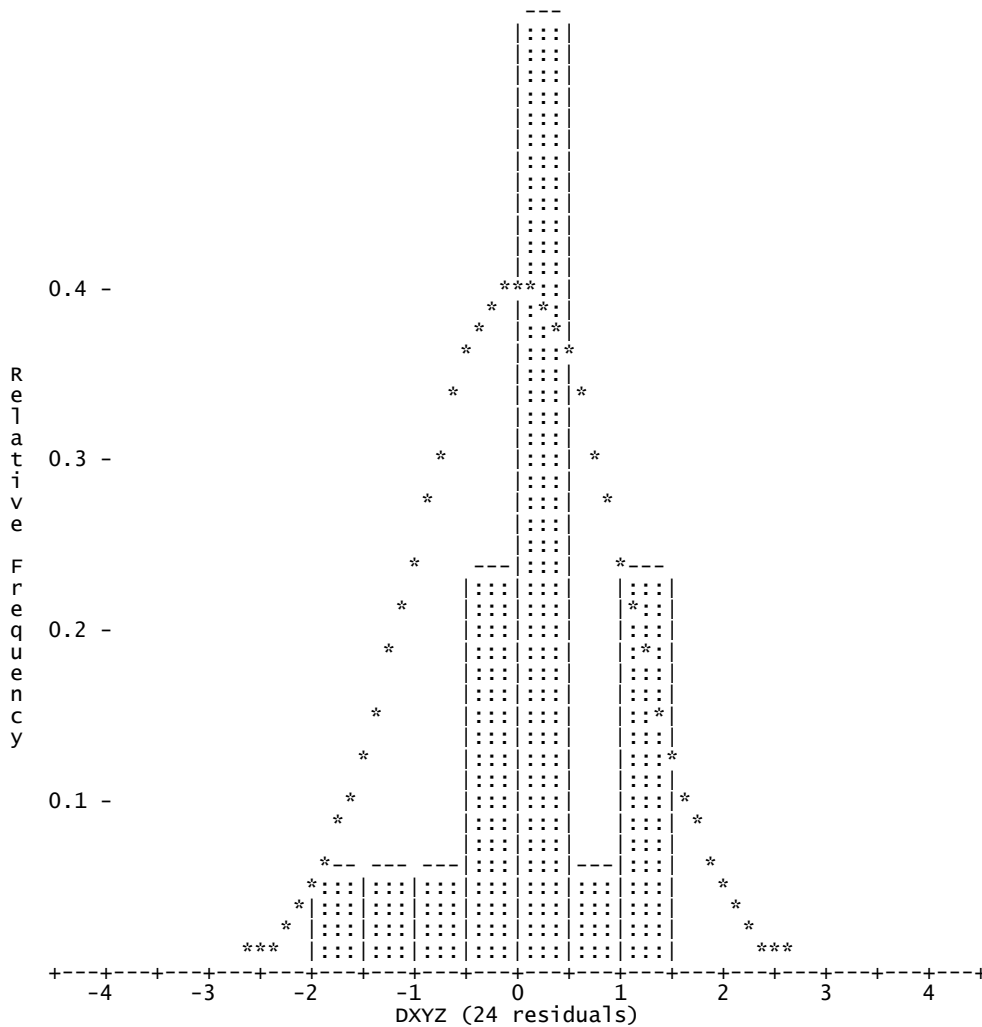
CO-LOCATION SURVEY REPORT
Kourou, French Guiana

ELAT	KRVB	KRVBC	0 00	0.00000	0.0001	0.3159
				0.0005	0.0003	565.45
ELON	KRVB	KRVBC	0 00	0.00000	-0.0003	-1.0566
				0.0005	0.0003	1968.99
EHGT	KRVB	KRVBC		0.17800	-0.0009	-0.9119
				0.0010	0.0010	5070.25
ELAT	KRVB	KRWB	0 00	0.00000	0.0000	0.0000
				0.0001	0.0000	0.00*
ELON	KRVB	KRWB	0 00	0.00000	-0.0000	-0.0000
				0.0001	0.0000	0.00*
EHGT	KRVB	KRWB		0.39100	-0.0000	-0.0000
				0.0001	0.0000	0.00*
ELAT	KOLDC	KOLD	0 00	0.00000	-0.0000	-0.0000
				0.0005	-0.0000	0.00
ELON	KOLDC	KOLD	0 00	0.00000	0.0000	0.0000
				0.0005	0.0007	0.00
EHGT	KOLDC	KOLD		-0.17800	0.0004	0.6108
				0.0010	0.0007	2490.30
ELAT	KOLDC	KRUB	0 00	0.00000	-0.0000	-0.0000
				0.0001	0.0000	0.00*
ELON	KOLDC	KRUB	0 00	0.00000	0.0000	0.0000
				0.0001	0.0000	0.00*
EHGT	KOLDC	KRUB		0.21300	-0.0000	-0.0000
				0.0001	0.0000	0.00*

=====

KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
 Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0009

=====



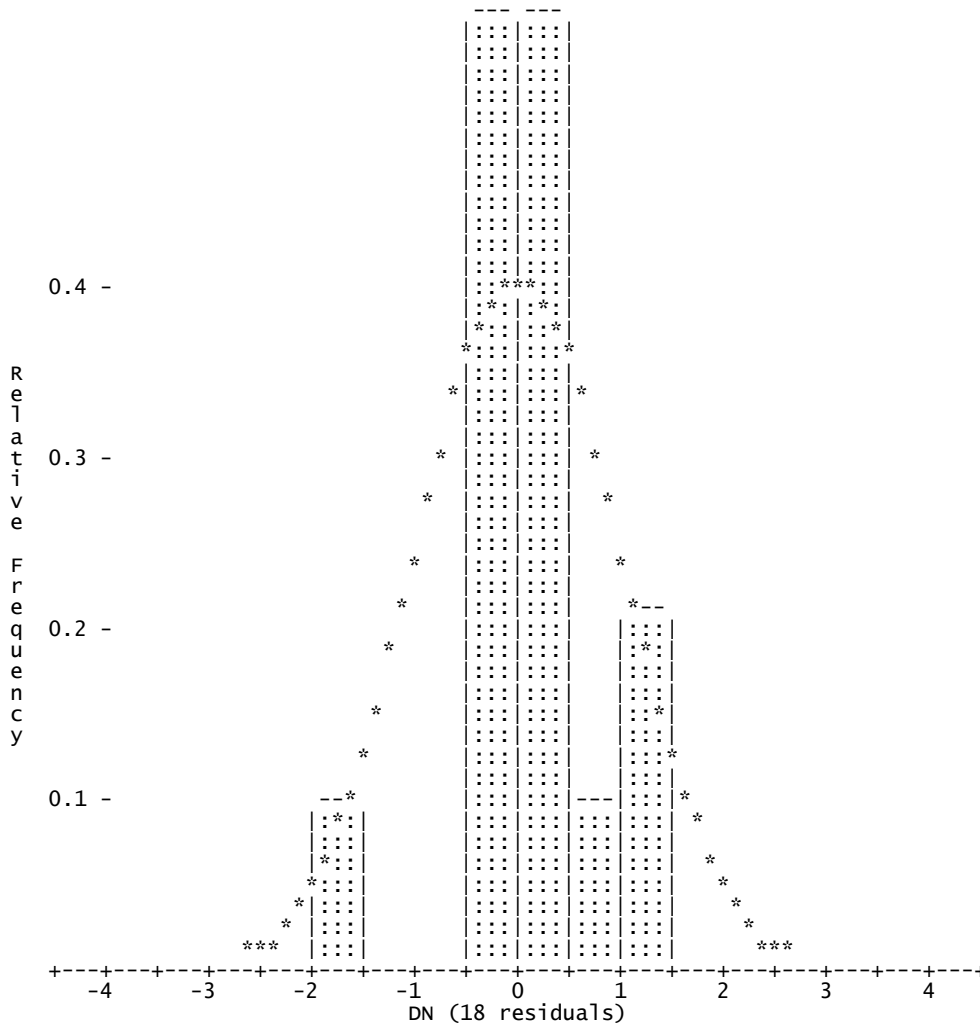
=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0011
=====

Residuals (critical value = 3.787):

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

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
OHDF		REGI	REGIBA1	0.00000 0.0002	-0.0001 0.0000	-0.0001 712.72*
OHDF		REGI	REGIBA2	0.00000 0.0002	-0.0001 0.0000	-0.0001 409.92*
OHDF		REGI	REGIBB1	0.00000 0.0002	0.0000 0.0000	0.0000 86.78*
OHDF		REGI	REGIBB2	0.00000 0.0002	0.0001 0.0000	0.0001 691.91*
OHDF		REGI	REGIBC1	0.00000 0.0002	-0.0000 0.0000	-0.0000 292.81*
OHDF		REGI	REGIBC2	0.00000 0.0002	0.0001 0.0000	0.0001 900.78*
OHDF		KRVB	KRVBBA1	0.00000 0.0002	0.0000 0.0001	0.2896 267.31
OHDF		KRVB	KRVBBA2	0.00000 0.0002	0.0000 0.0000	0.0000 290.88*
OHDF		KRVB	KRVBBB1	0.00000 0.0002	0.0002 0.0001	1.3802 1259.47
OHDF		KRVB	KRVBBB2	0.00000 0.0002	-0.0000 0.0000	-0.0000 250.57*
OHDF		KRVB	KRVBBC1	0.00000 0.0002	0.0000 0.0001	0.0476 44.16
OHDF		KRVB	KRVBBC2	0.00000 0.0002	-0.0001 0.0000	-0.0001 897.15*
OHDF		KOLD	KOLDBA1	0.00000 0.0002	-0.0002 0.0001	-1.5844 3079.01
OHDF		KOLD	KOLDBA2	0.00000 0.0002	-0.0000 0.0000	-0.0000 703.47*
OHDF		KOLD	KOLDBB1	0.00000 0.0002	0.0001 0.0001	0.6811 1319.87
OHDF		KOLD	KOLDBB2	0.00000 0.0002	0.0000 0.0000	0.0000 112.62*
OHDF		KOLD	KOLDBC1	0.00000 0.0002	0.0002 0.0001	1.3872 2781.70
OHDF		KOLD	KOLDBC2	0.00000 0.0002	-0.0000 0.0000	-0.0000 71.72*

=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0012
=====



=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch Geolab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0014
=====

Residuals (critical value = 3.787):

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

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIR		GAL3A	PLBD	0 0 0.0 13.0	-1.4 10.7	-0.1
DIR		GAL3A	GAL1A	65 61 63.8 13.0	17.0 11.4	1.5
DIR		GAL3A	GAL2A	116 49 86.0 13.0	-24.3 11.1	-2.2
DIR		GAL3A	REGIA	164 81 87.0 13.0	0.8 9.7	0.1
DIR		GAL3A	REGIB	164 82 2.8 13.0	11.2 8.6	1.3
DIR		GAL3A	KOLDB	77 81 99.1 13.0	8.7 9.5	0.9
DIR		GAL3A	KRVBB	79 81 54.8 13.0	-14.6 9.3	-1.6
DIR		GAL3A	KOLDC	77 86 41.4 13.0	1.7 10.3	0.2
DIR		GAL3A	KRVBC	79 80 77.9 13.0	0.9 9.9	0.1
DIR		GAL3A	PLBD	0 0 0.0 13.0	-7.9 10.4	-0.8
DIR		GAL3A	GAL1A	65 61 47.1 13.0	27.2 11.3	2.4
DIR		GAL3A	REGIA	164 81 95.0 13.0	-13.7 9.5	-1.4

DIR	GAL3A	REGIBA1	164 34	92.6	-0.0	-0.0
				13.0	0.0	
DIR	GAL3A	REGIBB1	164 87	0.6	-0.0	-0.0
				13.0	0.0	
DIR	GAL3A	REGIBC1	165 27	40.2	-0.0	-0.0
				13.0	0.0	
DIR	GAL3A	REGIB	164 82	18.7	-11.2	-1.3
				13.0	8.6	
DIR	GAL3A	KOLDB	77 82	18.7	-17.4	-1.8
				13.0	9.5	
DIR	GAL3A	KRVBB	79 81	38.1	-4.4	-0.5
				13.0	9.3	
DIR	GAL3A	KOLDC	77 86	9.2	27.4	2.7
				13.0	10.2	
DIR	GAL3A	KOLDBA1	77 58	77.1	0.0	0.0
				13.0	0.0	
DIR	GAL3A	KOLDBB1	77 91	61.8	0.0	0.0
				13.0	0.0	
DIR	GAL3A	KOLDBC1	78 7	9.4	0.0	0.0
				13.0	0.0	

=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0015
=====

Residuals (critical value = 3.787):

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

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIR		GAL3A	KRVBC	79 80	72.3	0.0
					13.0	9.8
DIR		GAL3A	KRVBBA1	79 1	27.3	0.0
					13.0	0.0
DIR		GAL3A	KRVBBB1	80 27	2.0	0.0
					13.0	0.0
DIR		GAL3A	KRVBBC1	80 15	72.2	0.0
					13.0	0.0
DIR		GAL1A	PLBD	0 0	0.0	4.3
					13.0	11.0
DIR		GAL1A	ROUT	113 77	13.9	3.4
					13.0	11.0
DIR		GAL1A	GAL2A	182 81	6.5	68.2
					23.9	22.0
DIR		GAL1A	REGIA	225 45	59.0	15.7
					13.0	10.8
DIR		GAL1A	GAL3A	266 41	98.0	-24.2
					13.0	11.4
DIR		GAL1A	KOLDB	251 12	75.6	-7.2
					13.0	6.6
DIR		GAL1A	KRVBB	253 45	97.8	-21.7
					13.0	7.6
DIR		GAL1A	KOLDC	251 10	55.6	12.5
					13.0	8.0
DIR		GAL1A	KRVBC	253 46	46.3	-3.0
					13.0	9.2
DIR		GAL2A	PLBD	0 0	0.0	0.1
					13.0	11.2
DIR		GAL2A	ROUT	113 42	77.3	8.6
					13.0	11.2
DIR		GAL2A	REGIA	272 1	73.0	0.1
					13.0	9.5
DIR		GAL2A	GAL3A	317 50	3.7	-0.2
					13.0	11.1
DIR		GAL2A	GAL1A	383 2	33.2	-9.8
					13.0	10.1
DIR		GAL2A	KOLDC	346 45	92.6	6.2
					13.0	9.5
DIR		GAL2A	KRVBC	340 8	40.5	-5.0
					13.0	9.8
DIR		GAL2A	PLBD	0 0	0.0	-1.5
					13.0	11.2
DIR		GAL2A	ROUT	113 42	87.0	-2.7
					13.0	11.2

=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0016
=====

Residuals (critical value = 3.787):

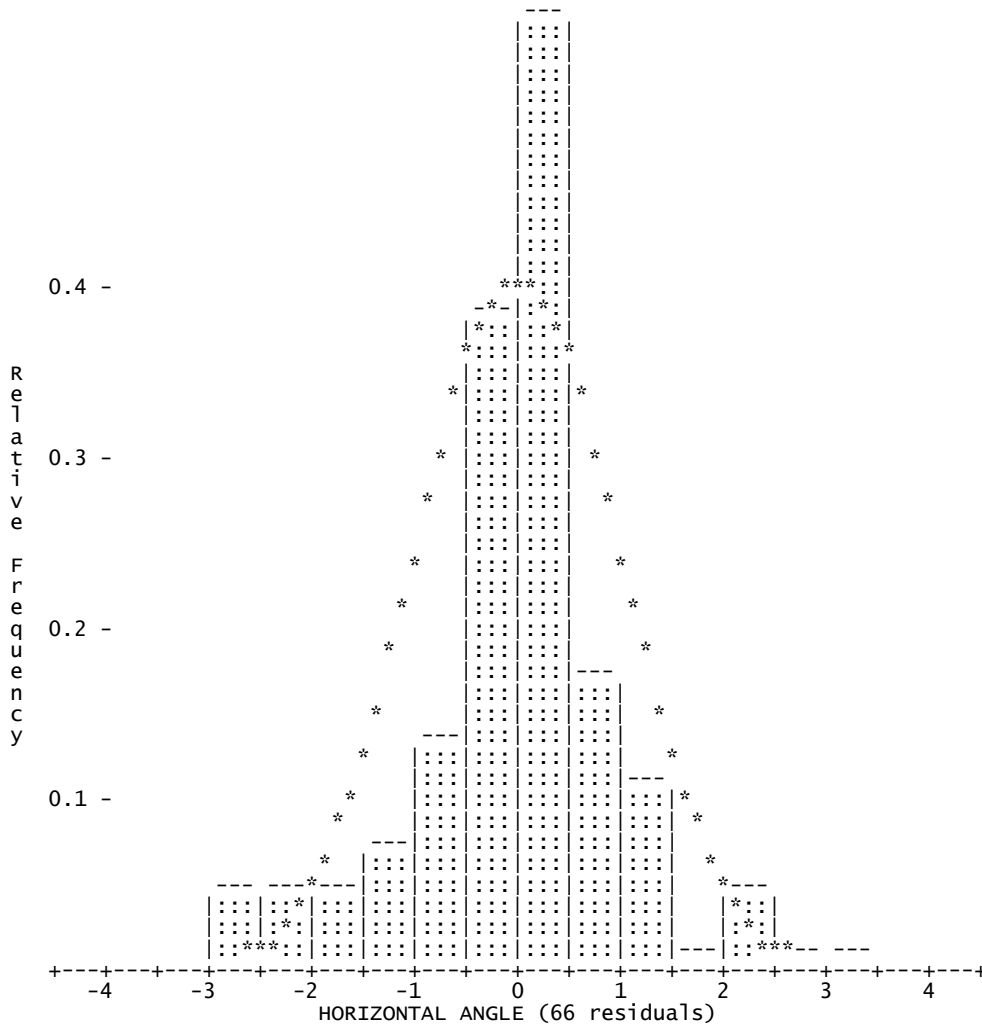
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIR		GAL2A	REGIA	272 1	77.3	-5.8
					13.0	9.5
DIR		GAL2A	REGIBA2	272 28	40.3	0.0

CO-LOCATION SURVEY REPORT
Kourou, French Guiana

DIR	GAL2A	REGIBB2	271 50	13.0 83.3 13.0	0.0 0.0 0.0	0.0
DIR	GAL2A	REGIBC2	272 25	58.9 13.0	0.0 0.0	0.0
DIR	GAL2A	GAL3A	317 49	95.1 13.0	6.8 11.1	0.6
DIR	GAL2A	GAL1A	383 2	51.8 13.0	-30.0 10.1	-3.0
DIR	GAL2A	KOLDC	346 45	74.9 13.0	22.3 9.5	2.4
DIR	GAL2A	KOLDBA2	346 24	77.1 13.0	0.0 0.0	0.0
DIR	GAL2A	KOLDBB2	346 51	39.5 13.0	0.0 0.0	0.0
DIR	GAL2A	KOLDBC2	346 63	38.5 13.0	0.0 0.0	0.0
DIR	GAL2A	KRVBC	340 8	23.1 13.0	10.8 9.8	1.1
DIR	GAL2A	KRVBBA2	340 41	33.9 13.0	0.0 0.0	0.0
DIR	GAL2A	KRVBBB2	340 24	88.4 13.0	0.0 0.0	0.0
DIR	GAL2A	KRVBBC2	339 59	36.6 13.0	0.0 0.0	0.0
DIR	KRVBA	ROUT	0 0	0.0 13.0	-0.0 9.7	-0.0
DIR	KRVBA	GAL2A	26 42	59.8 13.0	-1.8 9.2	-0.2
DIR	KRVBA	REGIA	93 35	61.9 13.0	-3.8 9.1	-0.4
DIR	KRVBA	GAL1A	340 0	69.6 13.0	5.6 8.6	0.7
DIR	KRVBA	ROUT	0 0	0.0 13.0	-3.3 9.7	-0.3
DIR	KRVBA	GAL2A	26 42	59.8 13.0	-5.0 9.2	-0.5
DIR	KRVBA	REGIA	93 35	48.9 13.0	5.9 9.1	0.6
DIR	KRVBA	GAL1A	340 0	69.6 13.0	2.4 8.6	0.3

=====
 KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
 Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0017
 =====



=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch Geolab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0019
=====

Residuals (critical value = 3.787):

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

TYPE	AT	FROM	TO	OBSERVATION	RESIDUAL	STD RES
				STD DEV	STD DEV	PPM
ZANG		GAL3A	GAL1A	100 1	78.8 13.0	-40.8 12.6
ZANG		GAL3A	GAL2A	100 22	80.3 13.0	-14.3 12.7
ZANG		GAL3A	REGIA	101 58	70.4 13.0	4.2 11.6
ZANG		GAL3A	REGIB	106 76	1.5 13.0	0.1 9.2
ZANG		GAL3A	KOLDB	103 16	23.8 13.0	27.9 10.8
ZANG		GAL3A	KRVBB	103 62	82.6 13.0	16.3 10.3
ZANG		GAL3A	KOLDC	91 58	6.9 13.0	11.1 11.3
ZANG		GAL3A	KRVBC	90 10	3.6 13.0	36.1 10.9
ZANG		GAL3A	GAL1A	100 1	52.3 23.9	-67.3 23.7
ZANG		GAL3A	GAL2A	100 22	70.6 13.0	-24.0 12.7
ZANG		GAL3A	REGIA	101 58	61.5 13.0	-4.7 11.6
ZANG		GAL3A	REGIBA1	102 55	48.3 13.0	9.6 10.0

ZANG	GAL3A	REGIBB1	102 52	34.1	-1.2	-0.1
				13.0	10.0	
ZANG	GAL3A	REGIBC1	102 55	62.4	4.0	0.4
				13.0	10.0	
ZANG	GAL3A	REGIB	106 76	1.3	-0.1	-0.0
				13.0	9.2	
ZANG	GAL3A	KOLDB	103 15	82.2	-13.7	-1.3
				13.0	10.8	
ZANG	GAL3A	KRVBB	103 62	43.2	-23.1	-2.2
				13.0	10.3	
ZANG	GAL3A	KOLDC	91 58	3.9	8.1	0.7
				13.0	11.3	
ZANG	GAL3A	KOLDBA1	92 49	13.0	14.3	1.6
				13.0	9.0	
ZANG	GAL3A	KOLDBB1	92 53	74.5	-6.2	-0.7
				13.0	9.1	
ZANG	GAL3A	KOLDBC1	92 47	72.2	-12.5	-1.4
				13.0	9.0	
ZANG	GAL3A	KRVBC	90 9	59.1	-8.4	-0.8
				13.0	10.9	

=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0020
=====

Residuals (critical value = 3.787):

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

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
ZANG		GAL3A	KRVBBA1	91 16	99.1	-2.4
					13.0	8.4
ZANG		GAL3A	KRVBBB1	91 24	89.7	-11.7
					13.0	8.5
ZANG		GAL3A	KRVBBC1	91 6	18.2	-0.4
					13.0	8.4
ZANG		GAL1A	GAL2A	100 28	31.8	-1.8
					13.0	12.4
ZANG		GAL1A	REGIA	100 93	46.5	1.7
					13.0	12.4
ZANG		GAL1A	GAL3A	99 97	79.5	-3.0
					13.0	12.6
ZANG		GAL1A	KOLDB	103 89	44.4	-11.5
					13.0	9.0
ZANG		GAL1A	KRVBB	103 27	59.6	7.3
					13.0	10.1
ZANG		GAL1A	KOLDC	89 49	42.9	-16.7
					13.0	9.9
ZANG		GAL1A	KRVBC	90 89	29.3	-24.1
					13.0	10.7
ZANG		GAL2A	REGIA	101 17	90.9	1.0
					13.0	11.7
ZANG		GAL2A	GAL3A	99 77	6.9	-0.9
					13.0	12.7
ZANG		GAL2A	GAL1A	99 71	49.0	-19.2
					13.0	12.4
ZANG		GAL2A	KOLDC	93 15	7.9	11.0
					13.0	11.9
ZANG		GAL2A	KRVBC	93 32	34.7	3.8
					13.0	12.0
ZANG		GAL2A	REGIA	101 17	87.1	-2.8
					13.0	11.7
ZANG		GAL2A	REGIBA2	102 10	60.5	5.9
					13.0	10.1
ZANG		GAL2A	REGIBB2	102 9	2.1	-10.1
					13.0	10.2
ZANG		GAL2A	REGIBC2	102 7	53.0	-12.8
					13.0	10.2
ZANG		GAL2A	GAL3A	99 76	95.3	-12.5
					13.0	12.7
ZANG		GAL2A	GAL1A	99 71	39.9	-28.3
					13.0	12.4
ZANG		GAL2A	KOLDC	93 14	89.3	-7.6
					13.0	11.9

=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0021
=====

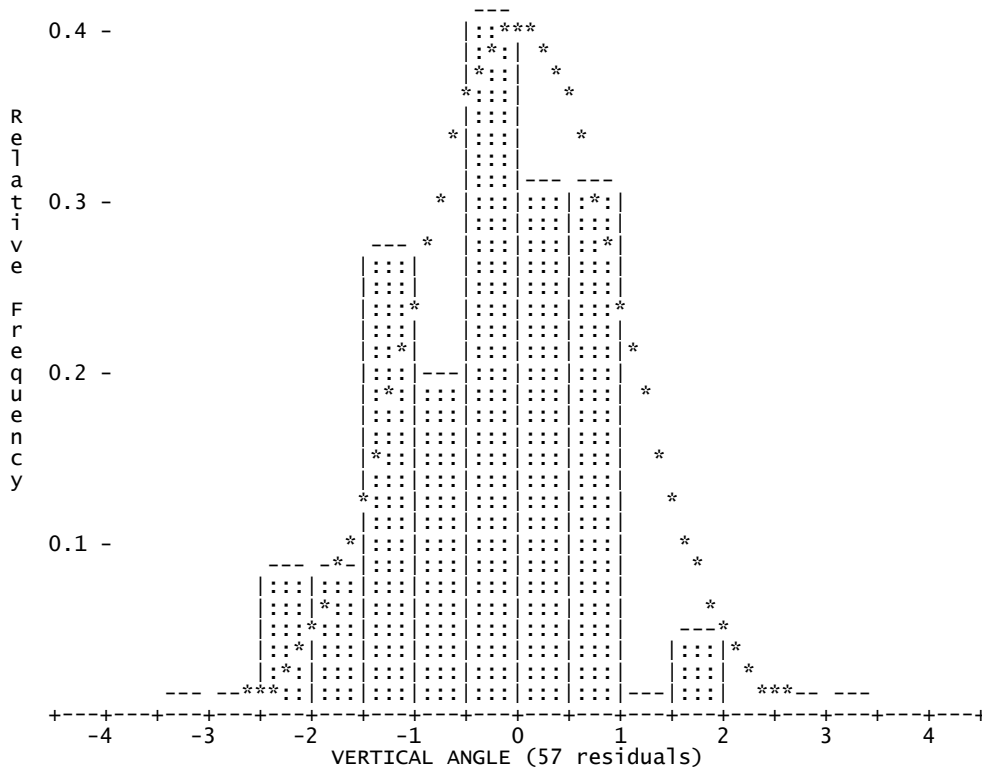
Residuals (critical value = 3.787):

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

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
ZANG		GAL2A	KOLDBA2	93 85	93.3	4.0
					13.0	10.1
ZANG		GAL2A	KOLDBB2	93 88	68.3	-0.7

ZANG	GAL2A	KOLDBC2	93 85	13.0 15.4 13.0	10.1 0.4 10.1	0.0
ZANG	GAL2A	KRVBC	93 32	22.3 13.0	-8.6 12.0	-0.7
ZANG	GAL2A	KRVBBA2	94 4	47.9 13.0	-4.1 10.4	-0.4
ZANG	GAL2A	KRVBBB2	93 96	41.1 13.0	3.6 10.3	0.3
ZANG	GAL2A	KRVBBC2	94 2	10.8 13.0	12.5 10.3	1.2
ZANG	KRVBA	GAL2A	106 95	17.2 13.0	-14.5 11.8	-1.2
ZANG	KRVBA	REGIA	107 91	57.0 13.0	6.3 11.5	0.5
ZANG	KRVBA	GAL1A	109 49	70.8 13.0	6.1 10.8	0.6
ZANG	KRVBA	GAL2A	106 95	17.2 13.0	-14.5 11.8	-1.2
ZANG	KRVBA	REGIA	107 91	49.1 13.0	-1.6 11.5	-0.1
ZANG	KRVBA	GAL1A	109 49	70.8 13.0	6.1 10.8	0.6

=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0022
=====



=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0024
=====

Residuals (critical value = 3.787):

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

TYPE AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIST	GAL3A	GAL1A	21.20470 0.0010	0.0002 0.0010	0.1920 8.69
DIST	GAL3A	GAL2A	23.92970 0.0010	0.0000 0.0010	0.0269 1.08
DIST	GAL3A	REGIA	15.75810 0.0010	-0.0001 0.0010	-0.0699 4.26
DIST	GAL3A	REGIB	15.84205 0.0010	0.0001 0.0007	0.2121 9.47
DIST	GAL3A	KOLDB	12.06657 0.0010	-0.0004 0.0009	-0.4694 34.59
DIST	GAL3A	KRVBB	10.37946 0.0010	-0.0012 0.0009	-1.3714 116.84
DIST	GAL3A	KOLDC	12.14780 0.0010	-0.0010 0.0010	-1.0471 82.58
DIST	GAL3A	KRVBC	10.48780 0.0010	-0.0004 0.0010	-0.4548 41.48
DIST	GAL3A	GAL1A	21.20490 0.0010	-0.0000 0.0010	-0.0163 0.74
DIST	GAL3A	GAL2A	23.92950 0.0010	0.0002 0.0010	0.2345 9.44
DIST	GAL3A	REGIA	15.75790 0.0010	0.0001 0.0010	0.1385 8.43
DIST	GAL3A	REGIBA1	15.70905 0.0010	-0.0000 0.0000	-0.0000 0.00*
DIST	GAL3A	REGIBB1	15.89527 0.0010	-0.0000 0.0000	-0.0000 0.00*
DIST	GAL3A	REGIBC1	15.69565 0.0010	-0.0000 0.0000	-0.0000 0.00*
DIST	GAL3A	REGIB	15.84235 0.0010	-0.0001 0.0007	-0.2121 9.47
DIST	GAL3A	KOLDB	12.06657 0.0010	-0.0004 0.0009	-0.4694 34.59
DIST	GAL3A	KRVBB	10.37926 0.0010	-0.0010 0.0009	-1.1452 97.57
DIST	GAL3A	KOLDC	12.14790 0.0010	-0.0011 0.0010	-1.1515 90.81
DIST	GAL3A	KOLDBA1	12.10083 0.0010	-0.0000 0.0000	-0.0000 0.00*
DIST	GAL3A	KOLDBB1	12.18079 0.0010	-0.0000 0.0000	-0.0000 0.00*
DIST	GAL3A	KOLDBC1	12.08540 0.0010	-0.0000 0.0000	-0.0000 0.00*
DIST	GAL3A	KRVBC	10.48770 0.0010	-0.0003 0.0010	-0.3503 31.94

KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0025

Residuals (critical value = 3.787):

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

TYPE AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIST	GAL3A	KRVBBA1	10.47178 0.0010	-0.0000 0.0000	-0.0000 0.00*
DIST	GAL3A	KRVBBB1	10.56785 0.0010	-0.0000 0.0000	-0.0000 0.00*
DIST	GAL3A	KRVBBC1	10.34552 0.0010	-0.0000 0.0000	-0.0000 0.00*
DIST	GAL1A	GAL2A	17.73870 0.0010	-0.0007 0.0010	-0.6817 37.17
DIST	GAL1A	REGIA	26.25860 0.0010	0.0010 0.0009	1.1077 39.92
DIST	GAL1A	GAL3A	21.20430 0.0010	0.0006 0.0010	0.6086 27.56
DIST	GAL1A	KOLDB	9.66907 0.0010	0.0004 0.0009	0.4293 39.17
DIST	GAL1A	KRVBB	11.34823 0.0010	0.0008 0.0009	0.9521 73.66
DIST	GAL1A	KOLDC	9.79650 0.0010	0.0010 0.0010	1.0289 100.78
DIST	GAL1A	KRVBC	11.45080 0.0010	0.0004 0.0010	0.3910 32.69
DIST	GAL2A	REGIA	16.55000 0.0010	0.0002 0.0010	0.2175 12.66
DIST	GAL2A	GAL3A	23.93010 0.0010	-0.0004 0.0010	-0.3882 15.63
DIST	GAL2A	GAL1A	17.73790 0.0010	0.0001 0.0010	0.1454 7.93

CO-LOCATION SURVEY REPORT
Kourou, French Guiana

DIST	GAL2A	KOLDC	15.71790	0.0009	0.8972
			0.0010	0.0010	55.18
DIST	GAL2A	KRVBC	16.34440	-0.0003	-0.3256
			0.0010	0.0010	19.19
DIST	GAL2A	REGIA	16.55010	0.0001	0.1137
			0.0010	0.0010	6.62
DIST	GAL2A	REGIBA2	16.44490	-0.0000	-0.0000
			0.0010	0.0000	0.00*
DIST	GAL2A	REGIBB2	16.55246	-0.0000	-0.0000
			0.0010	0.0000	0.00*
DIST	GAL2A	REGIBC2	16.66832	-0.0000	-0.0000
			0.0010	0.0000	0.00*
DIST	GAL2A	GAL3A	23.93000	-0.0003	-0.2844
			0.0010	0.0010	11.45
DIST	GAL2A	GAL1A	17.73780	0.0002	0.2488
			0.0010	0.0010	13.57
DIST	GAL2A	KOLDC	15.71760	0.0012	1.2075
			0.0010	0.0010	74.27

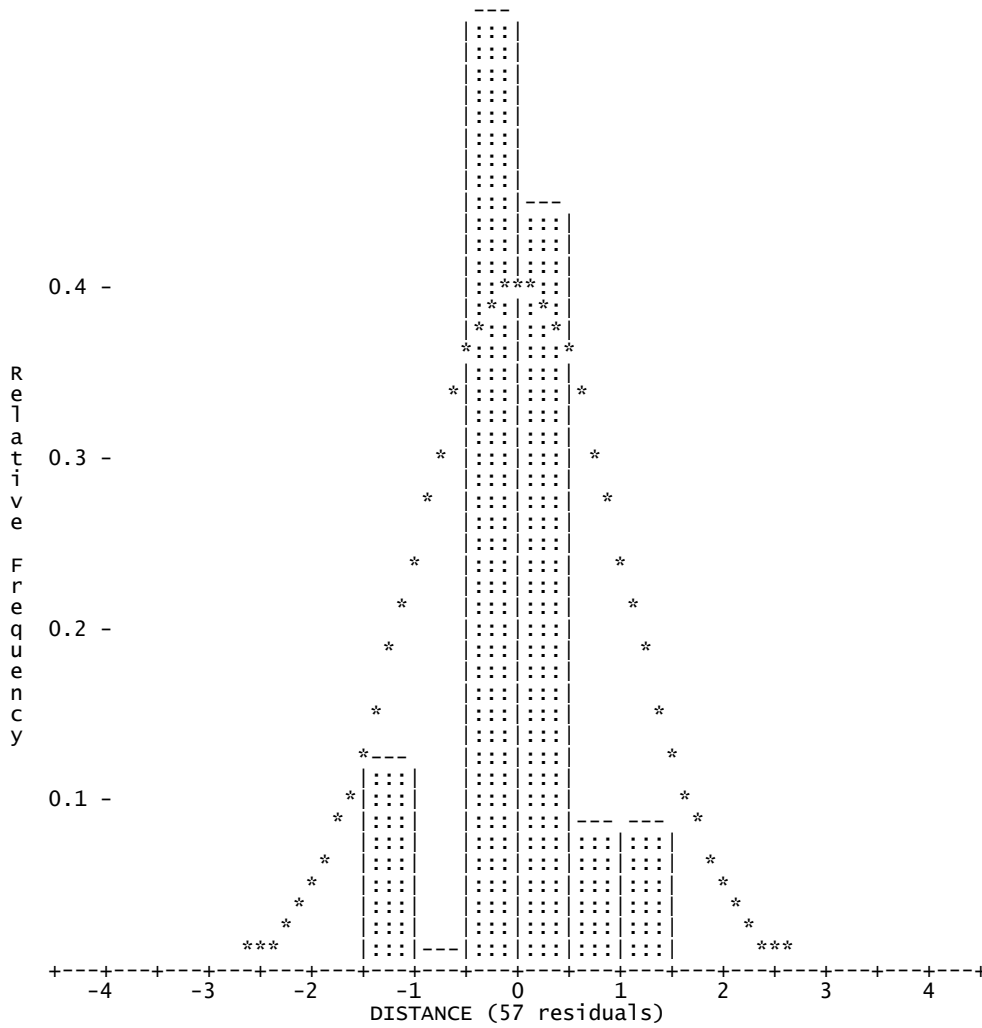
=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0026
=====

Residuals (critical value = 3.787):

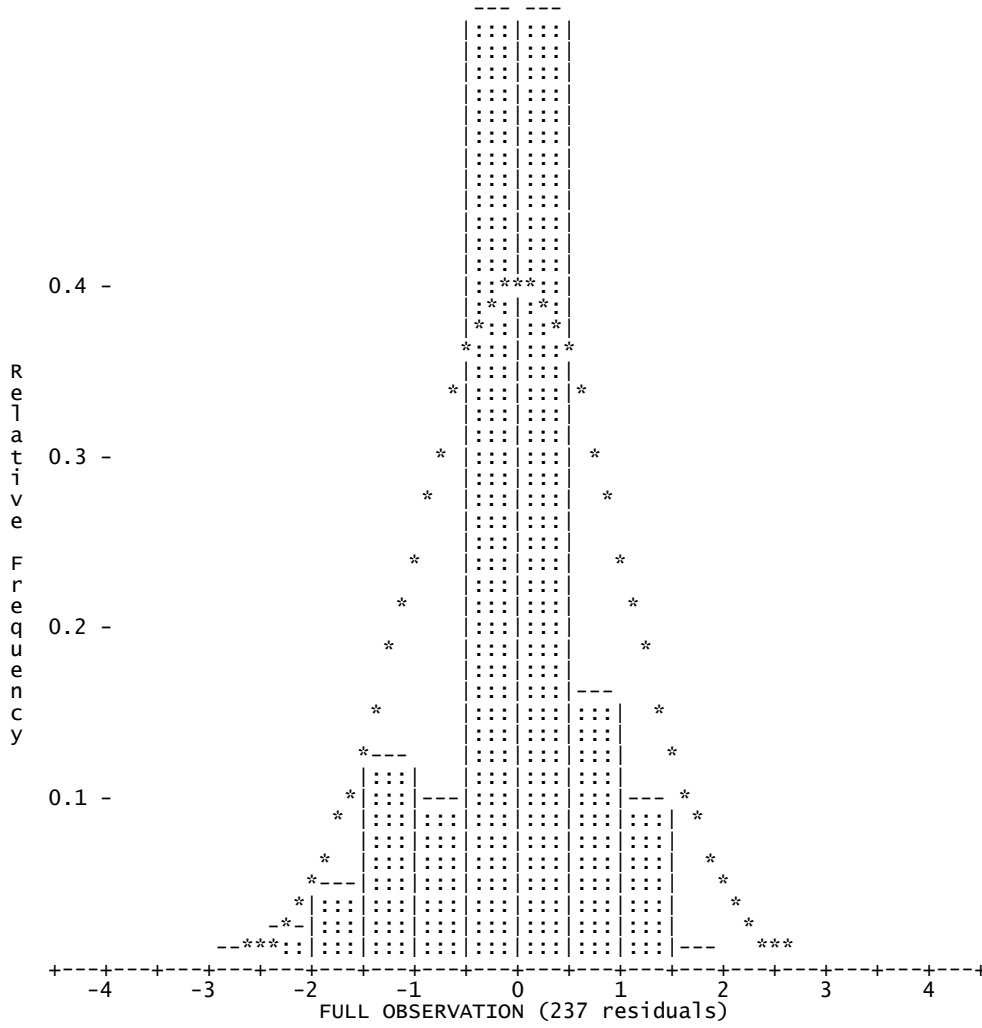
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIST		GAL2A	KOLDBA2	15.68357	-0.0000	-0.0000
				0.0010	0.0000	0.00*
DIST		GAL2A	KOLDBB2	15.75557	-0.0000	-0.0000
				0.0010	0.0000	0.00*
DIST		GAL2A	KOLDBC2	15.66505	-0.0000	-0.0000
				0.0010	0.0000	0.00*
DIST		GAL2A	KRVBC	16.34450	-0.0004	-0.4294
				0.0010	0.0010	25.31
DIST		GAL2A	KRVBBA2	16.42341	-0.0000	-0.0000
				0.0010	0.0000	0.00*
DIST		GAL2A	KRVBBB2	16.20174	-0.0000	-0.0000
				0.0010	0.0000	0.00*
DIST		GAL2A	KRVBBC2	16.35233	-0.0000	-0.0000
				0.0010	0.0000	0.00*
DIST		KRVBA	GAL2A	16.35130	-0.0003	-0.3372
				0.0010	0.0010	19.99
DIST		KRVBA	REGIA	16.84350	0.0001	0.1229
				0.0010	0.0009	6.85
DIST		KRVBA	GAL1A	11.46180	-0.0004	-0.4055
				0.0010	0.0009	33.39
DIST		KRVBA	GAL2A	16.35130	-0.0003	-0.3372
				0.0010	0.0010	19.99
DIST		KRVBA	REGIA	16.84360	0.0000	0.0164
				0.0010	0.0009	0.91
DIST		KRVBA	GAL1A	11.46180	-0.0004	-0.4055
				0.0010	0.0009	33.39

=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0027
=====



=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0029
=====



=====
KOUROU ITRF COLOCATION SURVEY 2011 - v11.iob
Microsearch GeoLab, v2001.9.20.0 GRS 80 UNITS: m,GRAD Page 0031
=====

3D Station Confidence Regions (95.000 percent):									
STATION	MAJ-SEMI (AZ,VANG)			MED-SEMI (AZ,VANG)			MIN-SEMI (AZ,VANG)		
GAL1A	0.0029	(139,	90)	0.0015	(306,	0)	0.0015	(36,	0)
GAL2A	0.0029	(119,	90)	0.0017	(350,	0)	0.0016	(260,	0)
GAL3A	0.0029	(138,	90)	0.0017	(26,	0)	0.0016	(296,	0)
KOLD	0.0030	(7,	90)	0.0022	(216,	0)	0.0022	(126,	0)
KOLDB	0.0030	(156,	90)	0.0020	(35,	0)	0.0016	(305,	0)
KOLDBA1	0.0034	(48,	0)	0.0030	(141,	90)	0.0017	(318,	0)
KOLDBA2	0.0034	(110,	0)	0.0030	(288,	90)	0.0019	(20,	0)
KOLDBB1	0.0034	(49,	0)	0.0030	(141,	90)	0.0017	(319,	0)
KOLDBB2	0.0034	(111,	0)	0.0030	(288,	90)	0.0019	(21,	0)
KOLDBC1	0.0034	(49,	0)	0.0030	(142,	90)	0.0017	(319,	0)
KOLDBC2	0.0034	(111,	0)	0.0030	(288,	90)	0.0019	(21,	0)
KOLDC	0.0029	(122,	90)	0.0017	(216,	0)	0.0016	(306,	0)
KOUG	0.0030	(192,	90)	0.0018	(2,	0)	0.0017	(92,	0)
KRUB	0.0030	(122,	90)	0.0017	(216,	0)	0.0016	(306,	0)
KRVB	0.0030	(20,	90)	0.0020	(204,	0)	0.0019	(114,	0)
KRVBA	0.0029	(320,	90)	0.0018	(194,	0)	0.0016	(104,	0)
KRVBB	0.0030	(149,	90)	0.0021	(40,	0)	0.0016	(310,	0)
KRVBA1	0.0034	(50,	0)	0.0030	(144,	90)	0.0017	(320,	0)
KRVBA2	0.0034	(105,	0)	0.0030	(280,	90)	0.0019	(15,	0)
KRVBB1	0.0034	(51,	0)	0.0030	(148,	90)	0.0017	(321,	0)
KRVBB2	0.0034	(105,	0)	0.0030	(280,	90)	0.0019	(15,	0)
KRVBBC1	0.0034	(51,	0)	0.0030	(147,	90)	0.0017	(321,	0)
KRVBBC2	0.0034	(104,	0)	0.0030	(279,	90)	0.0019	(14,	0)
KRVBC	0.0029	(88,	90)	0.0017	(222,	0)	0.0016	(312,	0)
KRWB	0.0030	(20,	90)	0.0020	(204,	0)	0.0019	(114,	0)
REGI	0.0030	(333,	90)	0.0023	(182,	0)	0.0022	(92,	0)
REGIA	0.0030	(192,	90)	0.0018	(2,	0)	0.0017	(92,	0)
REGIB	0.0030	(130,	90)	0.0026	(305,	0)	0.0018	(35,	0)
REGIBA1	0.0034	(126,	0)	0.0030	(299,	90)	0.0020	(36,	0)
REGIBA2	0.0034	(44,	0)	0.0030	(165,	90)	0.0020	(314,	0)
REGIBB1	0.0034	(126,	0)	0.0030	(300,	90)	0.0020	(36,	0)
REGIBB2	0.0034	(43,	0)	0.0030	(163,	90)	0.0020	(313,	0)
REGIBC1	0.0034	(126,	0)	0.0030	(300,	90)	0.0020	(36,	0)
REGIBC2	0.0034	(44,	0)	0.0030	(165,	90)	0.0020	(314,	0)

Mon Dec 5 13:27:04 2011

10. Annex 6: SINEX file

```
%=SNX 1.00 IGN 11:341:00000 IGN 11:055:00000 11:055:00000 C 00009
*-----
+FILE/COMMENT
* File created by geotosnx software (Z.Altamimi)
* Original input file: v11.cov
* Matrix Scalling Factor used:          1.0000000000
-FILE/COMMENT
*-----
+SITE/ID
*CODE PT  _DOMES_  T  _STATION DESCRIPTION_  APPROX_LON_  APPROX_LAT_  _APP_H_
KRWB  A  97301S006  97301S006  307 21 36.7  5 05 55.0  109.7
KOUG  A  97301M402  97301M402  307 21 36.8  5 05 54.4  107.3
KRUB  A  97301S004  97301S004  307 21 36.7  5 05 55.0  109.7
-SITE/ID
*-----
+SOLUTION/EPOCHS
*Code PT SOLN T Data_start_ Data_end_ Mean_epoch_
-SOLUTION/EPOCHS
*-----
+SOLUTION/ESTIMATE
*INDEX TYPE_ CODE PT SOLN  _REF_EPOCH_  UNIT S  _ESTIMATED VALUE_  _STD_DEV_
  1 STAX KRWB A 1 11:055:00000 m 2 0.385526041200000E+07 0.10616E-02
  2 STAY KRWB A 1 11:055:00000 m 2 -.504973553800000E+07 0.70992E-03
  3 STAZ KRWB A 1 11:055:00000 m 2 0.563056668000000E+06 0.67908E-03
  4 STAX KOUG A 1 11:055:00000 m 2 0.385526334900000E+07 0.10603E-02
  5 STAY KOUG A 1 11:055:00000 m 2 -.504973200200000E+07 0.62835E-03
  6 STAZ KOUG A 1 11:055:00000 m 2 0.563040410000000E+06 0.62626E-03
  7 STAX KRUB A 1 11:055:00000 m 2 0.385526117300000E+07 0.10565E-02
  8 STAY KRUB A 1 11:055:00000 m 2 -.504973477700000E+07 0.61633E-03
  9 STAZ KRUB A 1 11:055:00000 m 2 0.563058003000000E+06 0.57710E-03
-SOLUTION/ESTIMATE
*-----
+SOLUTION/MATRIX_ESTIMATE L COVA
*PARA1 PARA2  _PARA2+0_  _PARA2+1_  _PARA2+2_
  1 1 0.112692293536460E-05
  2 1 -.106354205905007E-08 0.503981941813096E-06
  3 1 0.598789918264239E-07 0.119201108399773E-07 0.461145611742763E-06
  4 1 0.109329515544336E-05 0.232812832952236E-09 0.703192629826773E-07
  5 4 0.112413254653509E-05
  5 1 -.129974122984246E-08 0.325150734912810E-06 0.145674158793058E-07
  5 4 -.112396637869927E-08 0.394824158706209E-06
  6 1 0.703192629805262E-07 -.260935123520179E-08 0.311435453371747E-06
  6 4 0.658282568134674E-07 0.125973426273249E-07 0.392207053049495E-06
  7 1 0.109223951015093E-05 -.597697109669583E-09 0.713400567926507E-07
  7 4 0.109109508594324E-05 -.160376827154062E-09 0.705450111497164E-07
  7 7 0.111621846650531E-05
  8 1 -.684220310901441E-09 0.319342577032447E-06 0.766869710192105E-08
  8 4 -.126946156789071E-08 0.319316494025173E-06 0.142280433498102E-07
  8 7 -.152037217789280E-09 0.379859939486604E-06
  9 1 0.713400567906581E-07 0.669895067874451E-08 0.299029894676875E-06
  9 4 0.705450111461069E-07 0.179749310604920E-08 0.306725354796307E-06
  9 7 0.704378559618601E-07 0.170402333199729E-08 0.333040163096732E-06
-SOLUTION/MATRIX_ESTIMATE L COVA
%ENDSNX
```