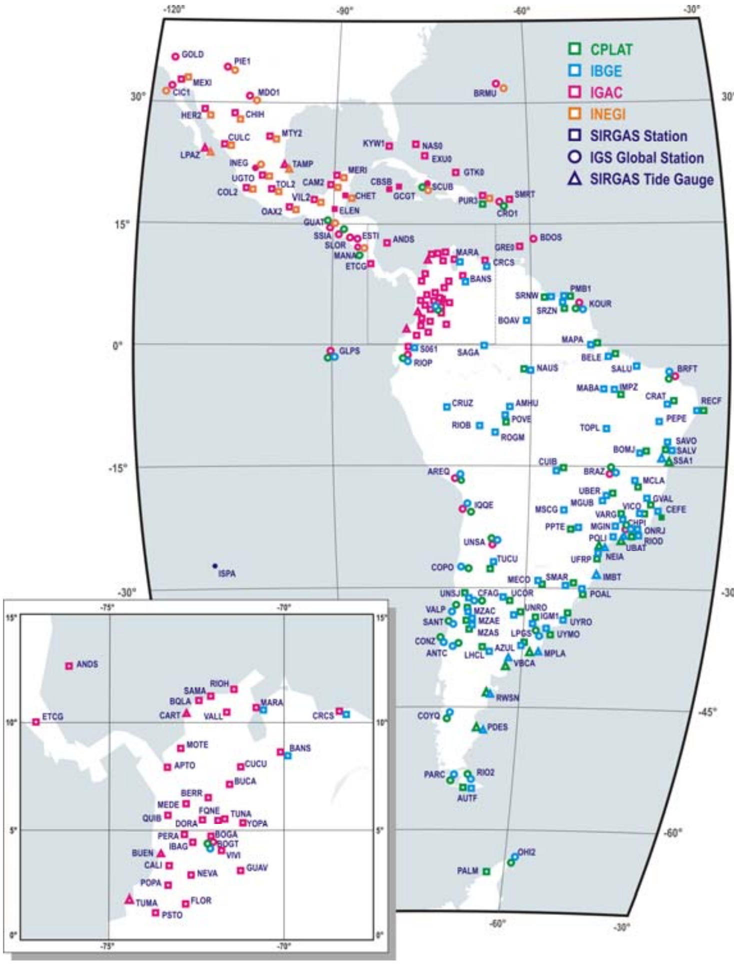
DGFI Report
No. 80

Comparison and combination of the weekly solutions delivered by the SIRGAS Experimental Processing Centres

LAURA SÁNCHEZ, WOLFGANG SEEMÜLLER, MANUELA KRÜGEL



SIRGAS-CON stations processed by the SIRGAS Experimental Processing Centres

Deutsches Geodätisches Forschungsinstitut (DGFI)
Alfons-Goppel-Str. 11, D-80539, Munich, Germany
2008

Comparison and combination of the weekly solutions delivered by the SIRGAS Experimental Processing Centres

Laura Sánchez, Wolfgang Seemüller, Manuela Krügel
Deutsches Geodätisches Forschungsinstitut (DGFI), Munich, Germany

Content

Figures

Tables

Annexes

1 Introduction

In August 2006, the SIRGAS Working Group I (Reference System) initiated a one-year project to establish Experimental Processing Centres (EPC) and Experimental Combination Centres (ECC) for SIRGAS. This implied the distribution of the regional stations between the participating EPCs to guarantee that each station is included in the same number of individual solutions, getting identical weights for all the stations in the combined solutions. In this way, the SIRGAS Continuously Operating Network (SIRGAS-CON) was divided into two blocks with a similar number of stations, namely a northern and a southern block. These blocks are connected by means of IGS Reference Stations (i.e. IGS05 frame stations), which serve also as fiducial points. The weekly free normal equations obtained by each EPC must be delivered to DGFI (which continues in charge of the official IGS-RNAAC-SIR) and to the other ECCs. They shall combine the individual solutions and carry out comparisons with the official solution provided by DGFI to establish the quality of the computations obtained by the EPCs. The following institutions provided solutions: Instituto Nacional de Estadística, Geografía e Informática (INEGI, Mexico), Instituto Geográfico Agustín Codazzi (IGAC, Colombia), Instituto Brasileiro de Geografia e Estatistica (IBGE, Brazil), and Universidad Nacional de La Plata (CPLAT: Centro de Procesamiento de La Plata, Argentina). INEGI and IGAC compute the northern block, while IBGE and CPLAT process the southern one.

The resolutions related to the experiment were adopted in the first workshop of the SIRGAS-WGI, held in Rio de Janeiro in August 2006. They will be called in the following “Rio Agreement” and can be summarized as:

1.1 Rio Agreement about SIRGAS-CON Stations:

a) Each SIRGAS-CON station must be completely described by means of an updated log file (IGS format);
b) SIRGAS-CON stations should not have long data interruptions. If it is the case, these interruptions should be immediately reported (by means of the SIRGAS mail exploder);
c) The tracked data must be prepared in RINEX files and be available within the two following weeks after the observation day;
d) Each SIRGAS-CON station should be processed by two EPCs;

1.2 Rio Agreement about Experimental Processing Centres and Experimental Combination Centres:

a) The EPCs should make available their individual weekly solutions within the three weeks following the processed week (for this purpose, DGFI made available a FTP server: ftp.dgfi.badw-muenchen.de);
b) The ECCs should compare and combine the EPC individual solutions and interchange their results within the four weeks following the processed week in order to assess the quality of the combined solutions by comparing them with the weekly solutions delivered by the IGS-RNAAC-SIR;
c) The ECC are also responsible for the statistics about the project efficiency;
d) The experiment started on October 1st, 2006 (GPS week 1395).

1.3 Rio Agreement about processing strategy (refers to the GNSS data processing, guidelines for the combination procedures were not defined):

a) Sampling rate: 30 sec;

b) Elevation cut-off: 3°;

c) Satellite orbits, satellite clock offsets, and Earth orientation parameters should be fixed to the combined IGS solutions (initially, they referred to the IGb00 reference frame; after the GPS week 1400, they refer to the IGS05 reference frame);

d) Absolute calibration values for the antenna phase centre corrections must be applied (the values published by the IGS are available since GPS week 1400, before the file generated by the University of Berne was applied);

e) Daily and weekly solutions should be datum free (loosely constrained), i.e. a priori σ for station positions should be $\sigma = \pm 1$ m. Troposphere and ambiguity parameters must be pre-eliminated in the daily solutions;

f) The processing characteristics that have not been explicitly mentioned were left to the discretion of each EPC.

Based on these resolutions, the present report describes the activities carried out by DGFI as a SIRGAS Experimental Combination Centre. Its main components are related to: i) comparison and evaluation of the weekly individual solutions delivered by the EPCs: CPLAT, IBGE, IGAC, and INEGI, ii) definition of an adequate combination strategy, and iii) ascertaining the quality of the weekly and accumulated combined solutions by comparing them with those produced by the IGS-RNAAC-SIR and the weekly solutions (combinations) of the IGS Global Network. These issues are faced by analysing not only the accuracy of the individual free solutions and their combination, but also operational aspects related with the punctuality on delivering the SINEX files, the observance of the Rio Agreement, accordance with the log files information, etc.

The procedures, analysis, and conclusions contained in this report are based on the weekly solutions delivered by each EPC to the DGFI FTP server between the GPS weeks 1395 (October 1st, 2006) and 1468 (March 1st, 2008). Annex 1 lists the weekly solutions deposited in the DGFI FTP server including the submission deadline and the effective delivering date. Details about the processing strategies applied by the EPCs are presented in the following reports: Reporte INEGI 2008: Centro de Procesamiento Piloto INEGI (Gonzalez 2008), Reporte del Centro Experimental de Procesamiento SIRGAS IGAC (De La Rosa et al. 2008), and Análises e Resultados do Centro de Processamento Piloto do IBGE (Da Silva, Costa 2008). These reports were presented in the Second Workshop of the SIRGAS-WGI held in Montevideo, Uruguay, between 26 and 27 May 2008. They are available at www.sirgas.org.

2 Processed network

The SIRGAS-CON stations distributed between the different EPCs correspond to those processed by the IGS-RNAAC-SIR. Annex 2 summarizes the stations each EPC should process according with the Rio Agreement and the missing (or additional) stations in the delivery weekly solutions. In August 2006 this network included 128 sites, 50 IGS stations, and 78 regional stations. From these 128 sites 116 were in operation. Since the GPS week 1395 46 new stations (Table 1) were integrated into the SIRGAS-CON network, and 5 sites (CULI, JAMA, MANZ, PARA, RIOG) were formerly decommissioned. Additionally, 10

GPS stations (COPO, COYQ, ESTI, IQQE, KYW1, PDES, PUR3, RIOP, SLOR, VALP) are inactive, i.e. they have not delivered observational data in the last three months. Figure 1 and Figure 2 show the stations processed at present, indicating the new stations and the decommissioned ones, as well as the stations that each operating EPC is processing. The statistics presented for INEGI are valid only for the period between GPS weeks 1395 and 1428.

Figure 1. *Stations processed within the SIRGAS-CON network since GPS week 1395.*

Table 1. *New SIRGAS-CON stations (after week 1395) included in the EPC weekly solutions.*

Southern part of the SIRGAS-CON network

Code	Included since GPS week				
	DGFI	IBGE	CPLAT	IGAC	INEGI
AMHU	1464	1465	missing		
AZUL	1466	1470	1470		
BOAV	1443	1441	missing		
CEFE	1443	1441	missing		
CRUZ	1443	1443	missing		
IMBT	1443	1441	missing		
MABA	1443	1441	missing		
MGIN	1466	1466	missing		
MGUB	1462	1464	missing		
MSCG	1462	1464	missing		
MZAE	1466	1431	1470		
MZAS	1426	1424	1425		
ONRJ	1421	1422	1424		
PEPE	1462	1464	missing		
POLI	1417	1407	1424		
RIO2	1425	1429	1426		
RIOB	1443	1442	missing		
ROGM	1462	1464	missing		
SAGA	1445	1445	missing		
SALU	1443	1441	missing		
SAVO	1443	1441	missing		
SSA1	1443	1442	missing		
TOPL	1462	1465	missing		
UFPR	1443	1443	missing		
UYMO	1451	1454	1470		
UYRO	1468	1470	1470		

Northern part of the SIRGAS-CON network

Code	Included since GPS week				
	DGFI	IBGE	CPLAT	IGAC	INEGI
ANDS	1426			1426	missing
APTO	1452			1453	missing
BERR	1428			1429	missing
BQLA	1446			1448	missing
CULC	1447			1453	missing
ELEN	1437			1442	missing
EXU0	1439			1442	missing
FLOR	1399			1399	missing
FQNE	1447			1449	missing
GRE0	1439			1442	missing
GTK0	1439			1442	missing
GUAV	1468			1468	missing
NAS0	1439			1442	missing
QUIB	1465			1465	missing
SMRT	1439			1442	missing
TUMA	1399			1399	missing
UGTO	1437			1442	missing

Table 1, Figure 2, and Annex 2 let us conclude that the distribution of the regional SIRGAS-CON stations between the EPCs is not homogeneous. Most of the sites included in the northern block are processed by IGAC only, while many of the new stations integrated into the southern block was not taken into account by CPLAT and they are processed by IBGE only. Another discrepancy to mention is the fact that the EPCs and DGFI (as IGS-RNAAC-SIR) did not always start to process the new stations at the same time, extreme examples are station MZAE (IBGE includes this station in its weekly solutions 35 weeks before DGFI), POLI (included in the IBGE solutions 10 weeks before than in those of DGFI), and CULC (included in the DGFI solutions 6 weeks before than in those of IGAC). Table 2 summarizes the number of common stations processed by the EPCs and DGFI.

Table 2. *Number of common stations processed by the Experimental Processing Centres and the IGS-RNAAC-SIR (GPS weeks 1395 – 1468).*

EPC	DGFI	CPLAT	IBGE	IGAC	INEGI
DGFI	159	68	88	82	24
CPLAT		68	60	16	4
IBGE			88	13	0
IGAC				82	24
INEGI					24

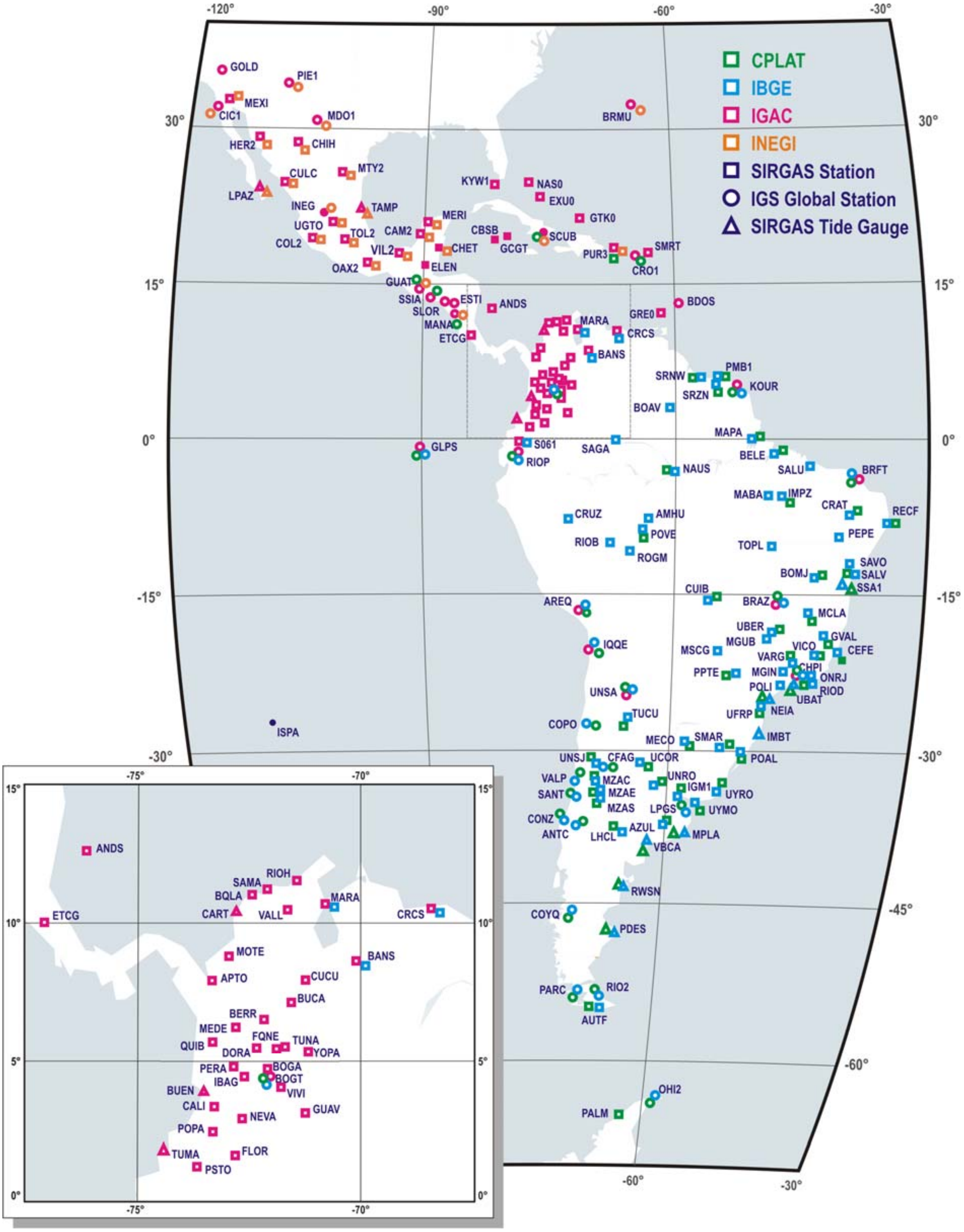


Figure 2. *Regional SIRGAS-CON stations processed by the Experimental Processing Centres.*

3 Review of the weekly solutions delivered by the EPCs

The EPCs put their weekly solutions on the DGFI FTP server conditioned for the SIRGAS activities. Processing Centres CPLAT, IBGE, and IGAC apply the BERNESE Software (http://www.bernese.unibe.ch/index.html) for the analysis, while INEGI applies GIPSY OASIS II (http://facility.unavco.org/software/processing/gipsy/gipsy_info.html). CPLAT, IBGE, and IGAC submitted free weekly solutions in SINEX format (SNX), as well as daily normal equations (NQ0) in binary and ASCII format for the GPS weeks 1395 until 1468. INEGI provided free and constrained weekly solutions in SINEX format (SNX) for the GPS weeks 1395 until 1428.

As a first step, a comparison between the weekly solutions provided by the EPCs and the corresponding free weekly solutions generated by the IGS-RNAAC-SIR (DGFI) was carried out. For this purpose, 7-parameter similarity transformations were weekly calculated between the loosely constrained coordinates contained in the SINEX files as follows: DGFI-INEGI, DGFI-CPLAT, DGFI-IBGE, DGFI-IGAC, CPLAT-IBGE, and IGAC-INEGI. As an example, figure 3 presents the weekly RMS values obtained from the comparison between the weekly coordinates calculated by the IGS-RNAAC-SIR and those submitted by INEGI, the mean values (over 33 weeks) are 3,1 mm for the north component, 3,8 mm for the east component, and 17,1 mm for the vertical component. The discrepancy in the vertical component is a consequence of the relative correction values, instead of the absolute ones, for the antenna phase centre variations (PCV) applied by INEGI.

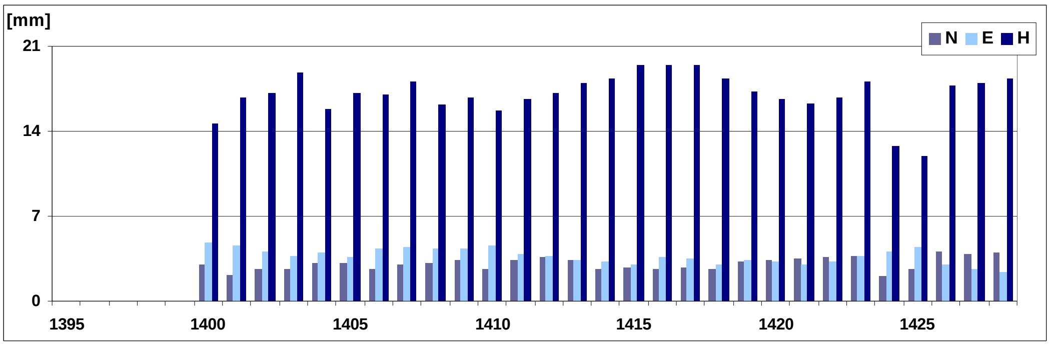


Figure 3. *Comparison between the constrained weekly solutions delivered by INEGI and the corresponding solutions generated by the IGS-RNAAC-SIR: RMS residuals after a 7-parameter similarity transformation. Mean RMS: N = 3,1 mm, E = 3,8 mm, h = 17,1 mm. (Comparison starts in week 1400 because since this week absolute PCVs were applied by IGS-RNAAC-SIR).*

Table 3 summarizes the mean RMS values of the residuals in the three components (N, E, H) for the other comparisons. Complementary, Annex 3 displays the weekly RMS values in bar-graphics, as well as the outliers for the 73 weeks. Results of this procedure show a very good agreement (N = 1,4 mm, E = 2,3 mm, H = 5,1 mm) between the free weekly solutions delivered by the CPLAT, IBGE, and IGAC. INEGI solutions can not be taken into account for combination due to utilization of relative correction values for the PCV. Therefore, in the following our discussion concentrates on three EPCs: CPLAT, IBGE and IGAC.

Table 3. *RMS values after a 7-parameter similarity transformation between free weekly solutions delivered by the EPCs and IGS-RNAAC-SIR (mean values over the GPS weeks 1395 – 1468).*

Processing Centre	DGFI			CPLAT			IGAC		
	N [mm]	E [mm]	H [mm]	N [mm]	E [mm]	h [mm]	N [mm]	E [mm]	H [mm]
CPLAT	1,75	2,69	6,07						
IBGE	1,25	2,16	5,50	1,38	1,95	4,54			
IGAC	1,25	2,33	4,41						
INEGI*	3,14	3,76	17,14				2,14	2,57	11,53

**The INEGI coordinates applied for comparison correspond to weekly constrained solutions.*

The available solutions were reviewed concerning their SINEX format and the suitability for combination of unconstrained normal equations. For this purpose, it was necessary to remove the a-priori datum constraints which are included in the weekly solutions. The generation of unconstrained normal equations from the SINEX file provided by CPLAT for the week 1395 failed and it could not be included into the combination.

4 Pre-processing of solutions

Before combining the individual solutions delivered by the EPCs on the level of unconstrained normal equations various pre-processing steps were performed:

4.1 Renaming of stations

The Rio Agreement recommends that all SIRGAS-CON stations shall be identified by an IERS domes number. So, the station information provided in the SINEX files must be consistent with the IERS domes number data bank (http://itrf.ensg.ign.fr/select.php). However, some stations were integrated in the EPC's routinely processing before they had the corresponding domes number, and in some cases, erroneous domes numbers were given. Consequently, it was necessary to identify this kind of mistakes and to rename the stations, avoiding inconsistencies and ensuring that the combined positions refer to a unique reference point.

4.2 Transformation of normal equations to identical a-priori values and generation of time series for station coordinates

The free weekly solutions delivered by each EPC are aligned to the IGS05 positions of the current epoch using a 7-parameter similarity transformation (the IGS05 stations available in the region are displayed in Figure 1, coordinates and velocities are available at ftp://igscb.jpl.nasa.gov/igscb/station/coord/IGS05.snx). After that, coordinate time series are generated for each EPC and compared with each other and with DGFI. This procedure is helpful to identify outliers in the time series and their possible causes: if outliers, jumps, or interruptions are identifiable in the different EPCs series, the problems may be associated to the station (tracking deficiencies, equipment changes, failure of the data submission, etc.). If outliers, jumps, or interruptions are not present in all time series, the deficiencies may be associated to administrative issues (neglecting of stations, incomplete download of RINEX files, not observance of the log files, etc.). Annex 8 presents the 'original' time series derived for the EPCs, i.e., they contain all outliers, stations inconsistencies, etc. In general, the individual time series are very similar. The prevalent discrepancies between the series derived from the EPCs and those from DGFI are related to the exclusion of some stations during some weeks; see for instance AUTF, BANS, ETCG, MARA, PIE1, and VBCA. (DGFI series start in the GPS week 1400 because before relative PCVs were applied). The real serious discrepancies are caused by including in the processing erroneous antenna types for some sites. In this way, wrong corrections for the PCVs are applied and these stations are biased in the weekly solutions. Selected examples of this incorrectness are CFAG, TUCU, and MZAS. DGFI processes station CFAG taken into account the radome covering the antenna (according to the site log file), CPLAT neglected the radome during the considered period (GPS weeks 1395 until 1468), and IBGE took into account the radome until GPS week 1414 (2007/02/11); after that, IBGE neglected the radome, too. Solutions neglecting the radome are biased about 15 mm, which are completely translated into the combined solution (Figure 4).

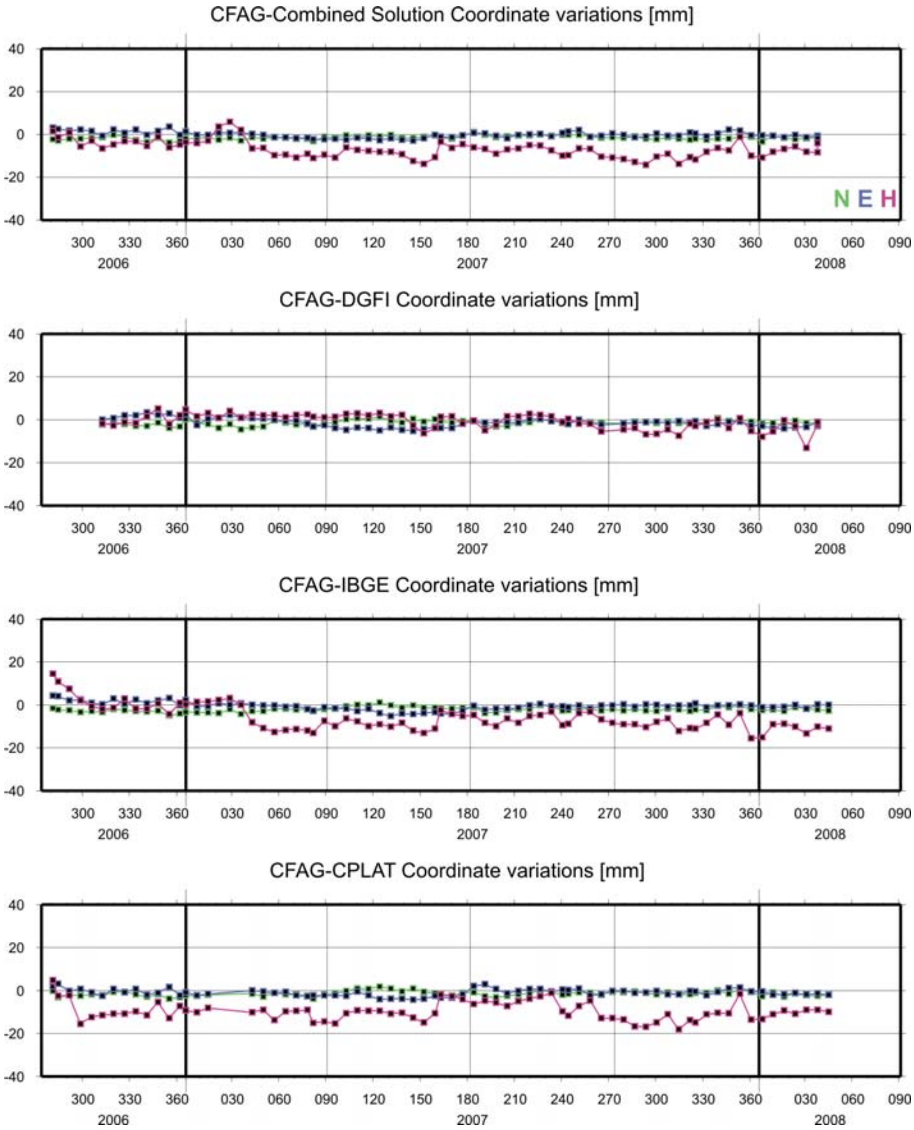


Figure 4. *Time series for station CFAG: CPLAT and IBGE neglected the radome covering the antenna (IBGE since 2007/02/11). As a consequence, the vertical component is biased by about 15 mm.*

Table 4 summarizes the differences between the phase centre offsets for the antenna without and with the corresponding radome. Although these differences are under the 1 mm-level, it should keep in mind that the corrections for the zenith-dependent phase variations are added to these offsets, and they can reach values until 15 mm for an elevation angle of 90°. Therefore, the caused bias is not constant, it can not be reduced in the combination process, and the station must be excluded.

In the second example, station TUCU, IBGE considered an erroneous antenna until GPS week 1414 (2007/02/11). It causes a bias of about 20 mm in the height component (Figure 5). Again, the discrepancies between the corresponding offsets presented in Table 4 are under the 1 mm-level, but the biases in the final positions are considerably larger. For station MZAS, DGFI did not take into account the radome, while CPLAT and IBGE did it. By comparing the individual solutions, DGFI presents a discrepancy of about 35 mm with respect to the other two solutions (Figure 6). Annex 4 summarizes the station information inconsistencies (with respect to the site log files) found in the weekly solutions delivered by CPLAT, IBGE, and IGAC.

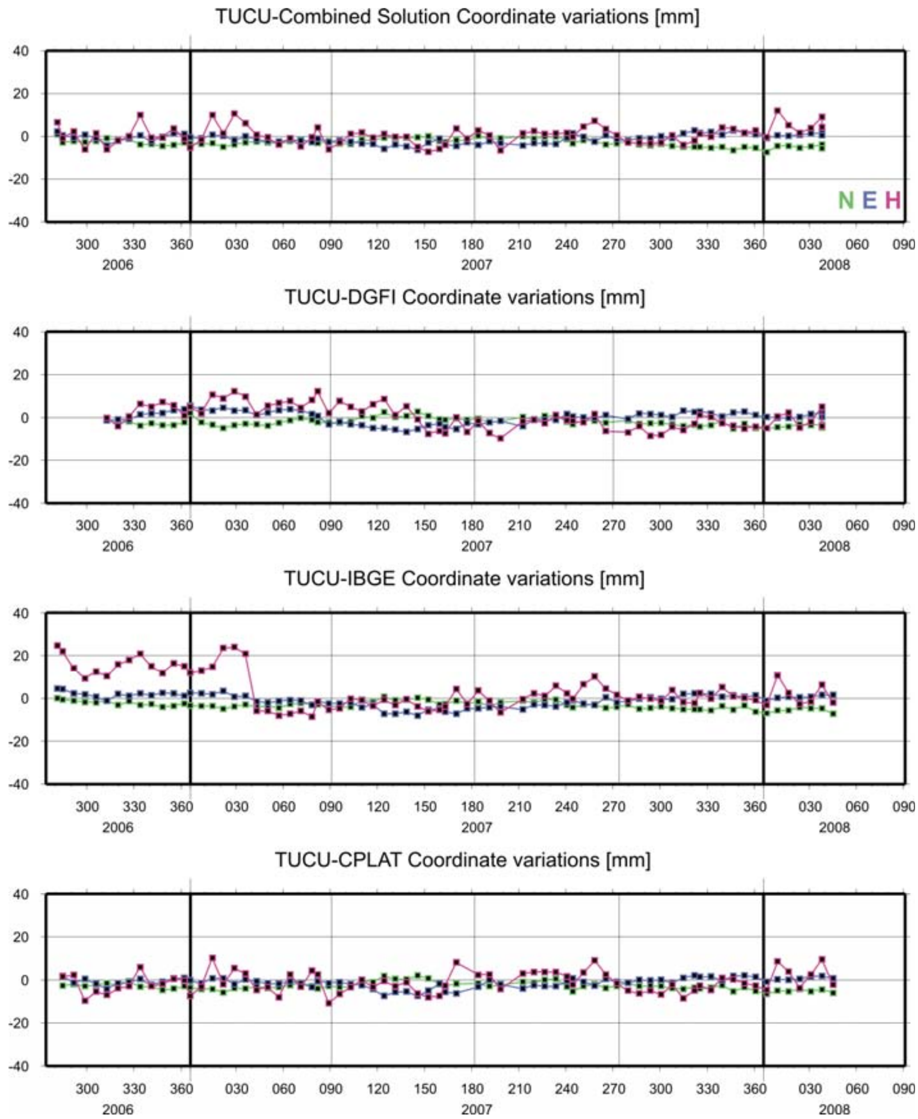


Figure 5. *Time series for station TUCU: IBGE included (until 2007/02/11) a different antenna as CPLAT and DGFI for the weekly processing. Height component is therefore biased. The combined solution does not include the TUCU station processed by IBGE before2007/02/11.*

Table 4. *PCV offset differences between the antenna type described in the site log files and the antenna type reported in the SINEX files for stations CFAG, TUCU and MZAS.*

Station	**Erroneous Antenna**	**L**	**Phase centre offsets [mm]**			**Correct Antenna**	**Phase centre offsets [mm]**			**Differences [mm]**		
			N	**E**	**h**		**N**	**E**	**h**	**N**	**E**	**h**
CFAG	ASH700936D_M SNOW	1	0,5	-0,1	91,0	ASH700936D_M NONE	0,8	0,0	91,5	0,3	0,1	0,5
		2	0,3	0,0	120,2		0,8	0,0	120,4	0,5	0,0	0,2
TUCU	AOAD/M_T NONE	1	0,6	-0,5	91,2	ASH700936C_M SNOW	-0,1	-0,5	90,4	-0,7	0,0	-0,8
		2	-0,1	-0,6	120,1		-0,5	0,4	120,1	-0,4	1,0	0,0
MZAS	TRM29659,00 NONE	1	-0,1	-0,9	92,0	TRM29659,00 UNAV	1,4	1,4	88,9	1,5	2,3	-3,1
		2	-0,2	0,2	120,5		-0,8	-0,7	119,4	-0,6	-0,9	-1,1

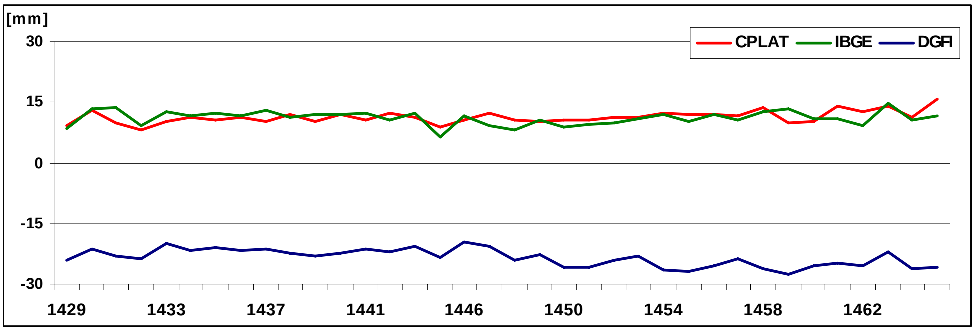


Figure 6. *Residuals for the height of station MZAS: CPLAT and IBGE took into account the radome covering the antenna, DGFI did not. DGFI estimates are biased by about 35 mm.*

4.3 Reduction of stations for the weekly combination of individual solutions

To avoid deformations in the combined network, those stations with very large outliers (more than 50 mm in any component) are reduced from the weekly normal equations. The identification of these outliers is carried out by means of:

a) Determination of time series for each station included in the individual solutions and the consequent analysis of the weekly RMS values. If these values are larger than 50 mm and they appear sporadically (without pattern), the station is reduced from the normal equation for the corresponding week. As an example, we can mention the CPLAT time series for station BOMJ (Annex 8), it presents this kind of outliers for the weeks 1438, 1439 and 1458;

b) Combination of the free weekly solutions provided by the EPCs with those generated by DGFI. Stations with RMS values larger than 50 mm with respect to the other solutions are analysed in order to identify the possible reasons for outliers. If they can not be corrected, the stations are reduced for the corresponding week. DGFI weekly solutions are not included in the final combination (see Section 5).

Annex 5 summarizes the reduced stations from the individual solutions, including the time period and the reason for reduction. In general, the largest outliers are associated to the erroneous antenna identification.

5 Combination

Input data for the combination are normal equations obtained from the three EPCs CPLAT, IBGE, and IGAC after reducing large outliers. The combination consists of the following steps:

5.1 Datum realization

The geodetic datum is defined by constraining coordinates and velocities by the conditions 'no net rotation' (NNR) and 'no net translation' (NNT) with respect to the IGS05 stations available in the region (Figure 1).

5.2 Relative weighting of individual EPC solutions

The determination of relative weighting factors (also called re-scaling factors) is necessary to compensate possible differences in the stochastic models of the EPCs. To validate the stochastic models we compare mean standard deviations of coordinates derived from solving the normal equations (see item a) with mean RMS values derived from the time series of station coordinates. The last ones reflect the real accuracy of the daily/weekly coordinate solutions. If the relation between the standard deviations of the different EPCs is the same as the relation between the RMS values, the stochastic models of the EPCs are comparable and it is not necessary to apply relative weighting factors. To ensure that the RMS values are not dominated by individual stations, they are computed in four different ways (items b to e). The computation of the standard deviations and RMS values was done as follows:

a) Determination of mean standard deviations based on minimum datum conditions (NNR+NNT) with respect to the IGS05 stations;

b) Evaluation of the daily coordinate repeatability with respect to the weekly solutions derived for each EPC separately (the solutions were obtained from free daily normal equations constrained to the IGS05 coordinates). The RMS values were analyzed including all processed stations, as well as the IGS05 stations only;

c) Evaluation of the individual weekly repeatability of station coordinates with respect to a cumulative solution calculated separately for each EPC;

d) Comparison of the individual weekly solutions with respect to the combined weekly solution;

e) Comparison of the individual weekly solutions with respect to the weekly IGS Global Network combination (files igs*YY*P*wwww*.snx available at ftp://cddis.gsfc.nasa.gov/gps/products/*wwww*);

Table 5 summarizes the mean values for the described approaches over the total analyzed period (GPS weeks 1395 until 1468). The different RMS values b), c) and d) agree very well and can be averaged. The RMS values derived from approach e) look a bit different. As they are computed with respect to an independent solution, they are not used in the averaging. The scaling factors are calculated with respect to the IGAC values. In general, it seems that CPLAT solutions are more imprecise (in a factor of 1,2) than those from IBGE and IGAC, while these two are in a better agreement with each other. This relation is shown by the standard deviations and the RMS values as well. However, keeping in mind that the three processing centres are applying the same processing strategy (double differences), the same software (BERNESE), the same satellite orbits, satellite clock offsets, and Earth orientation parameters (final IGS products), as well as the same observations (RINEX files) for the common stations, we can conclude that the parameters estimated by each of the contributing solutions are at the same accuracy level (i.e. there are no differences in the stochastic models) and a relative weighting of the EPCs is not necessary.

__Table 5.__ Scale factors (with respect to IGAC values) for the individual normal equations generated by each Experimental Processing Centre following different approaches.

Approach	CPLAT				IBGE				IGAC				Scaling factors wrt IGAC		
	N	**E**	**H**	**Total**	**N**	**E**	**H**	**Total**	**N**	**E**	**H**	**Total**	**CPLAT**	**IBGE**	**IGAC**
a) Mean standard deviation				1,92				1,68				1,52	1,3	1,1	1,0
b) RMS residuals for daily repeatability [mm]:															
all stations	2,19	2,52	6,27	7,10	2,05	2,02	5,74	6,42	1,94	1,89	5,37	6,02	1,2	1,1	1,0
IGS05 stations only	2,24	2,67	6,46	7,34	1,99	2,03	5,47	6,17	1,82	1,91	5,31	5,93	1,2	1,0	1,0
c) RMS residuals for weekly repeatability [mm]	2,21	2,08	5,22	6,03	1,97	1,77	4,72	5,41	2,29	1,87	3,98	4,95	1,2	1,1	1,0
d) RMS residuals wrt combined solution [mm]	0,79	1,18	2,57	2,94	0,79	1,00	2,39	2,70	0,50	0,82	2,10	2,29	1,3	1,2	1,0
Mean value													1,2	1,1	1,0
e) RMS residuals wrt IGS Global Stations [mm]	2,65	2,72	4,11	5,60	2,91	3,10	4,35	6,08	2,31	3,02	4,30	5,72	1,0	1,1	1,0

5.3 Correction for the stochastic model of the combined solutions

The individual EPC solutions contributing to the combined one include common stations and they are therefore highly correlated. In spite of this, the EPC solutions are initially treaded as independent within the combination. In this manner, the stochastic model of the combined solution is damaged: the standard deviations of the coordinates are overestimated by a factor of about √ (number of EPCs including each station). To correct the stochastic model, the standard deviations have to be multiplied by this factor and the variance-covariance matrix by the square of the factor, respectively. If each station is included in exactly the same number of individual solutions, this procedure can easily be carried out. However, due to different causes the station distribution between the EPCs included in the Rio Agreement is not fulfilled at present: some of the stations are included in one solution, in two solutions, or in the three solutions (Figure 2). It implies that the stochastic model of the combined solution cannot be corrected by one (unique) factor. It is necessary to determine separately correction factors for the stations, depending on the number of contributing EPC solutions where they are included. At present, we are trying to implement a method to compute and apply these factors directly in the combination software. In the mean time, it is not possible and therefore, this report does not take into account corrections for the stochastic model of the combined solutions. A good alternative to avoid this procedure is to guarantee that each regional station is included in exactly the same number of individual solutions. For that, a redistribution of the stations between the different EPCs would be necessary.

5.4 Identification and rejection of outliers

In the pre-processing step, stations with large residuals (more than 50 mm), caused mainly by antenna information inconsistencies, were reduced. Nevertheless, it is expected that additional discrepancies between the individual solutions are identified in the weekly combination. The detection of these discrepancies was carried out by comparing each station in each solution with the mean of the other two solutions. Differences exceeding five times the mean RMS values derived from the time series (i.e. N = (5 x 2) mm, E = (5 x 2) mm, H = (5 x 4) mm) were assumed as outliers, and the corresponding stations were excluded from the respective weekly solution. Annex 5 lists all stations that were reduced from the EPCs normal equations before the combination.

5.5 Combined solutions

Input for the combined solutions are the unconstrained weekly normal equations after reducing stations with large outliers for each EPC. These normal equations are added and solved by applying the BERNESE software. The geodetic datum is realized by NNT and NNR conditions with respect to the IGS05 positions and velocities available in the region (Figure 1). Three types of combined solutions are generated each week: a weekly constrained solution (fixed coordinates and cofactor matrix for internal control), an accumulated constrained solution (fixed coordinates, velocities, and cofactor matrix for applications), and a free weekly solution (unconstrained normal equations for later computations). Nevertheless, in the case of the cumulative solutions, it should be kept in mind that 73 weeks (the best case at present) represent a very short time period to estimate reliable velocities.

6 Evaluation of individual and combined solutions

The accuracy evaluation of the different steps included in the experimental project initiated in Rio (processing of SIRGAS-CON sub networks and their combination) was performed as follows:

6.1 Individual solutions

The combined solution was used to evaluate the accuracy of the individual solutions delivered by the EPCs. Mean standard deviations for station positions were estimated by using the reference IGS05 stations included in each weekly solution. In addition, RMS residuals were computed by comparing weekly solutions of each EPC with respect to i) the combined solution, and ii) the weekly combination of the IGS global network. The results are summarized in Figure 7. To simplify the diagrams, values for each fifth week are presented. The mean standard deviations, which represent the formal errors of the individual solutions, are in reasonable agreement. They are about 1,9 mm for CPLAT, 1,7 mm for IBGE, and 1,5 mm for IGAC. The RMS values obtained after comparing the individual solutions with the combined one are smaller than those derived from comparing the individual solutions with the weekly combination of the IGS global network. The last ones are larger about 1,9 mm in the horizontal component and 1,7 mm in the vertical component. Residuals for CPLAT and IBGE agree quite well, since they are processing almost the same sub network. It seems that IGAC fits the combined solution better than the other two EPCs, but this can be explained by the fact, that the network processed by IGAC is not contained in another contributing solution. The discrepancies between the individual solutions and the IGS global network values can be a consequence of the inhomogeneous distribution of IGS stations in the region, as well as, of particular problems in some of them. For instance, some stations (like MANA or OHI2) frequently present jumps in their time series, stations with periodical signals (like BRAZ, CRO1 or CHPI) are considered with linear movements, etc.

Figure 7. *Mean standard deviations for the individual EPC solutions and RMS residuals between the EPC's weekly solutions and the combined solutions, as well as, with respect to the weekly IGS global network combination. (values for each fifth week are presented).*

In general, one can say that the individual solutions present accuracies (internal consistency) of about 1,5 mm for the horizontal position and better than 2,5 mm for the vertical one, while their reliability (comparison with respect to IGS05 values) is about 2,5 mm for the horizontal components and 4,5 mm for the vertical one. Annexes 6 and 7 present the same content of Figure 7 by showing the north, east, and height components for each EPC. It also includes time series for the 7 transformation parameters obtained by comparing the individual weekly solutions with the combined ones. The comparison between the individual solutions and the weekly IGS global network combination was carried out with coordinate values directly; a 7-parameter similarity transformation was not applied here.

6.2 Weekly combined solutions

The weekly combined solutions are constrained by means of NNR+NNT conditions to the IGS05 values of the reference stations (Figure 1). The obtained coordinates are compared with the weekly constrained solutions made available by DGFI at the server ftp.dgfi.badw-muenchen.de/pub/gps/DGF, and with the weekly IGS global network combination (files igs*YY*P*wwww*.snx available at ftp://cddis.gsfc.nasa.gov/gps/

products/*wwww*). Figure 8 summarizes the results. Similarly to Figure 7, values for each fifth week are shown.

Although the combined network normally contains the same stations processed by IGS-RNAAC-SIR, the discrepancies between the combined solutions and DGFI are considerably large, specially in the vertical component (~ 3 mm). The processed network has a larger coverage in the north-south direction than in the east-west direction. It can explain the smaller residuals for the north component than for the east component. The residuals of the combined solutions with respect to the IGS global stations agree quite well with the residuals obtained after comparing the individual solutions with the IGS global network points. The reliability of the weekly combined solutions over the analyzed period is about 3 mm for the horizontal component and 4,5 mm for the vertical one.

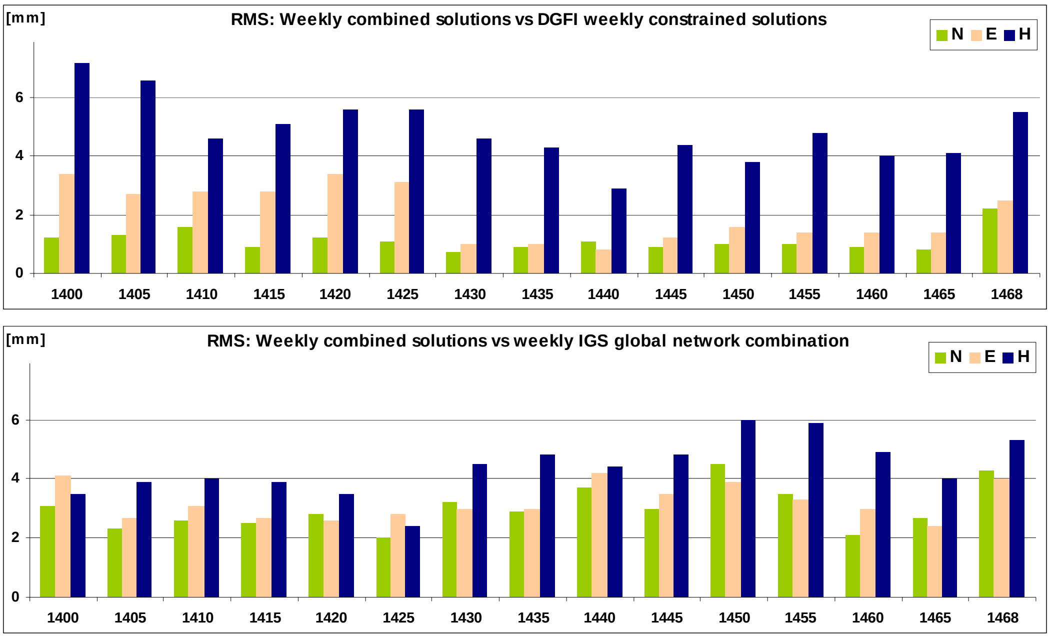


Figure 8. *RMS residuals between the weekly combined solution and the constrained IGS-RNAAC-SIR coordinates, as well as with respect to the weekly IGS global network combination (values for each fifth week are presented).*

6.3 Cumulative combined solution

Cumulative solutions are necessary to find outliers in the time series of the weekly combined solutions and to make available station velocities. However, since the time period is too short (73 weeks), this procedure is included in the present report only to show how to perform this step, when the SIRGAS processing and combination strategy is installed as a routinely process. As an example, the cumulative solution for the GPS week 1468 is presented. The geodetic datum was defined by the NNR+NNT conditions with respect to the IGS05 coordinates and velocities of the following sites: CHPI, CONZ, CRO1, GLPS, GOLD, LPGS, MDO1, OHI2, SANT, and UNSA (until 2007/12/31, after that this station shows too large residuals). Stations BRAZ, MANA, PIE1, and SCUB are not included as reference points because: i) the year signal component in the height variations of BRAZ is not totally represented in the analyzed time period and the linear velocity included in IGS05 is not reliable; ii) MANA presents a strong jump in the vertical component at the beginning of September, 2007; iii) the time series for PIE1 is too short (less than one year); iv) the time series for SCUB includes RMS values larger than 20 mm.

Resulting coordinates and velocities are compared with the latest IGS-RNAAC-SIR solution (DGF08P01-SIR, available at www.sirgas.org), and the IGS05 reference values (ftp://igscb.jpl.nasa.gov/igscb/station/coord/IGS05.snx). Figure 9 presents the histograms with position and velocity differences between DGF08P01-SIR and the cumulative solution for GPS week 1468 for 99 common stations. For about 80% of all common sites the difference in positions and velocities are below 3 mm and 3 mm/yr, respectively. However, there are about 11 stations with position and velocity differences larger than 10 mm and 10 mm/yr. Table 6 summarizes the corrections obtained for positions and velocities of the IGS05 sites included as reference frame stations, as well as for the excluded ones. The large differences in the velocities (more than 3 mm/yr) are a consequence of the short time period considered in the cumulative solution. All compared coordinates were reduced to the same reference epoch, in this case 2006-10-01.

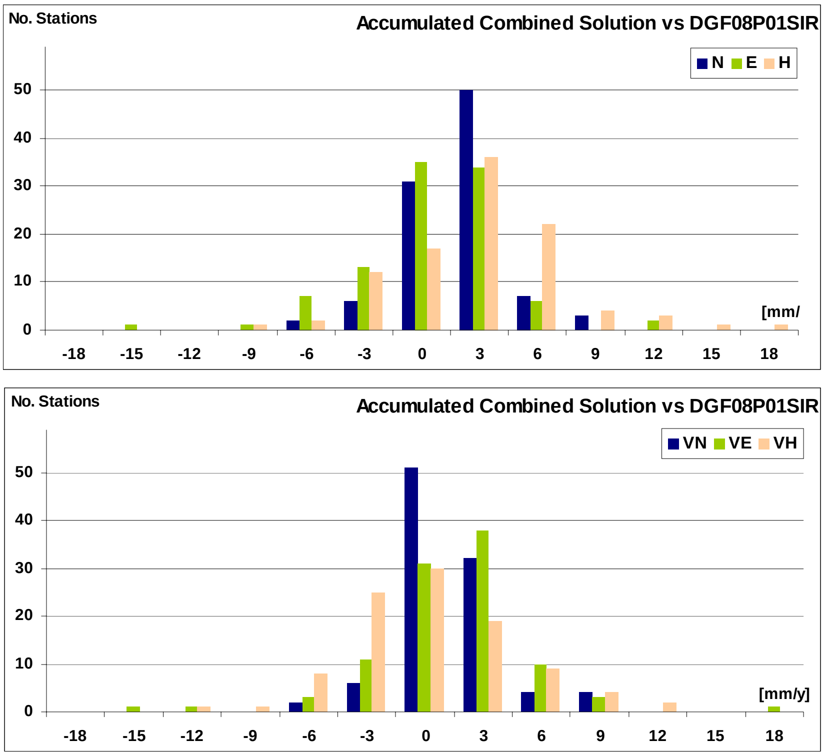


Figure 9. *Differences between the combined cumulative solution for week 1468 and the multi-year solution DGF08P01-SIR in station positions (above) and velocities (bellow) for 99 common stations.*

Table 6. *Corrections obtained in the combined cumulative solution for positions and velocities of the IGS05 sites included as reference frame stations, as well as for the excluded ones.*

Station	ΔN [mm]	ΔE [mm]	ΔH [mm]	ΔV_N [mm/yr]	ΔV_E [mm/yr]	ΔV_H [mm/yr]
CHPI	0,7	0,9	-4,2	0,3	0,5	1,4
CONZ	-0,5	1,3	2,6	0,2	1,6	0,7
CRO1	2,7	1,8	2,0	1,0	-3,2	-3,3
GLPS	-1,1	-3,5	5,1	1,3	-0,2	3,3
GOLD	1,8	-1,1	-0,7	1,5	0,9	0,7
LPGS	-2,2	3,4	0,8	-0,9	-1,4	0,9
MDO1	1,4	-1,9	-3,1	0,8	0,4	-0,2
OHI2	-0,1	0,7	-3,5	-3,1	1,0	0,4
SANT	-1,4	-2,0	2,9	-1,1	-0,2	-1,0
UNSA	-2,1	2,1	2,1	-1,0	0,7	0,4
IGS05 sites that were not used as reference frame stations						
BRAZ	-0,9	-2,9	0,3	0,7	-1,5	7,3
MANA	-6,9	-2,2	-3,6	-2,3	3,2	-11,6
PIE1	8,5	-3,2	-8,0	0,7	-1,7	-0,3
SCUB	2,9	4,7	7,3	3,2	0,0	-8,3

7 Conclusions and recommendations

DGFI as a SIRGAS Experimental Combination Centre has reviewed, compared, and combined the individual solutions delivered by three SIRGAS Experimental Processing Centres (namely CPLAT, IBGE, and IGAC) installed in Rio de Janeiro in August 2006. The analyzed period corresponds to the GPS weeks 1395 - 1468. The results permit to conclude that these three Processing Centres become capable to satisfy the administrative and quality processing requirements defined in the Rio Agreement. Their weekly solutions are at the same accuracy level with respect to each other and with respect to the IGS-RNAAC-SIR solutions. The individual solutions present accuracies (internal consistency) of about 1,5 mm for the horizontal position and better than 2,5 mm for the vertical one. Their realization accuracy with respect to the IGS05 frame (external precision) is about 2,5 mm for the horizontal components and 4,5 mm for the vertical one. In the same way, the weekly combination of the individual solutions provides accuracies of about 3 mm for the horizontal component and 4,5 mm for the vertical one.

The major deficiencies in the individual solutions relate to systematic biases caused by applying erroneous antennae (+ radome) in the weekly processing. This is a consequence of:

a) Log files do not include always the correct denomination for the equipment, i.e. they are not aligned with the conventional names given by the IGS (http://igscb.jpl.nasa.gov/igscb/station/general/rcvr_ant.tab);

b) There are two or more valid log files for some sites. These log files present different equipments for the same period and the same station, and it is not clear which one is the correct one;

c) Changes in the station equipments are not opportunely reported. There are often time spans in which e.g. the station has a new antenna, but the log file is not appropriately updated;

d) Processing centres are informed about the equipment changes too late.

Recommendation 1: It is mandatory to review and to update the existing log files for the regional SIRGAS-CON stations and to ensure completeness and correctness of their content. For the IGS global stations, IGS log files must be applied. Detected discrepancies have to be reported to IGS.

Recommendation 2: Processing centres must align their station information reference files with the actualized log files as soon as possible.

Recommendation 3: Operators of SIRGAS-CON stations shall routinely inform about changes or problems in the stations. The SIRMAIL exploder is very useful for this purpose.

The SIRGAS-CON network has improved continuously in terms in the number of sites (in GPS week 1468, it comprises 169 stations) as well as their continental distribution. At present, more and more Latin American countries are qualifying their national reference frames by installing continuously operating GNSS stations. Until now, SIRGAS procured to include all available stations in the SIRGAS-CON network; however, not all of them operate homogeneously. About 20% of the processed stations present very large data gaps, or jumps in their time series; i.e. all SIRGAS-CON stations do not fully satisfy accuracy, reliability, and homogeneity requirements for a precise reference frame with long-term stability. Additionally, if the number of continuously operating stations is continuously increasing with the same velocity as it does until now; in the near future the operational capabilities of the processing centres will be overloaded. Therefore:

Recommendation 4: Similarly to the first SIRGAS campaign performed in 1995, it is necessary to define a core network with a good continental coverage and stabile site locations to ensure high long-term stability of the reference frame. This core network should serve as frame for the national densification networks, which, despite of being composed by continuously operating stations, remain densification networks and their stations do not have to be included in the continental reference frame. The SIRGAS-CON 'core' network shall contain those sites that, due to their quality and reliability, can be included into the IGS global network as well as in the ITRF solutions.

The combination strategy applied in this report is based on the combination of normal equations; this approach directly allows the analysis of constraints (which eventually might be introduced in the computations), and, in the case of unconstrained normal equations, the combination can be directly done without inversion. To ensure a high consistency and accuracy of the combined solution, it is essential that the solutions of the EPC are consistent concerning modelling and parameterization. This demands the adoption of common standards and models according to the most recent set of conventions, e.g. IERS conventions (http://www.iers.org/); presentations and conclusions of the GGOS Unified Analysis Workshop, held in Monterey, USA, December 5th to 7th, 2007 (http://www.iers.org/MainDisp.csl?pid=66-1100205). According to this:

Recommendation 5: SIRGAS analysis centres shall permanently align their processing strategies to the IERS (i.e. IGS) conventions, but coordinated under the umbrella of the

SIRGAS-WGI to update simultaneously their strategies. The individual solutions delivered for combination should include common standards and models, and in order to avoid problems concerning the reduction of constraints, unconstrained normal solutions should be provided.

Recommendation 6: If constrained solutions are delivered, all constraints have to be reported in the corresponding SINEX files, i.e. the statistical information (e.g., number of observations, number of unknowns, variance factor) necessary for combining at the normal equation level, has to be included in the SINEX files.

Recommendation 7: To get homogeneous accuracies for station positions and velocities in the combined solutions, it is desirable to redistribute the regional SIRGAS-CON stations between the operative processing centres in such a way that each regional SIRGAS-CON station is included in the same number (one, two or more) of individual solutions.

Annex 1: Solution delivery of the SIRGAS Experimental Processing Centres

EAC Week / delivery date	CPL	GMA	IBG	IGA	INE
1395 / 30.10.06	17.11.06		04.12.06	14.12.06/01.02.07	08.01.08
1396 / 06.11.06	20.11.06		04.12.06	15.12.06/01.02.07	08.01.08
1397 / 13.11.06	20.11.06		04.12.06	01.02.07	08.01.08
1398 / 20.11.06	27.12.06		04.12.06	01.02.07	08.01.08
1399 / 27.11.06	27.12.06		04.12.06	01.02.07	08.01.08
1400 / 04.12.06	26.12.06	06.06.07	07.12.06	01.02.07	08.01.08
1401 / 11.12.06	27.12.06		18.12.06	01.02.07	08.01.08
1402 / 18.12.06	28.12.06		21.12.06	01.02.07	08.01.08
1403 / 25.12.06	02.01.07		28.12.06	01.02.07	08.01.08
1404 / 01.01.07	03.01.07		02.01.07	01.02.07	08.01.08
1405 / 08.01.07	04.01.07		08.01.07	01.02.07	08.01.08
1406 / 15.01.07	09.01.07		16.01.07	06.02.07	08.01.08
1407 / 22.02.07	22.01.07		23.01.07	01.02.07	08.01.08
1408 / 29.01.07	01.02.07		26.01.07	06.02.07	08.01.08
1409 / 05.02.07	05.02.07		05.02.07	14.02.07	08.01.08
1410 / 12.02.07	07.02.07		13.02.07	13.02.07	08.01.08
1411 / 19.02.07	13.02.07		15.02.07	21.02.07	08.01.08
1412 / 26.02.07	20.02.07		23.02.07	27.02.07	08.01.08
1413 / 05.03.07	27.02.07		09.03.07	13.04.07	08.01.08
1414 / 12.03.07	06.03.07		13.03.07	13.04.07	08.01.08
1415 / 19.03.07	13.03.07		19.03.07	13.04.07	08.01.08
1416 / 26.03.07	20.03.07		26.03.07	15.04.07	08.01.08
1417 / 02.04.07	27.03.07		29.03.07	23.04.07	08.01.08
1418 / 09.04.07	11.04.07		19.04.07	20.04.07	08.01.08
1419 / 16.04.07	20.04.07		19.04.07	25.04.07	08.01.08
1420 / 23.04.07	24.04.07		25.04.07	26.04.07	08.01.08
1421 / 30.04.07	02.05.07		04.05.07	30.04.07	08.01.08
1422 / 07.05.07	09.05.07		08.05.07	16.05.07	08.01.08
1423 / 14.05.07	15.05.07		11.05.07	16.05.07	08.01.08
1424 / 21.05.07	23.05.07		29.05.07	30.05.07	08.01.08

in time acceptabel too late

EAC Week / delivery date	CPL	GMA	IBG	IGA	INE
1425 / 28.05.07	29.05.07		01.06.07	30.05.07	08.01.08
1426 / 04.06.07	02.06.07		12.06.07	30.05.07	08.01.08
1427 / 11.06.07	10.06.07		12.06.07	13.06.07	08.01.08
1428 / 18.06.07	20.06.07		15.06.07	15.06.07	08.01.08
1429 / 25.06.07	24.06.07		25.06.07	21.06.07	
1430 / 02.07.07	27.06.07		28.06.07	27.06.07	
1431 / 09.07.07	13.07.07		06.07.07	06.07.07	
1432 / 16.07.07	13.07.07		16.07.07	18.07.07	
1433 / 23.07.07	17.07.07		18.07.07	19.07.07	
1434 / 30.07.07	26.07.07		26.07.07	14.08.07	
1435 / 06.08.07	04.08.07		03.08.07	14.08.07	
1436 / 13.08.07	10.08.07		16.08.07	15.08.07	
1437 / 20.08.07	15.08.07		17.08.07	21.08.07	
1438 / 27.08.07	25.08.07		23.08.07	24.08.07	
1439 / 03.09.07	01.09.07		30.08.07	28.08.07	
1440 / 10.09.07	08.09.07		04.09.07	03.09.07	
1441 / 17.09.07	12.10.07		12.09.07	11.09.07	
1442 / 24.09.07	13.10.07		21.09.07	18.09.07	
1443 / 01.10.07	14.10.07		26.09.07	21.09.07	
1444 / 08.10.07	12.10.07		05.10.07	02.10.07	
1445 / 15.10.07	12.10.07		11.10.07	05.10.07	
1446 / 22.10.07	22.10.07		17.10.07	12.10.07	
1447 / 29.10.07	25.10.07		01.11.07	20.10.07	
1448 / 05.11.07	02.11.07		01.11.07	29.10.07	
1449 / 12.11.07	09.11.07		21.11.07	02.11.07	
1450 / 19.11.07	15.11.07		22.11.07	14.11.07	
1451 / 26.11.07	28.11.07		27.11.07	20.11.07	
1452 / 03.12.07	28.11.07		29.11.07	23.11.07	
1453 / 10.12.07	05.12.07		05.12.07	26.12.07	
1454 / 17.12.07	12.12.07		13.12.07	26.12.07	

in time — acceptabel — too late

EAC Week / delivery date	CPL	GMA	IBG	IGA	INE
1455 / 24.12.07	19.12.07		19.12.07	26.12.07	
1456 / 31.12.07	24.12.07		08.01.08	28.12.07	
1457 / 07.01.08	03.01.08		08.01.08	08.01.08	
1458 / 14.01.08	07.01.08		17.01.08	08.01.08	
1459 / 21.01.08	18.01.08		22.01.08	11.01.08	
1460 / 28.01.08	28.01.08		23.01.08	21.01.08	
1461 / 04.02.08	01.02.08		08.02.08	28.01.08	
1462 / 11.02.08	06.02.08		12.02.08	13.02.08	
1463 / 18.02.08	13.02.08		19.02.08	13.02.08	
1464 / 25.02.08	21.02.08		27.02.08	15.02.08	
1465 / 03.03.08	03.03.08		28.02.08	05.03.08	
1466 / 10.03.08	10.03.08		06.03.08	07.03.08	
1467 / 17.03.08	12.03.08		12.03.08	13.03.08	
1468 / 24.03.08	19.03.08		20.03.08	18.03.08	
1469 / 31.03.08	01.04.08		26.03.08	26.03.08	
1470 / 07.04.08	16.04.08		04.04.08	01.04.08	
1471 / 14.04.08					
1472 / 21.04.08					
1473 / 28.04.08					
1474 / 05.05.08					
1475 / 12.05.08					
1476 / 19.05.08					
1477 / 26.05.08					
1478 / 02.06.08					
1479 / 09.06.08					
1480 / 16.06.08					
1481 / 23.06.08					
1482 / 30.06.08					
1483 / 07.07.08					
1484 / 14.07.08					

in time acceptabel too late

2. Regional SIRGAS-CON stations included in the individual weekly solutions delivered by the SIRGAS Experimental Processing Centres

Southern part of the SIRGAS-CON network

Code	Country	CPLAT	IBGE	IGAC	INEGI
AMHU	BR	ok	ok		
ANTC	CL	ok	ok		
AREQ	PE	ok	ok	extra	
AUTF	AR	ok	ok		
AZUL	AR	ok	ok		
BELE	BR	ok	ok		
BOAV	BR	ok	missing		
BOMJ	BR	ok	ok		
BRFT	BR	ok	ok		
CEFE	BR	ok	missing		
CFAG	AR	ok	ok		
COPO	CL	ok	ok		
CRAT	BR	ok	ok		
CRUZ	BR	ok	missing		
CUIB	BR	ok	ok		
GVAL	BR	ok	ok		
IGM1	AR	ok	ok		
IMBT	BR	ok	ok		
IMPZ	BR	ok	ok		
KOUR	FR	ok	ok	extra	
LHCL	AR	ok	ok		
MABA	BR	ok	ok		
MAPA	BR	ok	missing		
MCLA	BR	ok	ok		
MECO	AR	ok	ok		
MGIN	BR	ok	ok		
MGUB	BR	ok	missing		
MPLA	AR	ok	ok		
MSCG	BR	ok	missing		
MZAC	AR	ok	ok		
MZAE	AR	ok	ok		
MZAS	AR	ok	ok		
NAUS	BR	ok	ok		
NEIA	BR	ok	ok		
ONRJ	BR	ok	ok		
PALM	AQ	missing	ok		
PARC	CL	ok	ok		
PDES	AR	ok	ok		
PEPE	BR	ok	missing		
PMB1	SR	ok	ok		
POAL	BR	ok	ok		
POLI	BR	ok	ok		
POVE	BR	ok	ok		
PPTE	BR	ok	ok		
RECF	BR	ok	ok		
RIO2	AR	ok	ok		
RIOB	BR	ok	missing		
RIOD	BR	ok	ok		
RIOG	AR	ok	ok		
ROGM	BR	ok	missing		
RWSN	AR	ok	ok		
SAGA	BR	ok	missing		
SALU	BR	ok	missing		
SALV	BR	ok	ok		

Northern part of the SIRGAS-CON network

Code	Country	CPLAT	IBGE	IGAC	INEGI
ANDS	CO			ok	missing
APTO	CO			ok	missing
AREQ	PE			ok	missing
BANS	VE		extra	ok	missing
BDOS	BB			ok	ok
BERR	CO			ok	missing
BOGA	CO			ok	missing
BOGT	CO	extra	extra	ok	missing
BQLA	CO			ok	missing
BRMU	UK			ok	ok
BUCA	CO			ok	missing
BUEN	CO			ok	missing
CALI	CO			ok	missing
CAM2	MX			ok	ok
CART	CO			ok	missing
CBSB	UK			ok	missing
CHET	MX			ok	ok
CHIH	MX			ok	ok
CIC1	MX			ok	ok
COL2	MX			ok	ok
CRCS	VE		extra	ok	missing
CUCU	CO			ok	missing
CULC	MX			ok	ok
CULI	MX			ok	ok
DORA	CO			ok	missing
ELEN	GT			ok	missing
ETCG	CR			ok	missing
EXU0	BS			ok	missing
FLOR	CO			ok	missing
FQNE	CO			ok	missing
GCGT	UK			ok	missing
GRE0	GD			ok	missing
GTK0	UK			ok	missing
GUAT	GT			ok	ok
GUAV	CO			ok	missing
HER2	MX			ok	ok
IBAG	CO			ok	missing
INEG	MX			ok	ok
JAMA	JM	extra		ok	ok
KYW1	US			ok	missing
LPAZ	MX			ok	ok
MARA	VE		extra	ok	missing
MEDE	CO			ok	missing
MERI	MX			ok	ok
MEXI	MX			ok	ok
MOTE	CO			ok	missing
MTY2	MX			ok	ok
NAS0	BS			ok	missing
NEVA	CO			ok	missing
OAX2	MX			ok	ok
PERA	CO			ok	missing
POPA	CO			ok	missing
PSTO	CO			ok	missing
PUR3	PR			ok	ok

Southern part of the SIRGAS-CON network

Code	Country	CPLAT	IBGE	IGAC	INEGI
SAVO	BR	ok	missing		
SMAR	BR	ok	ok		
SRNW	SR	ok	ok		
SRZN	SR	ok	ok		
SSA1	BR	ok	missing		
TOPL	BR	ok	missing		
TUCU	AR	ok	ok		
UBAT	BR	ok	ok		
UBER	BR	ok	ok		
UCOR	AR	ok	ok		
UFPR	BR	ok	ok		
UNRO	AR	ok	ok		
UNSJ	AR	ok	ok		
UYMO	UY	ok	ok		
UYRO	UY	ok	ok		
VARG	BR	ok	ok		
VBCA	AR	ok	ok		
VESL	AQ	ok	ok		
VICO	BR	ok	ok		

Northern part of the SIRGAS-CON network

Code	Country	CPLAT	IBGE	IGAC	INEGI
QUIB	CO			ok	missing
RIOH	CO			ok	missing
RIOP	EC	extra	extra	ok	missing
S061	EC		extra	ok	missing
SAMA	CO			ok	missing
SMRT	NL			ok	missing
SSIA	SV			ok	ok
TAMP	MX			ok	ok
TOL2	MX			ok	ok
TUMA	CO			ok	missing
TUNA	CO			ok	missing
UGTO	MX			ok	missing
VALL	CO			ok	missing
VIL2	MX			ok	ok
VIVI	CO			ok	missing
YOPA	CO			ok	missing

Annex 3: Comparison between the free weekly solutions provided by the SIRGAS Experimental Processing Centres and the corresponding free weekly solutions generated by the IGS-RNAAC-SIR

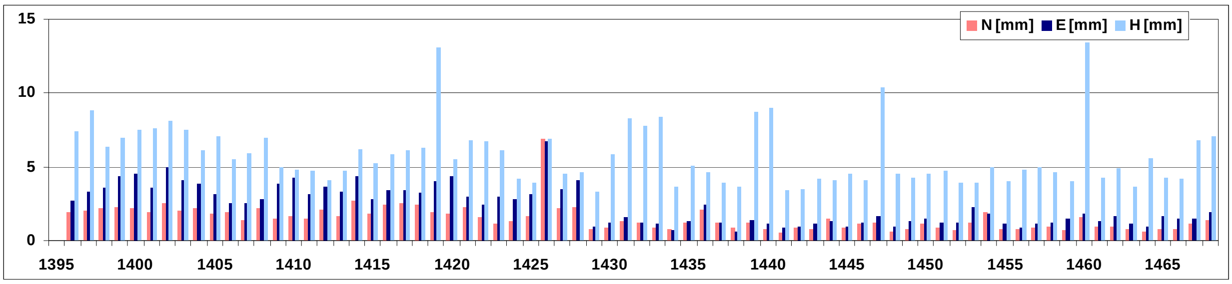


Figure A3.1. *RMS residuals after a 7-parameter similarity transformation between the free weekly solutions delivered by CPLAT and the corresponding free weekly SINEX files generated by the IGS-RNAAC-SIR. Mean RMS values: N = 1,8 mm, E = 2,7 mm, H = 6,1 mm.*

Table A3.1. *Outliers after a 7-parameter similarity transformation between the free weekly solutions delivered by CPLAT and the corresponding free weekly SINEX files generated by the IGS-RNAAC-SIR.*

Week	Station	N [mm]	E [mm]	H [mm]
1419	PUR3	-3,1	-10,4	-69,7
1426	SSIA	-47,6	38,8	-32,8
1447	POAL	3,2	1,0	66,8
1460	BOMJ	-2,8	-4,4	-53,4
1460	CRAT	-5,6	-5,0	-69,1

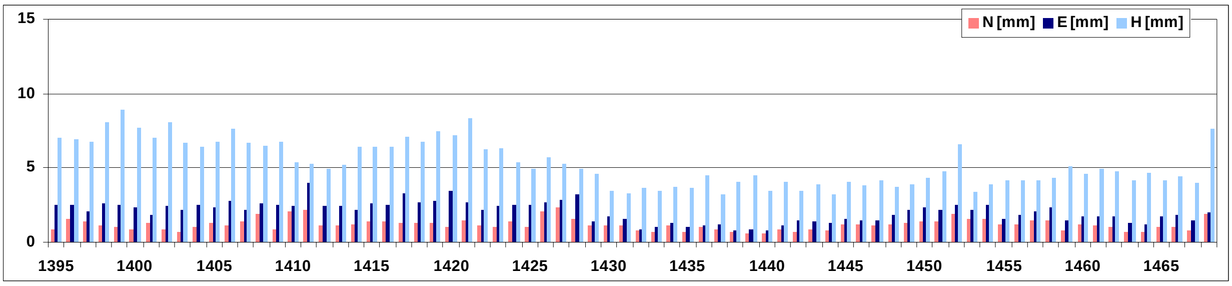


Figure A3.2. *RMS residuals after a 7-parameter similarity transformation between the free weekly solutions delivered by IBGE and the corresponding free weekly SINEX files generated by the IGS-RNAAC-SIR. Mean RMS values: N = 1,2 mm, E = 2,2 mm, H = 5,5 mm.*

Table A3.2. *Outliers after a 7-parameter similarity transformation between the free weekly solutions delivered by IBGE and the corresponding free weekly SINEX files generated by the IGS-RNAAC-SIR.*

Week	Station	N [mm]	E [mm]	H [mm]
1399	AREQ	-1,2	0,1	-32,6
1421	POLI	-0,8	8,8	24,3

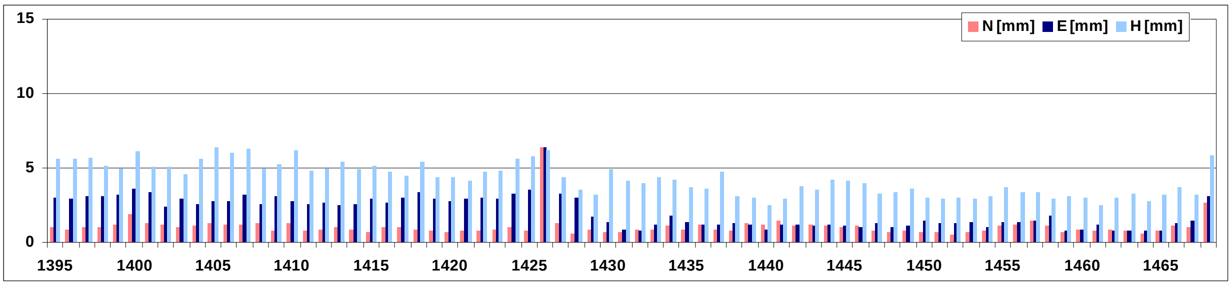


Figure A3.3. *RMS residuals after a 7-parameter similarity transformation between the free weekly solutions delivered by IGAC and the corresponding free weekly SINEX files generated by the IGS-RNAAC-SIR. Mean RMS values: N = 1,3 mm, E = 2,3 mm, H = 4,4 mm.*

Table A3.3. *Outliers after a 7-parameter similarity transformation between the free weekly solutions delivered by IGAC and the corresponding free weekly SINEX files generated by the IGS-RNAAC-SIR.*

Week	Station	N [mm]	E [mm]	H [mm]
1405	BDOS	7,0	8,7	-30,7
1426	SSIA	-47,1	40,5	-34,6

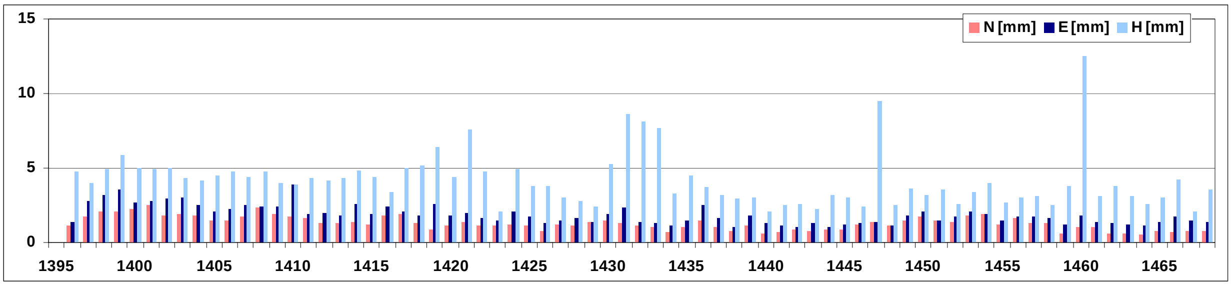


Figure A3.4. *RMS residuals after a 7-parameter similarity transformation between the free weekly solutions delivered by CPLAT and IBGE. Mean RMS values: N = 1,4 mm, E = 1,9 mm, H = 4,5 mm.*

Table A3.4. *Outliers after a 7-parameter similarity transformation between the free weekly solutions delivered by CPLAT and IBGE.*

Week	Station	N [mm]	E [mm]	H [mm]
1431	CRAT	3,5	1,3	54,8
1447	POAL	-3,9	-1,8	-61,7
1460	BOMJ	2,5	1,5	50,1
1460	CRAT	0,0	2,0	60,5

Annex 4: Station information inconsistencies between data included in the delivered SINEX files by each SIRGAS Experimental Processing Centre and the corresponding site log files (valid for the period GPS weeks 1395 - 1468)

Experimental Processing Centre CPLAT

From	To	Station	Inconsistency	CPLAT SINEX file	Log File
2007 12 23	2008 03 01	BOGT 41901M001	Antenna type	ASH701945G_M NONE	ASH701945E_M NONE
2007 08 05	2008 01 05	BOMJ 41612M001	Receiver type	TRIMBLE 4000SSI	TRIMBLE NETR5
2006 10 01	2008 03 01	CFAG 41517S001	Antenna type	ASH700936D_M SNOW	ASH700936D_M NONE
2007 06 10	2008 01 04	CRAT 41619M001	Antenna type	TRM29659.00 NONE	TRM55971.00 NONE
2007 12 30	2008 01 04	CRAT 41619M001	Receiver type	TRIMBLE 4000SSI	TRIMBLE NETR5
2007 12 30	2008 01 04	CRAT 41619M001	Ant ecc (up)	0,0070 m	0,0080 m
2006 10 12	2007 05 08	CRAT 41619M001	Ant ecc (up)	0,0080 m	0,0070 m
2007 04 07	2007 04 14	CUIB 41603M001	Receiver type	TRIMBLE 4000SSI	TRIMBLE NETRS
2007 04 07	2007 04 14	CUIB 41603M001	Antenna type	TRM29659.00 NONE	TRM41249.00 NONE
2006 10 01	2008 03 01	GVAL 41623M001	Receiver type	ASHTECH Z-FX	ASHTECH UZ-12
2006 10 06	2006 12 09	IGM1 41505M003	Receiver type	ASHTECH UZ-12	TRIMBLE NETRS
2007 12 30	2008 01 04	IMPZ 41615M001	Receiver type	TRIMBLE NETRS	TRIMBLE NETR5
2008 01 16	2008 03 01	KOUR 97301M210	Antenna type	ASH701945C_M NONE	ASH701946.3 NONE
2008 01 16	2008 03 01	KOUR 97301M210	Receiver type	ASHTECH UZ-12	JPS LEGACY
2007 04 14		MAPA 41629M001	Receiver type	TRIMBLE 4000SSI	TRIMBLE NETRS
2006 10 01	2008 03 01	MCLA 41624M001	Receiver type	ASHTECH Z-FX	ASHTECH UZ-12
2007 11 13	2008 03 01	OHI2 66008M005	Receiver type	AOA SNR-8000 ACT	JPS E_GGD
2007 09 30	2007 10 04	POAL 41616M001	Antenna type	TRM55971.00 NONE	TRM29659.00 NONE
2007 08 19	2008 03 01	POVE 41628M001	Receiver type	TRIMBLE 4000SSI	TRIMBLE NETR5
2007 03 20	2007 03 21	RIOD 41608M001	Antenna type	TRM29659.00 NONE	TRM41249.00 NONE
2007 03 20	2007 03 21	RIOD 41608M001	Receiver type	TRIMBLE 4000SSI	TRIMBLE NETRS
2007 05 14	2007 05 26	RIOP 42006M001	Antenna type	TRM29659.00 SCIT	TRM29659.00 NONE
2007 05 18	2007 06 07	SMAR 41621M001	Receiver type	TRIMBLE 4000SSI	TRIMBLE NETRS
2007 05 18	2007 06 07	SMAR 41621M001	Antenna type	TRM29659.00 NONE	TRM41249.00 NONE
2006 10 01	2008 03 01	UBER 41625M001	Receiver type	ASHTECH Z-FX	ASHTECH UZ-12
2006 10 01	2008 03 01	VARG 41626M001	Receiver type	ASHTECH Z-FX	ASHTECH UZ-12

Experimental Processing Centre IBGE

From	To	Station	Inconsistency	IBGE SINEX file	Log File
2007 06 03	2008 03 01	BELE 41622M001	Ant ecc (up)	0,0080 m	0,0075 m
2007 12 16	2008 03 01	BOGT 41901M001	Antenna type	ASH701945G_M NONE	ASH701945E_M NONE
2006 10 02	2007 03 11	BRAZ 41606M001	Antenna type	TRM29659.00 NONE	AOAD/M_T NONE
2006 10 01	2007 02 10	CFAG 41517S001	Receiver type	ASHTECH Z-XII3	TRIMBLE NETRS
2007 02 11	2008 03 01	CFAG 41517S001	Antenna type	ASH700936D_M SNOW	ASH700936D_M NONE
2007 02 25	2007 03 03	CFAG 41517S001	Receiver type	TRIMBLE NETR5	TRIMBLE NETRS
2006 10 01	2007 02 10	CONZ 41719M002	Receiver type	JPS LEGACY	TPS E_GGD
2006 10 12	2007 05 08	CRAT 41619M001	Ant ecc (up)	0,0080 m	0,0070 m
2006 10 01	2008 03 01	GVAL 41623M001	Receiver type	ASHTECH Z-FX	ASHTECH UZ-12
2006 10 02	2007 02 10	IGM1 41505M003	Antenna type	ASH700936C_M SNOW	ASH700936D_M SNOW
2006 10 06	2007 02 10	IGM1 41505M003	Receiver type	ASHTECH UZ-12	TRIMBLE NETRS
2006 10 12	2006 11 19	KOUR 97301M210	Receiver type	ASHTECH UZ-12	JPS LEGACY
2007 04 14		MAPA 41629M001	Receiver type	TRIMBLE NETRS	TRIMBLE 4000SSI
2006 10 01	2008 03 01	MCLA 41624M001	Receiver type	ASHTECH Z-FX	ASHTECH UZ-12
2006 11 19	2007 06 16	PARC 41716S001	Receiver type	ASHTECH Z-XII3	TRIMBLE NETRS
2006 10 01	2007 03 22	POVE 41628M001	Ant ecc (up)	0,0080 m	0,0075 m
2007 05 19	2007 06 16	RIOP 42006M001	Receiver type	ROGUE SNR-8000	TRIMBLE 4000SSI
2007 05 19	2007 06 16	RIOP 42006M001	Antenna type	AOAD/M_T NONE	TRM29659.00 NONE
2007 05 29		SMAR 41621M001	Receiver type	TRIMBLE 4000SSI	TRIMBLE NETRS
2007 05 29		SMAR 41621M001	Antenna type	TRM29659.00 NONE	TRM41249.00 NONE

From	To	Station	Inconsistency	IBGE SINEX file	Log File
2006 10 01	2007 02 10	TUCU 41520S001	Antenna type	AOAD/M_T NONE	ASH700936C_M SNOW
2006 10 01	2007 02 10	TUCU 41520S001	Receiver type	ASHTECH Z-XII3	TRIMBLE NETRS
2006 10 01	2008 03 01	UBER 41625M001	Receiver type	ASHTECH Z-FX	ASHTECH UZ-12
2006 10 01	2008 03 01	VARG 41626M001	Receiver type	ASHTECH Z-FX	ASHTECH UZ-12

Experimental Processing Centre IGAC

From	To	Station	Inconsistency	IGAC SINEX file	Log File
2007 12 23	2008 01 05	BOGT 41901M001	Antenna type	ASH701945G_M NONE	ASH701945E_M NONE
2007 02 11	2007 03 03	PIE1 40456M001	Antenna type	AOAD/M_T NONE	ASH701945E_M NONE
2007 04 22	2007 05 23	SSIA 41401S001	Receiver type	TRIMBLE 4000SSI	TRIMBLE NETRS

Annex 5: Reduced stations from the individual EPC solutions before combination (valid for the period GPS weeks 1395 - 1468)

Experimental Processing Centre CPLAT

Station	From YY MM DD HH MM SS	To YY MM DD HH MM SS	Reason
AREQ 42202M005	2006 10 03 00 00 00	2006 10 03 23 59 30	U -30,39
AREQ 42202M005	2007 03 09 00 00 00	2007 03 09 23 59 30	U -34,91
AREQ 42202M005	2007 03 17 00 00 00	2007 03 17 23 59 30	U -41,99
BELE 41622M001	2007 01 09 00 00 00	2007 01 09 23 59 30	U 33,15
BELE 41622M001	2007 01 14 00 00 00	2007 01 20 23 59 59	C1_1410
BELE 41622M001	2007 01 17 00 00 00	2007 01 17 23 59 30	E 31,10
BOGT 41901M001	2006 10 04 00 00 00	2006 10 04 23 59 30	U -52,27
BOGT 41901M001	2007 06 17 00 00 00	2007 06 17 23 59 30	U -31,83
BOMJ 41612M001	2007 08 05 00 00 00	2007 08 18 23 59 59	I1_1439_1440
BOMJ 41612M001	2007 08 05 00 00 00	2007 08 18 23 59 30	U 47,24...58,95
BOMJ 41612M001	2007 12 30 00 00 00	2008 01 05 23 59 59	C1_1460
BOMJ 41612M001	2007 12 30 00 00 00	2008 01 05 23 59 30	U 38,14...53,29
BRAZ 41606M001	2006 10 12 00 00 00	2006 10 12 23 59 30	U 38,47
BRAZ 41606M001	2007 03 11 00 00 00	2007 03 17 23 59 59	C1_1418
CFAG 41517S001	2007 08 26 00 00 00	2007 08 26 23 59 30	U -30,50
CONZ 41719M002	2006 10 10 00 00 00	2006 10 10 23 59 30	U -43,01
CONZ 41719M002	2006 11 09 00 00 00	2006 11 09 23 59 30	U -30,85
CRAT 41619M001	2007 06 10 00 00 00	2008 01 04 23 59 59	Antenna Type
CRO1 43201M001	2006 10 02 00 00 00	2006 10 03 23 59 30	U -51,29...-40,91
CRO1 43201M001	2006 10 12 00 00 00	2006 10 12 23 59 30	U -33,02
CRO1 43201M001	2006 12 31 00 00 00	2006 12 31 23 59 30	U -34,77
CRO1 43201M001	2007 03 21 00 00 00	2007 03 21 23 59 30	U -38,44
CRO1 43201M001	2007 05 29 00 00 00	2007 05 29 23 59 30	U 37,74
CRO1 43201M001	2007 06 08 00 00 00	2007 06 08 23 59 30	U 35,63
CRO1 43201M001	2007 08 26 00 00 00	2007 08 26 23 59 30	E 31,56
CUIB 41603M001	2007 04 01 00 00 00	2007 04 14 23 59 59	Antenna Type
CUIB 41603M001	2008 02 06 00 00 00	2008 02 06 23 59 30	U -34,34
GLPS 42005M002	2006 10 10 00 00 00	2006 10 10 23 59 30	U 34,55
GLPS 42005M002	2007 08 27 00 00 00	2007 08 27 23 59 30	E 29,06
GUAT 40901S001	2007 08 26 00 00 00	2007 08 27 23 59 30	E 32,53...35,17
GVAL 41623M001	2006 10 02 00 00 00	2006 10 07 23 59 59	C1_1395
GVAL 41623M001	2006 11 12 00 00 00	2006 11 12 23 59 30	U 30,72
GVAL 41623M001	2006 11 30 00 00 00	2006 11 30 23 59 30	U 33,26
GVAL 41623M001	2007 09 19 00 00 00	2007 09 19 23 59 30	U -32,09
JAMA 42601S001	2006 10 02 00 00 00	2006 10 02 23 59 30	U 30,01
JAMA 42601S001	2006 10 06 00 00 00	2006 10 06 23 59 30	U 33,00
JAMA 42601S001	2007 08 12 00 00 00	2007 09 01 23 59 59	I1_1440_1441_1442
JAMA 42601S001	2007 08 26 00 00 00	2007 08 27 23 59 30	E -366,24...-362,17
LPGS 41510M001	2007 04 15 00 00 00	2007 04 21 23 59 59	C2_1423
MANA 41201S001	2006 10 19 00 00 00	2006 10 19 23 59 30	U 34,48
MANA 41201S001	2007 07 10 00 00 00	2007 07 10 23 59 30	U 33,24
MANA 41201S001	2007 09 02 00 00 00	2007 09 15 23 59 59	C1_1443_1444
MCLA 41624M001	2008 02 04 00 00 00	2008 02 04 23 59 30	U 30,32
OHI2 66008M005	2006 10 02 00 00 00	2006 10 13 23 59 30	U -30,92...37,46
OHI2 66008M005	2006 10 24 00 00 00	2006 10 24 23 59 30	U -30,92
OHI2 66008M005	2007 07 08 00 00 00	2007 07 08 23 59 30	U 31,75
PMB1 43702S001	2007 03 19 00 00 00	2007 03 19 23 59 30	U -32,29
PMB1 43702S001	2007 10 06 00 00 00	2007 10 06 23 59 30	U 31,62
POAL 41616M001	2007 09 30 00 00 00	2007 10 04 23 59 59	Antenna Type
POVE 41628M001	2007 01 31 00 00 00	2007 01 31 23 59 30	U -31,90

Station	From YY MM DD HH MM SS	To YY MM DD HH MM SS	Reason
PUR3 82001S003	2006 10 02 00 00 00	2006 10 03 23 59 30	U -39,02...-40,14
PUR3 82001S003	2007 03 18 00 00 00	2007 03 31 23 59 59	C1_1419_1420
PUR3 82001S003	2007 03 21 00 00 00	2007 03 25 23 59 30	U 64,75...90,56
RIOD 41608M001	2007 03 20 00 00 00	2007 03 21 23 59 30	Antenna Type
RIOP 42006M001	2007 05 14 00 00 00	2007 05 26 23 59 30	Antenna Type
SCUB 40701M001	2006 10 03 00 00 00	2006 10 03 23 59 30	U 67,64
SCUB 40701M001	2007 09 09 00 00 00	2007 09 15 23 59 30	C4_1444
SMAR 41621M001	2007 05 18 00 00 00	2007 06 09 23 59 30	Antenna Type
SSIA 41401S001	2007 08 26 00 00 00	2007 08 27 23 59 30	E 33,18...35,93
SSIA 41401S001	2007 10 20 00 00 00	2007 10 20 23 59 30	U -32,51
UBAT 41627M001	2007 04 12 00 00 00	2007 04 12 23 59 30	U -30,22
UBER 41625M001	2006 10 12 00 00 00	2006 10 12 23 59 30	U 40,50

Experimental Processing Centre IBGE

Station	From YY MM DD HH MM SS	To YY MM DD HH MM SS	Reason
AREQ 42202M005	2006 11 12 00 00 00	2006 11 12 23 59 30	U -42,63
AREQ 42202M005	2007 01 02 00 00 00	2007 01 02 23 59 30	U -52,47
AREQ 42202M005	2007 01 24 00 00 00	2007 01 24 23 59 30	U -30,31
AREQ 42202M005	2007 01 30 00 00 00	2007 01 30 23 59 30	U -34,61
AREQ 42202M005	2007 02 26 00 00 00	2007 02 26 23 59 30	U -32,94
AREQ 42202M005	2007 03 13 00 00 00	2007 03 13 23 59 30	U -37,19
AREQ 42202M005	2007 03 16 00 00 00	2007 03 16 23 59 30	U 33,69
AREQ 42202M005	2007 03 25 00 00 00	2007 03 25 23 59 30	U 33,07
AREQ 42202M005	2007 04 28 00 00 00	2007 04 28 23 59 30	U 30,49
AREQ 42202M005	2008 02 14 00 00 00	2008 02 14 23 59 30	U -40,61
BANS 42403M001	2008 03 05 00 00 00	2008 03 05 23 59 30	U 32,59
BELE 41622M001	2007 01 09 00 00 00	2007 01 09 23 59 30	U 40,81
BOGT 41901M001	2006 10 25 00 00 00	2006 10 25 23 59 30	E 30,78
BOMJ 41612M001	2007 12 30 00 00 00	2008 01 05 23 59 59	C1_1460
BRAZ 41606M001	2006 10 02 00 00 00	2007 03 11 23 59 59	Antenna Type
BRFT 41602M002	2007 02 28 00 00 00	2007 02 28 23 59 30	U 38,71
CONZ 41719M002	2008 01 13 00 00 00	2008 01 19 23 59 30	U -88,63...E 139,56
CRAT 41619M001	2007 06 10 00 00 00	2007 06 16 23 59 59	C1_1431
CRAT 41619M001	2007 06 24 00 00 00	2007 06 30 23 59 59	C1_1433
CRAT 41619M001	2007 12 27 00 00 00	2008 01 05 23 59 59	C1_1460
CRCS 42401M001	2006 10 25 00 00 00	2006 10 25 23 59 30	E 32,97
CRCS 42401M001	2008 02 25 00 00 00	2008 02 25 23 59 30	U 30,48
CRCS 42401M001	2006 11 19 00 00 00	2006 11 19 23 59 30	U -30,19
CUIB 41603M001	2007 09 24 00 00 00	2007 09 24 23 59 30	U 34,45
CUIB 41603M001	2007 04 01 00 00 00	2007 04 07 23 59 59	C1_1421
GLPS 42005M002	2008 02 24 00 00 00	2008 03 01 23 59 59	C1_1468
GLPS 42005M002	2006 10 09 00 00 00	2006 10 09 23 59 30	U 36,14
GLPS 42005M002	2007 03 20 00 00 00	2007 03 20 23 59 30	N 33,96
GVAL 41623M001	2007 01 20 00 00 00	2007 01 20 23 59 30	U -40,82
IGM1 41505M003	2006 10 02 00 00 00	2007 02 10 23 59 59	Antenna Type
IMBT 41638M001	2007 09 01 00 00 00	2007 09 01 23 59 30	U -31,20
IMPZ 41615M001	2006 10 23 00 00 00	2006 10 23 23 59 30	U -37,83
IMPZ 41615M001	2007 01 19 00 00 00	2007 01 19 23 59 30	U 30,10
IMPZ 41615M001	2007 09 26 00 00 00	2007 09 26 23 59 30	U 33,09
IMPZ 41615M001	2007 10 31 00 00 00	2007 10 31 23 59 30	U 32,40
KOUR 97301M210	2007 01 19 00 00 00	2007 01 19 23 59 30	U 30,35
KOUR 97301M210	2007 03 25 00 00 00	2007 03 25 23 59 30	U -35,90
LPGS 41510M001	2007 09 16 00 00 00	2007 09 29 23 59 59	C1_1445 C3_1446
LPGS 41510M001	2007 04 15 00 00 00	2007 04 21 23 59 59	C1_1423
MABA 41642M001	2007 12 22 00 00 00	2007 12 22 23 59 30	U 30,45

Station	From YY MM DD HH MM SS	To YY MM DD HH MM SS	Reason
MABA 41642M001	2008 01 09 00 00 00	2008 01 09 23 59 30	U 31,27
MARA 42402M001	2006 10 09 00 00 00	2006 10 09 23 59 30	U -55,00
MARA 42402M001	2007 09 24 00 00 00	2007 09 24 23 59 30	U -35,81
MARA 42402M001	2006 10 25 00 00 00	2006 10 25 23 59 30	E 28,05
MARA 42402M001	2008 02 29 00 00 00	2008 02 29 23 59 30	U 33,65
MCLA 41624M001	2008 02 04 00 00 00	2008 02 04 23 59 30	U 37,04
MZAS 41528M001	2007 04 22 00 00 00	2007 04 22 23 59 30	U -30,11
MZAS 41528M001	2007 05 03 00 00 00	2007 05 03 23 59 30	U -30,26
MZAS 41528M001	2007 05 06 00 00 00	2007 05 06 23 59 30	U -30,14
NEIA 41620M002	2007 04 26 00 00 00	2007 04 26 23 59 30	U 33,35
NEIA 41620M002	2007 02 14 00 00 00	2007 02 14 23 59 30	U -33,27
NEIA 41620M002	2008 01 13 00 00 00	2008 01 13 23 59 30	U -36,59
OHI2 66008M005	2006 10 02 00 00 00	2006 10 12 23 59 30	U 35,16...62,13
OHI2 66008M005	2006 10 19 00 00 00	2006 10 19 23 59 30	U 30,18
OHI2 66008M005	2006 10 23 00 00 00	2006 10 23 23 59 30	U -31,20
OHI2 66008M005	2007 03 20 00 00 00	2007 03 20 23 59 30	U -31,39
ONRJ 41635M001	2007 12 08 00 00 00	2007 12 08 23 59 30	U -36,89
PMB1 43702S001	2006 10 25 00 00 00	2006 10 25 23 59 30	E 37,79
POAL 41616M001	2007 09 30 00 00 00	2007 10 06 23 59 59	C1_1447
POLI 41630M001	2007 01 19 00 00 00	2007 01 19 23 59 30	U -33,11
POLI 41630M001	2007 03 04 00 00 00	2007 03 10 23 59 59	C4_1417
RECF 41617M001	2007 07 10 00 00 00	2007 07 10 23 59 30	U 31,93
RIOP 42006M001	2007 05 19 00 00 00	2007 06 16 23 59 30	Antenna Type
SMAR 41621M001	2007 05 29 00 00 00	2007 05 29 23 59 30	U 32,77...39,48
SMAR 41621M001	2007 08 18 00 00 00	2007 08 19 23 59 30	U 32,77...39,48
SRNW 43703M001	2007 11 18 00 00 00	2007 11 18 23 59 30	U 35,95
SRNW 43703M001	2008 02 08 00 00 00	2008 02 08 23 59 30	U 30,86
SRNW 43703M001	2006 10 25 00 00 00	2006 10 25 23 59 30	E 36,66
SRZN 43701S005	2006 10 25 00 00 00	2006 10 25 23 59 30	E 40,59
TUCU 41520S001	2006 10 02 00 00 00	2007 02 10 23 59 30	Antenna Type
TUCU 41520S001	2007 02 15 00 00 00	2007 02 15 23 59 30	U 35,72
TUCU 41520S001	2007 01 24 00 00 00	2007 01 24 23 59 30	U -31,33
UBAT 41627M001	2008 03 14 00 00 00	2008 03 14 23 59 30	U 32,41
UBER 41625M001	2006 12 08 00 00 30	2006 12 08 23 59 30	U 37,23
UBER 41625M001	2007 12 03 00 00 00	2007 12 03 23 59 30	U 32,55
UNSA 41514M001	2007 01 04 00 00 00	2007 01 04 23 59 30	U -30,15
UNSA 41514M001	2007 12 16 00 00 00	2007 12 17 23 59 30	N 30,35...28,47

Experimental Processing Centre IGAC

Station	From YY MM DD HH MM SS	To YY MM DD HH MM SS	Reason
BDOS 43401M001	2006 12 08 00 00 00	2006 12 08 23 59 30	U -30,76
BDOS 43401M001	2007 01 14 00 00 00	2007 01 20 23 59 59	C3_1410
BDOS 43401M001	2007 08 03 00 00 00	2007 08 03 23 59 30	U -31,70
BQLA 41934S001	2007 12 17 00 00 00	2007 12 17 23 59 30	U -31,36
CAM2 40514M001	2007 09 30 00 00 00	2007 09 30 23 59 30	U -30,13
CHPI 41609M003	2007 01 16 00 00 00	2007 01 16 23 59 30	U -30,30
CRO1 43201M001	2007 06 03 00 00 00	2007 06 09 23 59 59	C2_1430
FLOR 41916S001	2007 04 01 00 00 00	2007 04 01 23 59 30	U 35,61
GLPS 42005M002	2008 02 24 00 00 00	2008 03 01 23 59 59	C1_1468
JAMA 42601S001	2007 04 12 00 00 00	2007 04 12 23 59 30	U 30,87
MANA 41201S001	2006 10 15 00 00 00	2006 10 21 23 59 30	C4_1397
MANA 41201S001	2007 02 23 00 00 00	2007 02 23 23 59 30	U -50,92
MANA 41201S001	2007 05 14 00 00 00	2007 05 14 23 59 30	U 31,17
MANA 41201S001	2007 07 08 00 00 00	2007 07 14 23 59 59	C1_1435
MANA 41201S001	2007 07 22 00 00 00	2007 07 28 23 59 59	C1_1437

Station	From YY MM DD HH MM SS	To YY MM DD HH MM SS	Reason
MANA 41201S001	2007 08 19 00 00 00	2007 08 25 23 59 59	C2_1441
MANA 41201S001	2007 09 30 00 00 00	2007 10 06 23 59 59	C3_1447
OAX2 40517M001	2007 12 03 00 00 00	2007 12 04 23 59 30	U 32,65...33,16
OAX2 40517M001	2007 12 16 00 00 00	2007 12 16 23 59 30	U 30,63
OAX2 40517M001	2007 12 30 00 00 00	2007 12 30 23 59 30	U 34,11
OAX2 40517M001	2008 01 11 00 00 00	2008 01 11 23 59 30	U 30,40
OAX2 40517M001	2008 01 23 00 00 00	2008 01 23 23 59 30	U 30,84
PUR3 82001S003	2007 03 18 00 00 00	2007 03 31 23 59 59	I1_1419_1420
RIOH 41927S001	2006 11 25 00 00 00	2006 11 25 23 59 30	U -33,68
SAMA 41928S001	2006 10 02 00 00 00	2006 10 02 23 59 30	U -30,93
SAMA 41928S001	2006 11 10 00 00 00	2006 11 10 23 59 30	U -30,10
SAMA 41928S001	2007 11 27 00 00 00	2007 11 30 23 59 30	U -30,43...-51,90
SAMA 41928S001	2007 12 04 00 00 00	2007 12 04 23 59 30	U -30,43
SAMA 41928S001	2007 12 17 00 00 00	2007 12 17 23 59 30	U -35,28
SAMA 41928S001	2008 01 17 00 00 00	2008 01 17 23 59 30	U -39,78
SCUB 40701M001	2007 09 09 00 00 00	2007 09 15 23 59 59	C3_1444
SCUB 40701M001	2007 12 11 00 00 00	2007 12 11 23 59 30	U -38,13
UNSA 41514M001	2007 12 16 00 00 00	2007 12 18 23 59 30	N 20,20...27,90
VIL2 40527M001	2007 09 23 00 00 00	2007 09 23 23 59 30	U -31,87
VIL2 40527M001	2007 10 11 00 00 00	2007 10 11 23 59 30	U -32,95
VIL2 40527M001	2007 11 03 00 00 00	2007 11 03 23 59 30	U -34,51
VIVI 41931S001	2007 02 15 00 00 00	2007 02 15 23 59 30	U 33,04

Annex 6: Comparison of the individual weekly Experimental Processing Centre solutions with the final weekly combined solutions

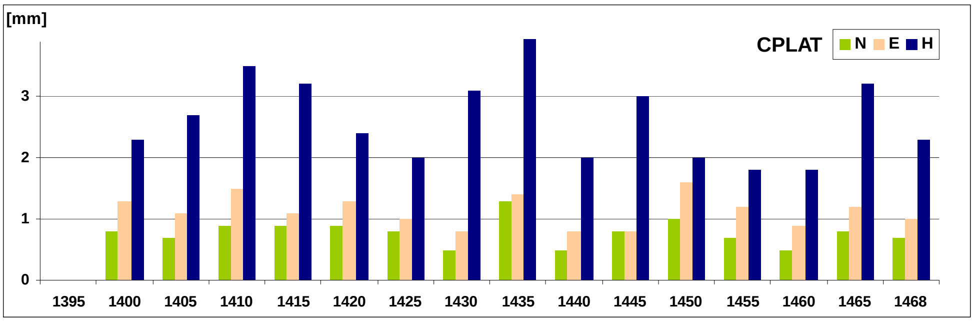


__Figure A6.1.__ Residuals after a 7-parameter similarity transformation between weekly CPLAT solutions and the final weekly combined solutions (values each fifth week are shown,)
Mean RMS values over the period GPS weeks 1396 - 1468:
N = 0,79 mm, E = 1,18 mm, H = 2,57 mm.

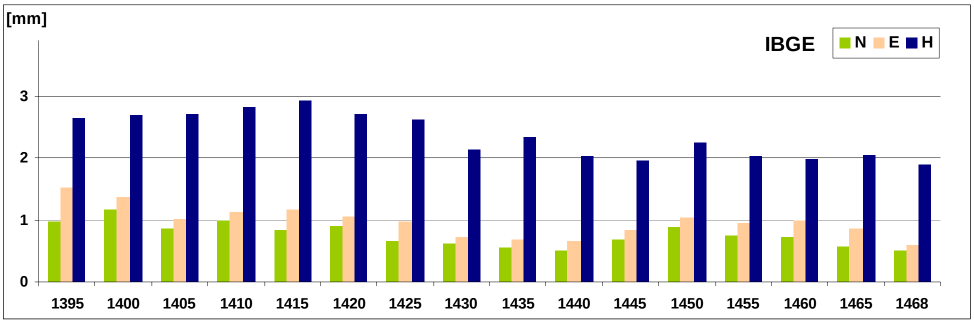


__Figure A6.2.__ Residuals after a 7-parameter similarity transformation between weekly IBGE solutions and the final weekly combined solutions (values each fifth week are shown,)
Mean RMS values over the period GPS weeks 1396 - 1468:
N = 0,79 mm, E = 1,00 mm, H = 2,70 mm.

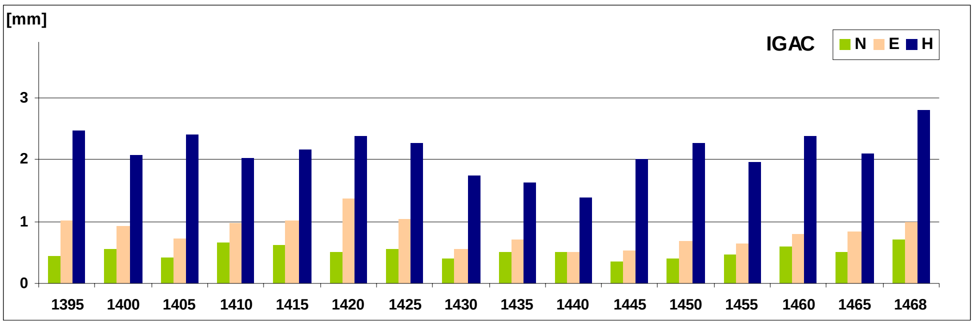


__Figure A6.3.__ Residuals after a 7-parameter similarity transformation between weekly IGAC solutions and the final weekly combined solutions (values each fifth week are shown,)
Mean RMS values over the period GPS weeks 1396 - 1468:
N = 0,50 mm, E = 0,82 mm, H = 2,10 mm.

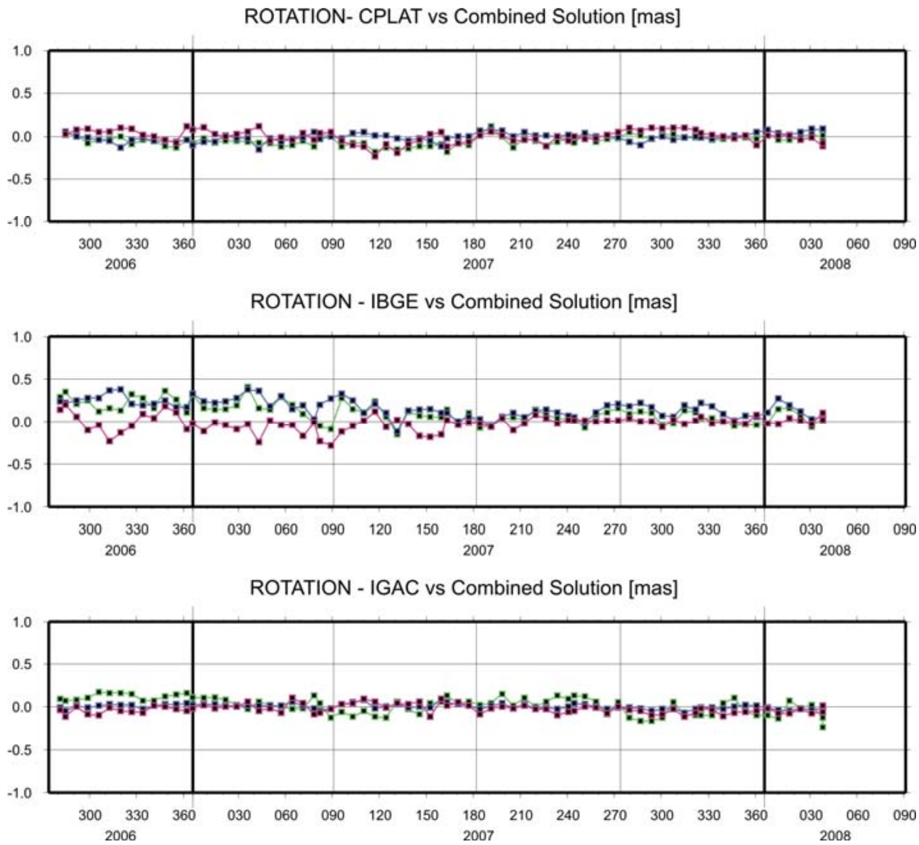


Figure A6.4. *Time series for the rotation parameters in X, Y, Z between individual EPC solutions and the final weekly combined solutions after a 7-parameter similarity transformation.*

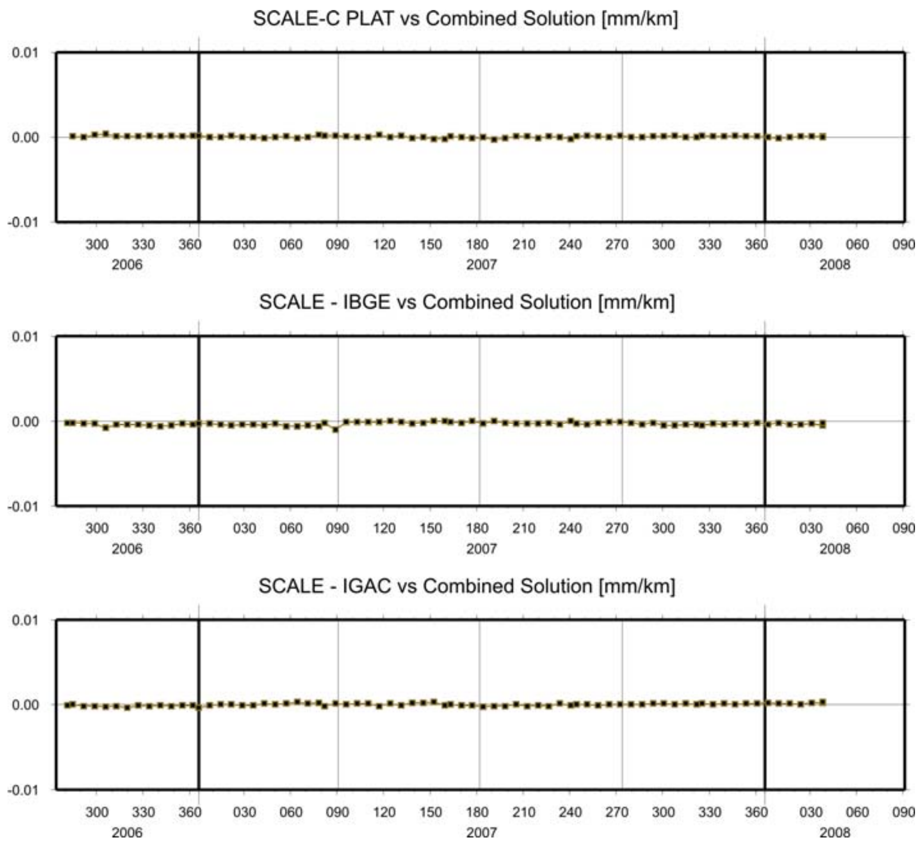


Figure A6.5. *Time series for the scale parameter between individual EPC solutions and the final weekly combined solutions after a 7-parameter similarity transformation.*

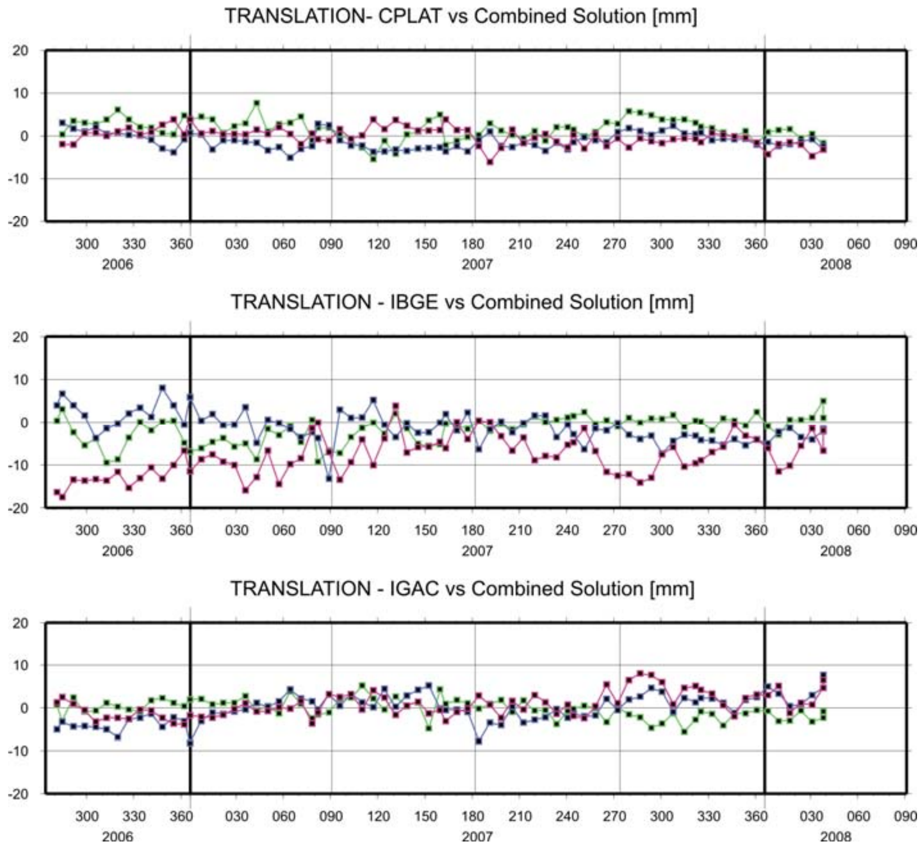


Figure A6.6. *Time series for the translation parameters in X, Y, Z between individual EPC solutions and the final weekly combined solutions after a 7-parameter similarity transformation.*

Annex 7: Comparison of the individual weekly Experimental Processing Centre solutions with the weekly combination of the IGS Global Network

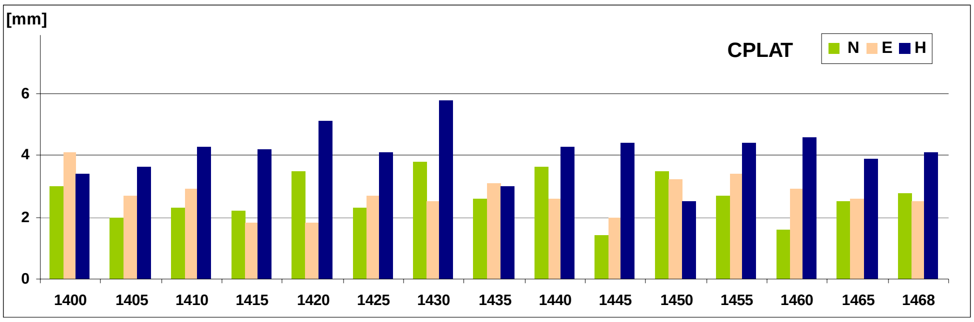


Figure A7.1. *Residuals after a direct comparison between constrained weekly CPLAT coordinates (after NNT+NNR to IGS05 values) and weekly coordinates from the IGS global network combination (values each fifth week are shown),*
Mean RMS values over the period GPS weeks 1396 - 1468:
N = 2,65 mm, E = 2,72 mm, H = 4,11 mm.

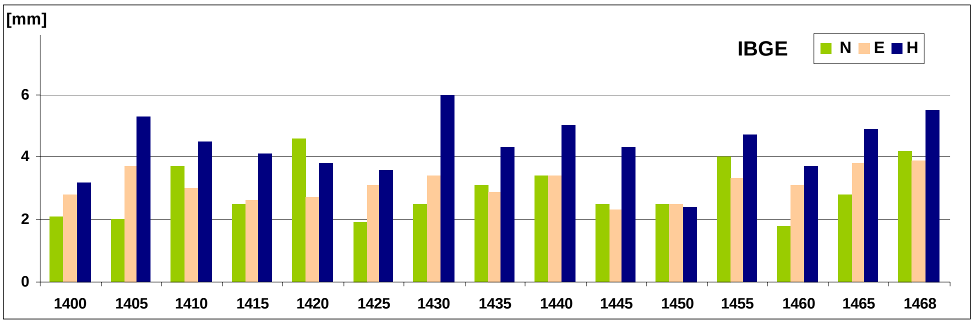


Figure A7.2. *Residuals after a direct comparison between constrained weekly IBGE coordinates (after NNT+NNR to IGS05 values) and weekly coordinates from the IGS global network combination (values each fifth week are shown),*
Mean RMS values over the period GPS weeks 1396 - 1468:
N = 2,91 mm, E = 3,10 mm, H = 4,35 mm.

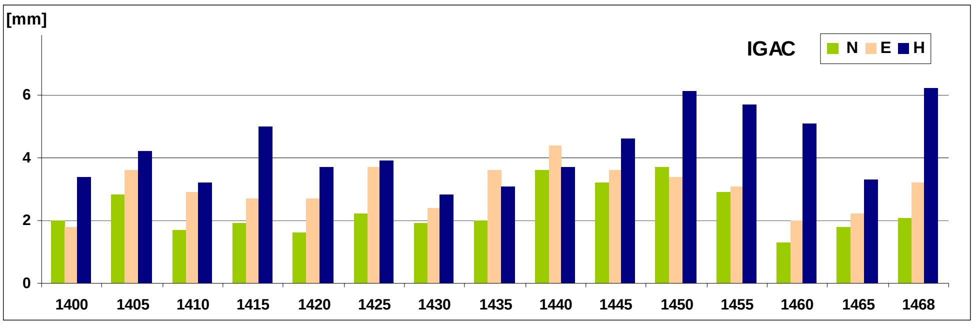


Figure A7.1. *Residuals after a direct comparison between constrained weekly IGAC coordinates (after NNT+NNR to IGS05 values) and weekly coordinates from the IGS global network combination (values each fifth week are shown),*
Mean RMS values over the period GPS weeks 1396 - 1468:
N = 2,31 mm, E = 3,02 mm, H = 4,30 mm.

Annex 8: Time series for station coordinates after each SIRGAS Experimental Processing Centre, the final combined solution, and the constrained weekly solutions processed by the IGS-RNAAC-SIR (DGFI) for the period covered by the GPS weeks 1395 until 1468

In the following, the time series for 142 stations are presented. Time series for the SIRGAS Experimental Processing Centres correspond to the original delivered solutions, i.e. they include outliers, station equipment inconsistencies, etc. Combined solution comprised the individual solutions of CPLAT, IBGE, and IGAC. Time series for the combination correspond to the final computation, i.e. stations listed in Annex 5 are already reduced. DGFI time series start in the GPS week 1400, because before relative PCVs were applied. All time series are derived after constraining the networks by not net rotation and not net translation conditions with respect to the IGS05 stations included in each solution. The presentation diagram is:

Time series for the final combined solution

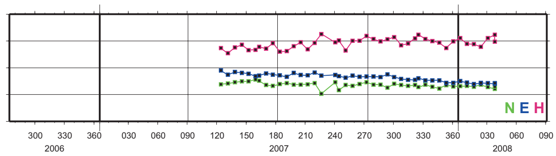
Time series for the IGAC weekly solutions

Time series for the IGS-RNAAC-SIR weekly constrained solutions (DGFI)

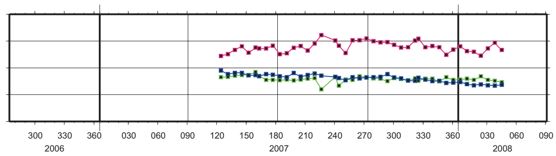
Time series for the IBGE weekly solutions

Time series for the CPLAT weekly solutions

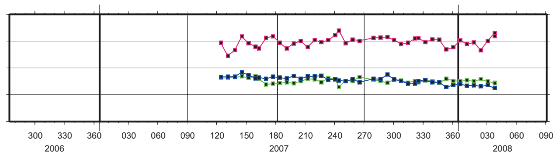
ANDS-Combined Solution Coordinate variations [mm]



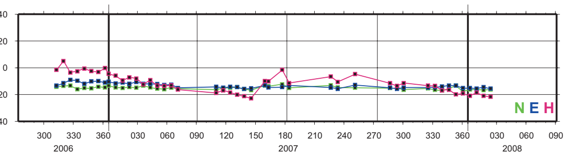
ANDS-IGAC Coordinate variations [mm]



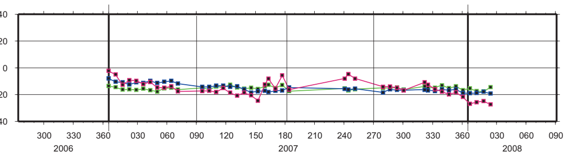
ANDS-DGFI Coordinate variations [mm]



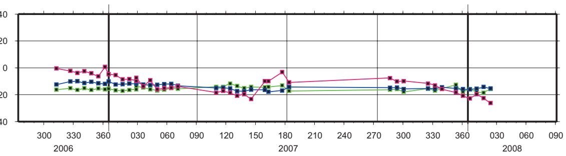
ANTC-Combined Solution Coordinate variations [mm]



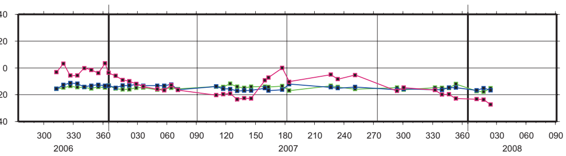
ANTC-DGFI Coordinate variations [mm]



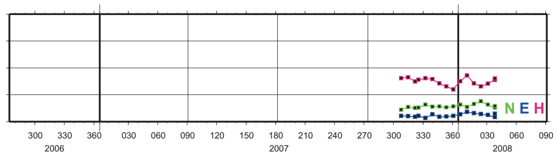
ANTC-IBGE Coordinate variations [mm]



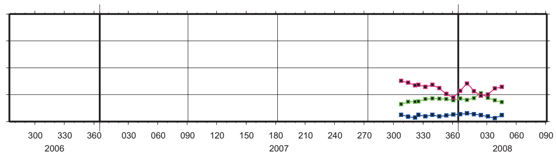
ANTC-CPLAT Coordinate variations [mm]



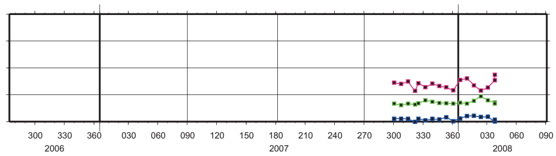
APTO-Combined Solution Coordinate variations [mm]



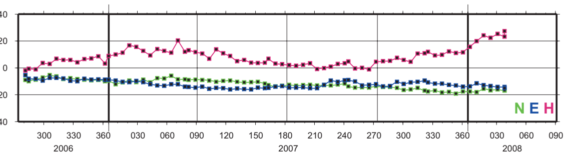
APTO-IGAC Coordinate variations [mm]



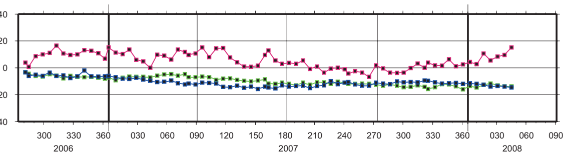
APTO-DGFI Coordinate variations [mm]



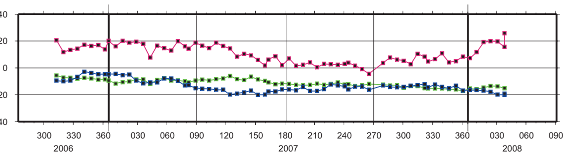
AREQ-Combined Solution Coordinate variations [mm]



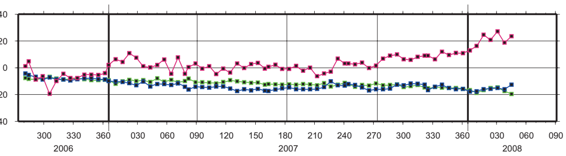
AREQ-IGAC Coordinate variations [mm]



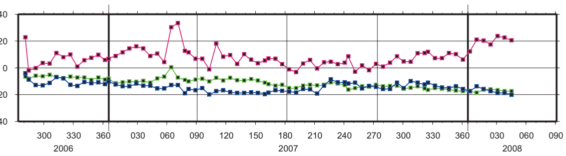
AREQ-DGFI Coordinate variations [mm]



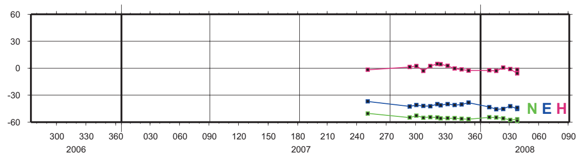
AREQ-IBGE Coordinate variations [mm]



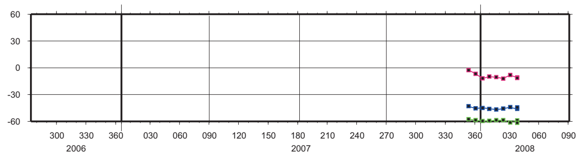
AREQ-CPLAT Coordinate variations [mm]



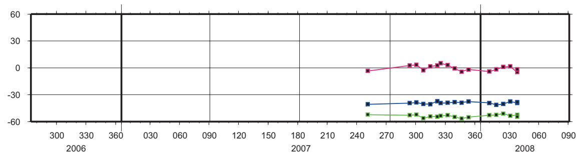
AUTF-Combined Solution Coordinate variations [mm]



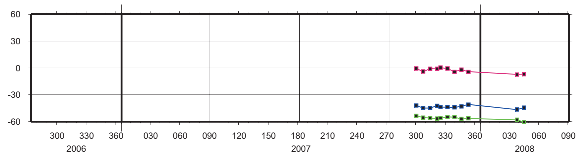
AUTF-DGFI Coordinate variations [mm]



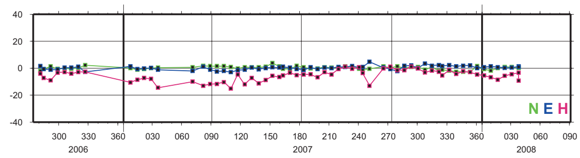
AUTF-IBGE Coordinate variations [mm]



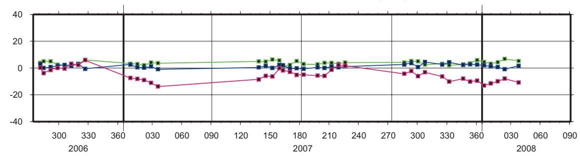
AUTF-CPLAT Coordinate variations [mm]



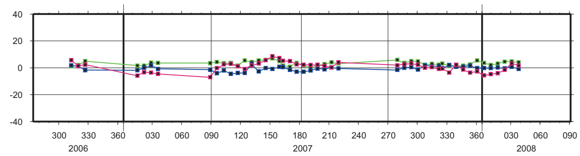
BANS-Combined Solution Coordinate variations [mm]



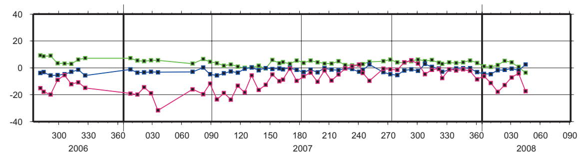
BANS-IGAC Coordinate variations [mm]



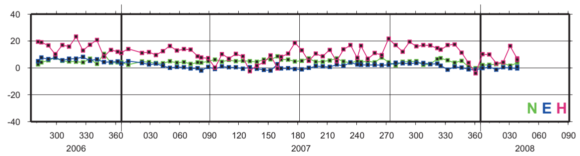
BANS-DGFI Coordinate variations [mm]



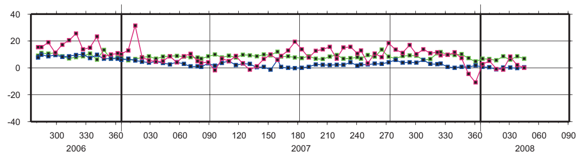
BANS-IBGE Coordinate variations [mm]



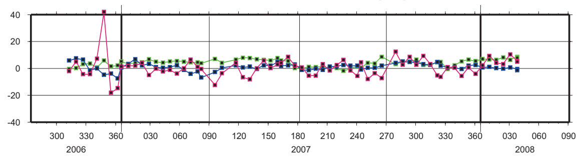
BDOS-Combined Solution Coordinate variations [mm]



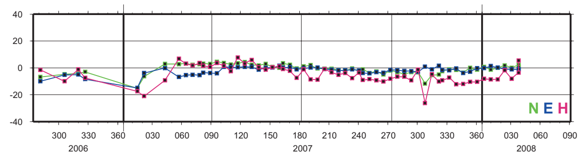
BDOS-IGAC Coordinate variations [mm]



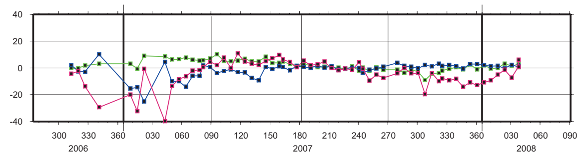
BDOS-DGFI Coordinate variations [mm]



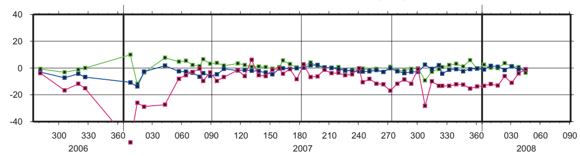
BELE-Combined Solution Coordinate variations [mm]



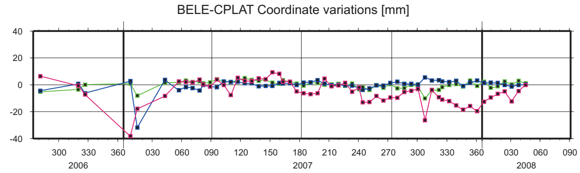
BELE-DGFI Coordinate variations [mm]



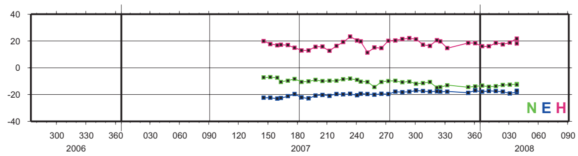
BELE-IBGE Coordinate variations [mm]



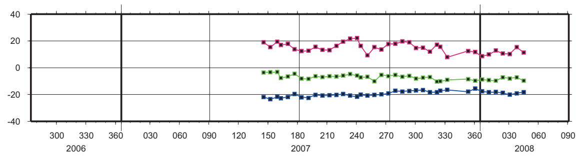
BELE-CPLAT Coordinate variations [mm]



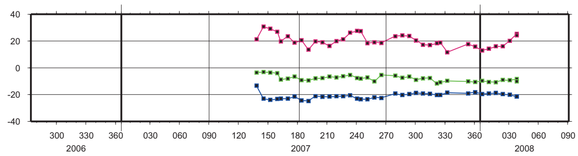
BERR-Combined Solution Coordinate variations [mm]



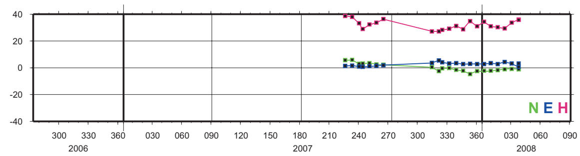
BERR-IGAC Coordinate variations [mm]



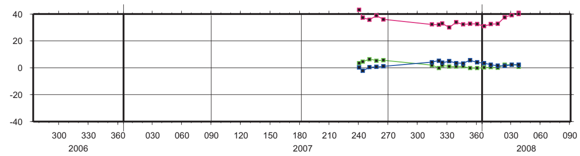
BERR-DGFI Coordinate variations [mm]



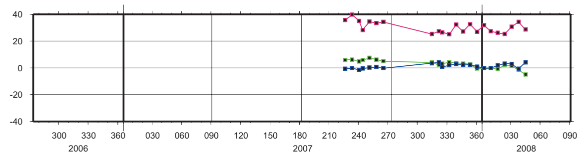
BOAV-Combined Solution Coordinate variations [mm]



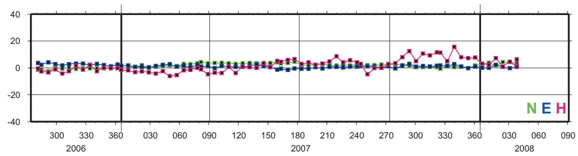
BOAV-DGFI Coordinate variations [mm]



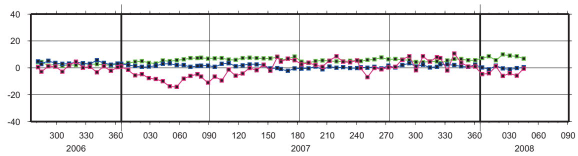
BOAV-IBGE Coordinate variations [mm]



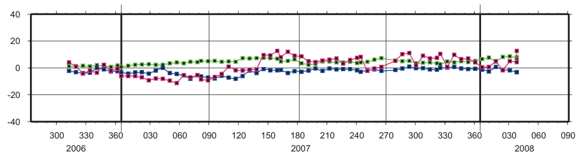
BOGA-Combined Solution Coordinate variations [mm]



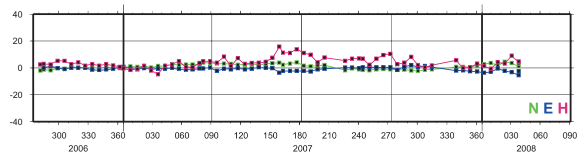
BOGA-IGAC Coordinate variations [mm]



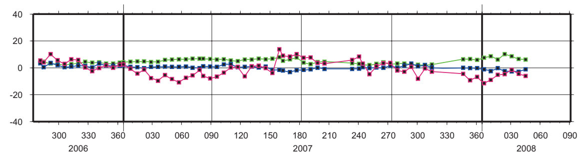
BOGA-DGFI Coordinate variations [mm]



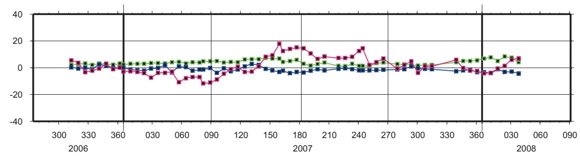
BOGT-Combined Solution Coordinate variations [mm]



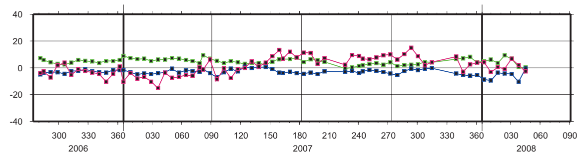
BOGT-IGAC Coordinate variations [mm]



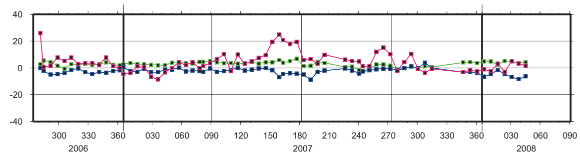
BOGT-DGFI Coordinate variations [mm]



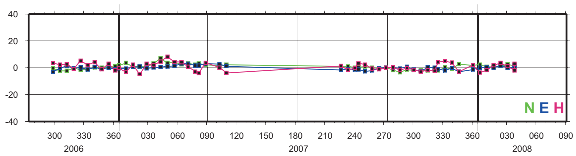
BOGT-IBGE Coordinate variations [mm]



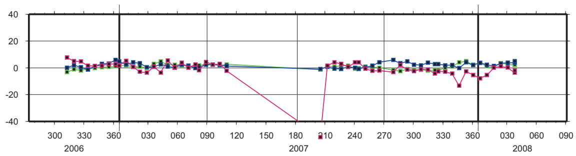
BOGT-CPLAT Coordinate variations [mm]



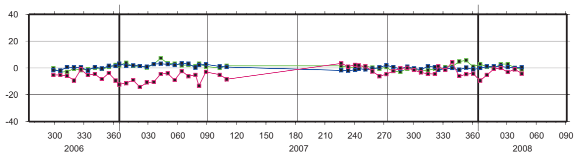
BOMJ-Combined Solution Coordinate variations [mm]



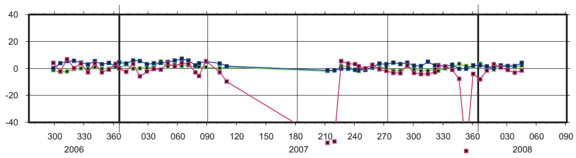
BOMJ-DGFI Coordinate variations [mm]



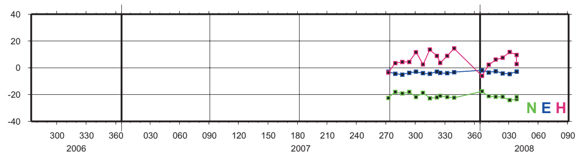
BOMJ-IBGE Coordinate variations [mm]



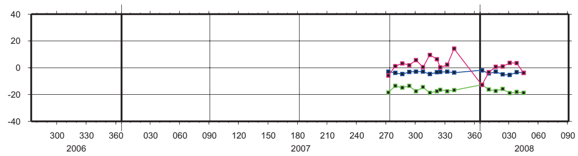
BOMJ-CPLAT Coordinate variations [mm]



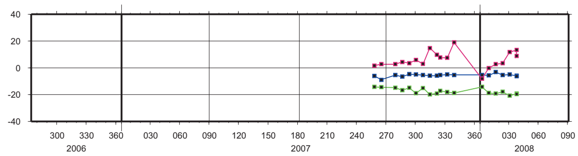
BQLA-Combined Solution Coordinate variations [mm]



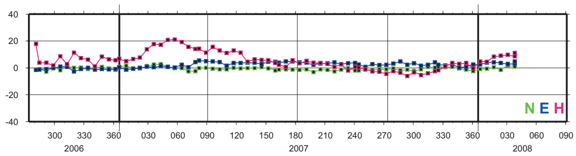
BQLA-IGAC Coordinate variations [mm]



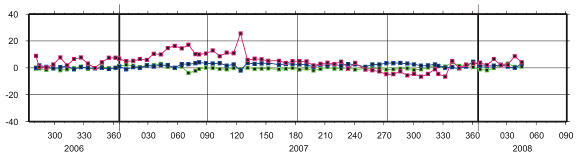
BQLA-DGFI Coordinate variations [mm]



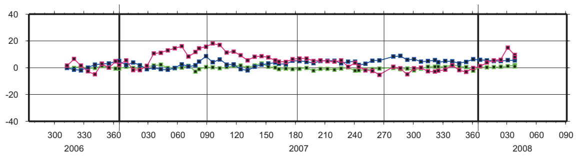
BRAZ-Combined Solution Coordinate variations [mm]



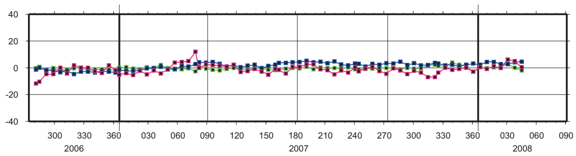
BRAZ-IGAC Coordinate variations [mm]



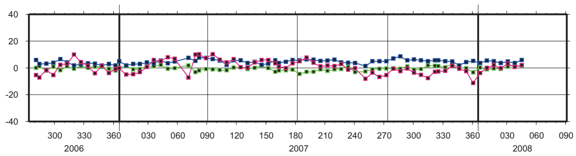
BRAZ-DGFI Coordinate variations [mm]



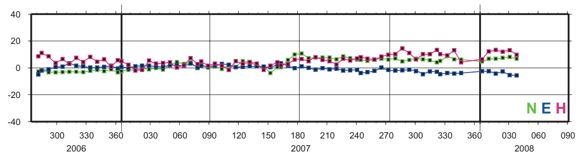
BRAZ-IBGE Coordinate variations [mm]



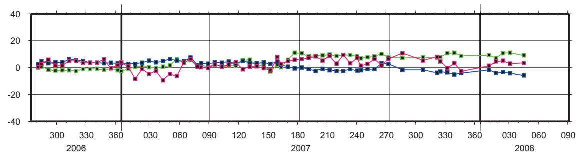
BRAZ-CPLAT Coordinate variations [mm]



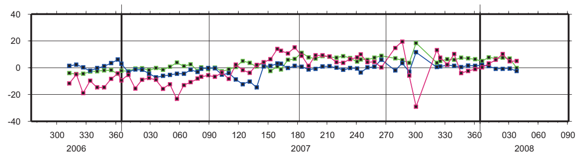
BRFT-Combined Solution Coordinate variations [mm]



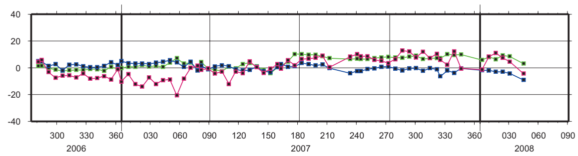
BRFT-IGAC Coordinate variations [mm]



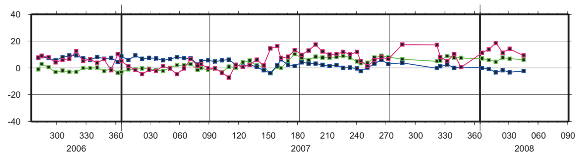
BRFT-DGFI Coordinate variations [mm]



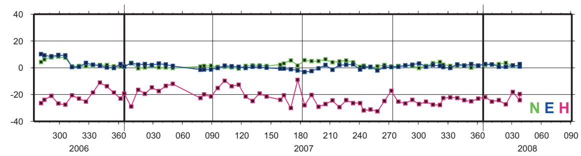
BRFT-IBGE Coordinate variations [mm]



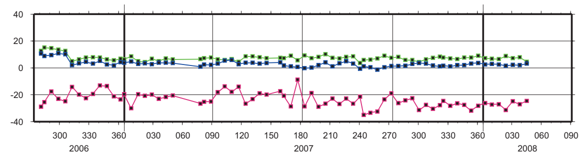
BRFT-CPLAT Coordinate variations [mm]



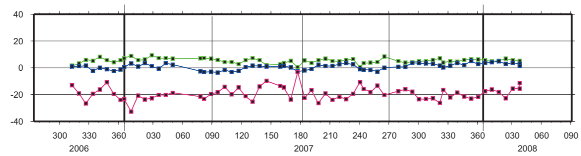
BRMU-Combined Solution Coordinate variations [mm]



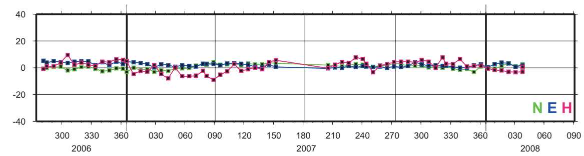
BRMU-IGAC Coordinate variations [mm]



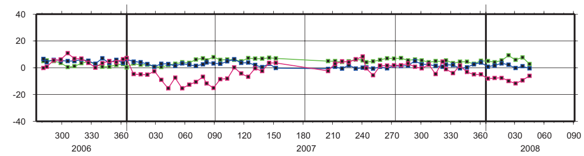
BRMU-DGFI Coordinate variations [mm]



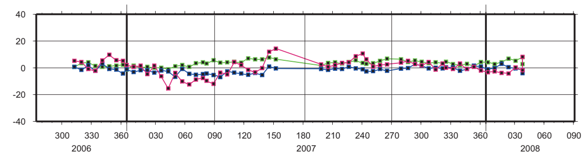
BUCA-Combined Solution Coordinate variations [mm]



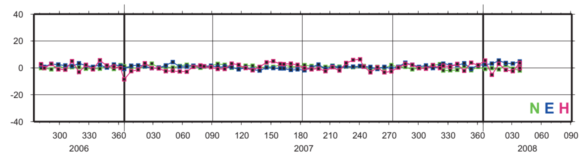
BUCA-IGAC Coordinate variations [mm]



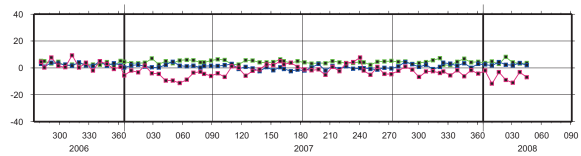
BUCA-DGFI Coordinate variations [mm]



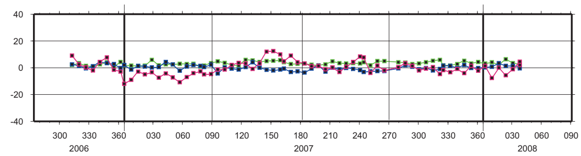
BUEN-Combined Solution Coordinate variations [mm]



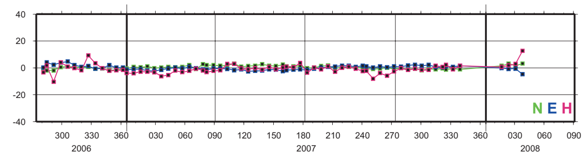
BUEN-IGAC Coordinate variations [mm]



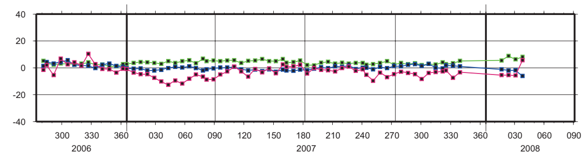
BUEN-DGFI Coordinate variations [mm]



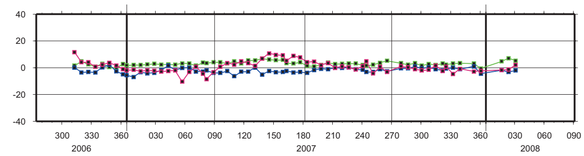
CALI-Combined Solution Coordinate variations [mm]



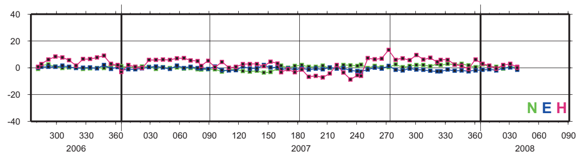
CALI-IGAC Coordinate variations [mm]



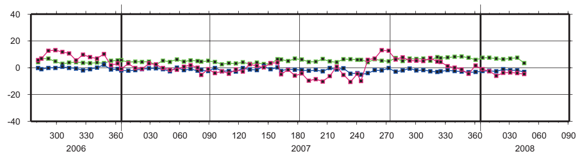
CALI-DGFI Coordinate variations [mm]



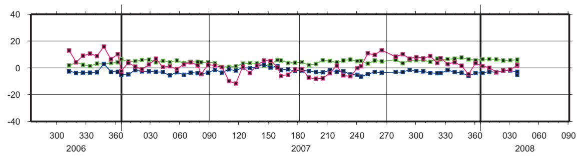
CAM2-Combined Solution Coordinate variations [mm]



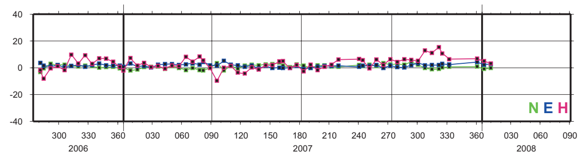
CAM2-IGAC Coordinate variations [mm]



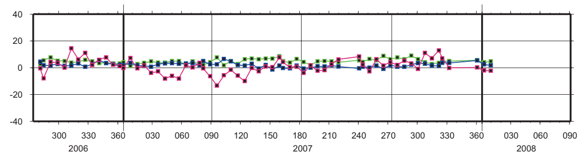
CAM2-DGFI Coordinate variations [mm]



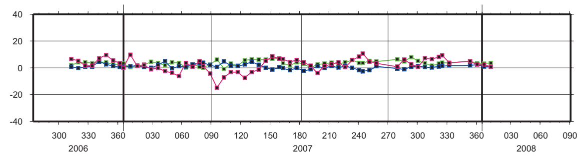
CART-Combined Solution Coordinate variations [mm]



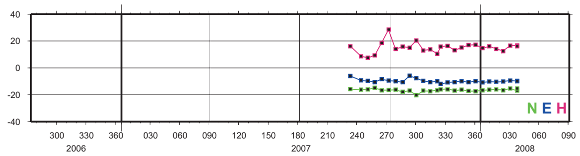
CART-IGAC Coordinate variations [mm]



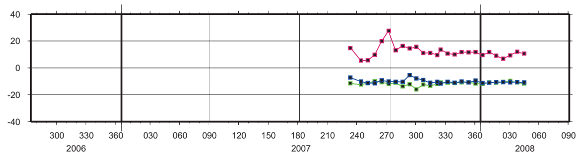
CART-DGFI Coordinate variations [mm]



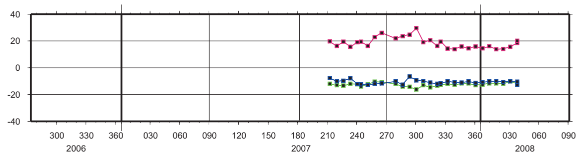
CBSB-Combined Solution Coordinate variations [mm]



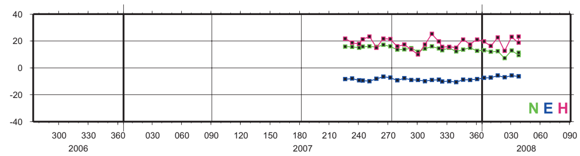
CBSB-IGAC Coordinate variations [mm]



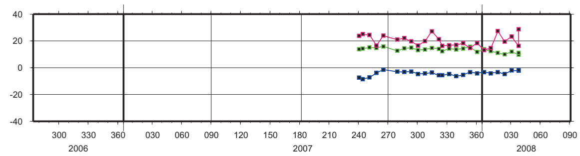
CBSB-DGFI Coordinate variations [mm]



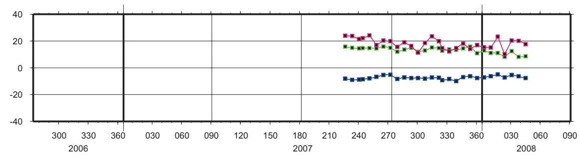
CEFE-Combined Solution Coordinate variations [mm]



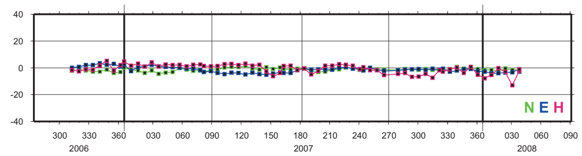
CEFE-DGFI Coordinate variations [mm]



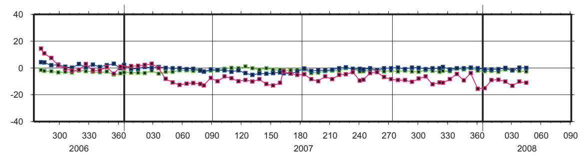
CEFE-IBGE Coordinate variations [mm]



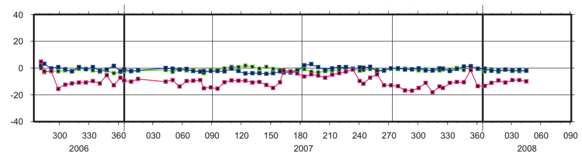
CFAG-DGFI Coordinate variations [mm]



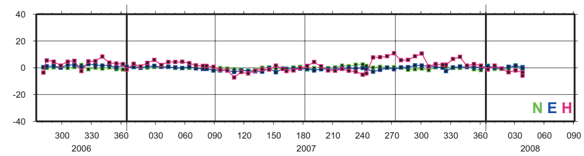
CFAG-IBGE Coordinate variations [mm]



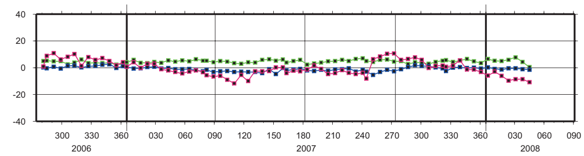
CFAG-CPLAT Coordinate variations [mm]



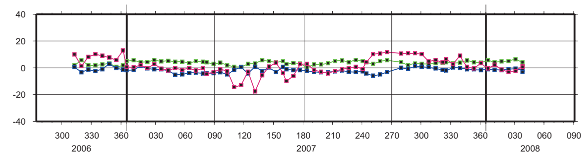
CHET-Combined Solution Coordinate variations [mm]



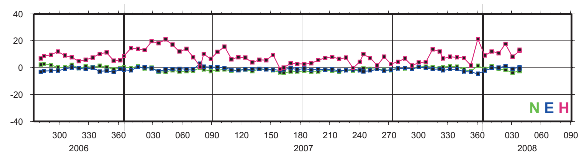
CHET-IGAC Coordinate variations [mm]



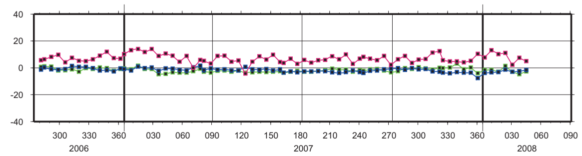
CHET-DGFI Coordinate variations [mm]



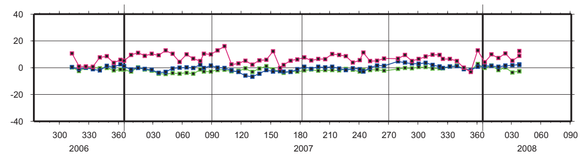
CHPI-Combined Solution Coordinate variations [mm]



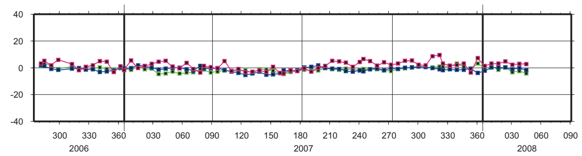
CHPI-IGAC Coordinate variations [mm]



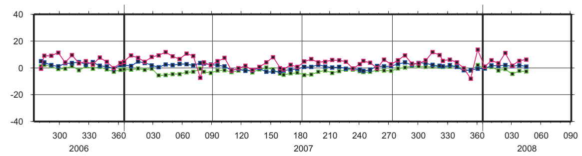
CHPI-DGFI Coordinate variations [mm]



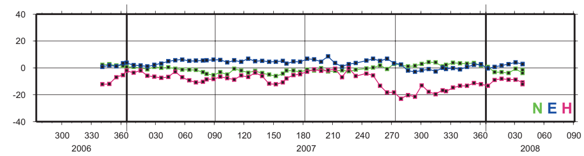
CHPI-IBGE Coordinate variations [mm]



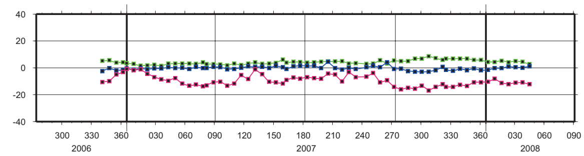
CHPI-CPLAT Coordinate variations [mm]



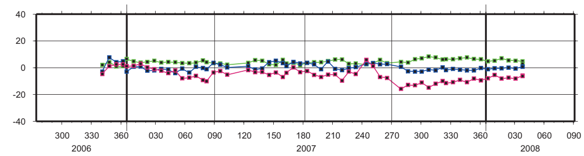
CIC1-Combined Solution Coordinate variations [mm]



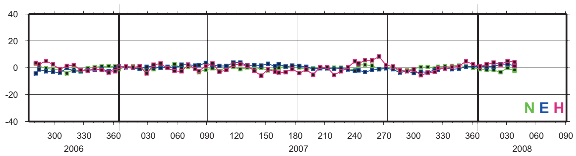
CIC1-IGAC Coordinate variations [mm]



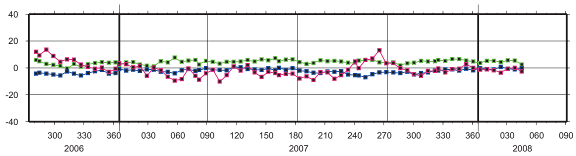
CIC1-DGFI Coordinate variations [mm]



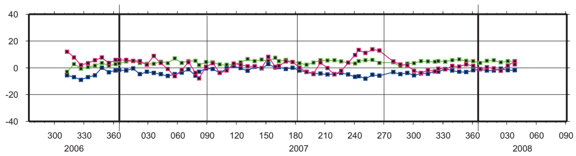
COL2-Combined Solution Coordinate variations [mm]



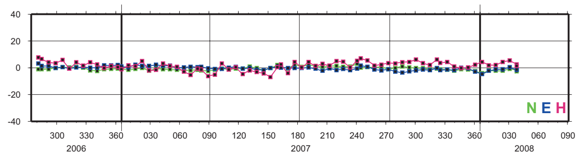
COL2-IGAC Coordinate variations [mm]



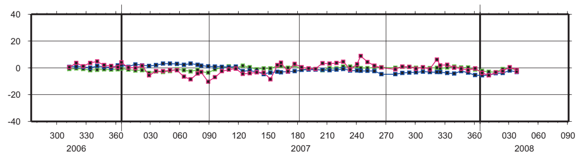
COL2-DGFI Coordinate variations [mm]



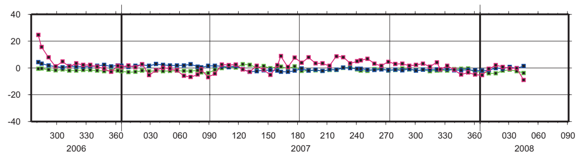
CONZ-Combined Solution Coordinate variations [mm]



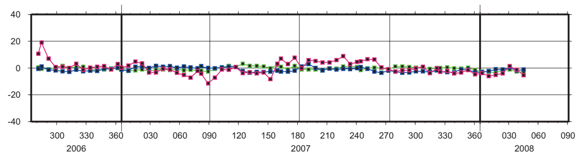
CONZ-DGFI Coordinate variations [mm]



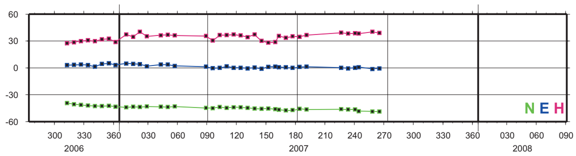
CONZ-IBGE Coordinate variations [mm]



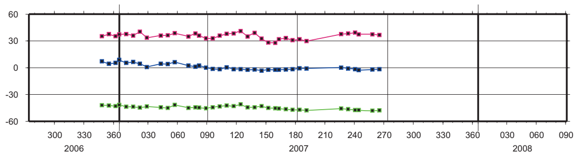
CONZ-CPLAT Coordinate variations [mm]



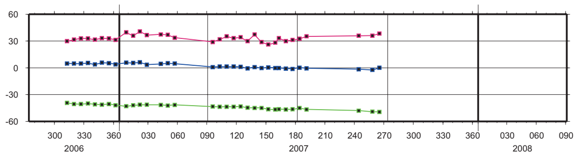
COPO-Combined Solution Coordinate variations [mm]



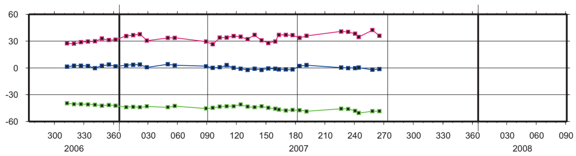
COPO-DGFI Coordinate variations [mm]



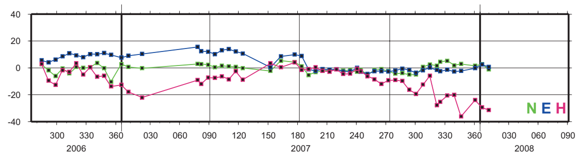
COPO-IBGE Coordinate variations [mm]



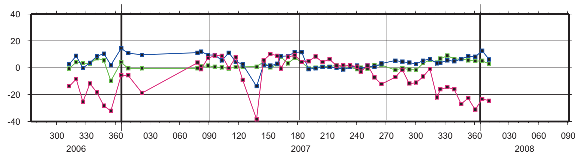
COPO-CPLAT Coordinate variations [mm]



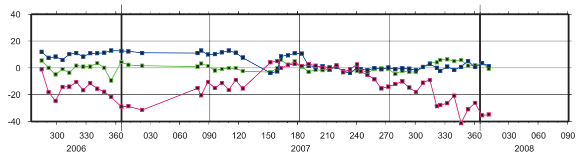
CRAT-Combined Solution Coordinate variations [mm]



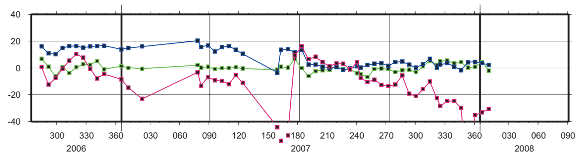
CRAT-DGFI Coordinate variations [mm]



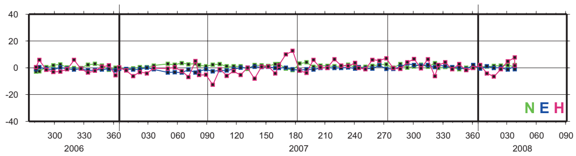
CRAT-IBGE Coordinate variations [mm]



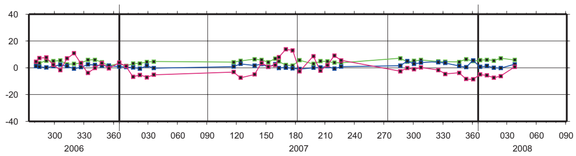
CRAT-CPLAT Coordinate variations [mm]



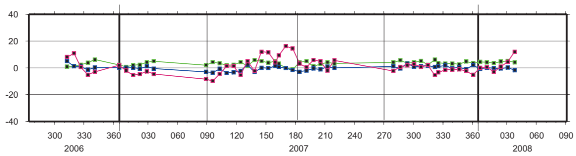
CRCS-Combined Solution Coordinate variations [mm]



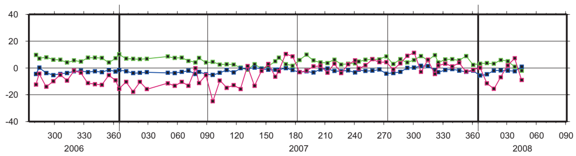
CRCS-IGAC Coordinate variations [mm]



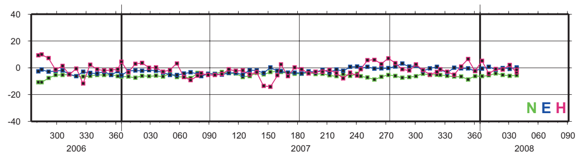
CRCS-DGFI Coordinate variations [mm]



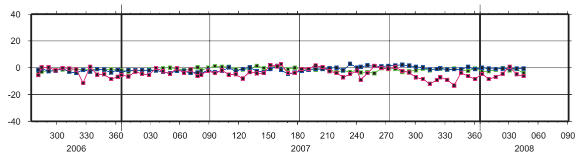
CRCS-IBGE Coordinate variations [mm]



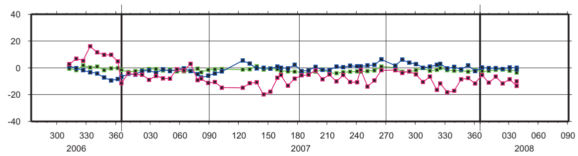
CRO1-Combined Solution Coordinate variations [mm]



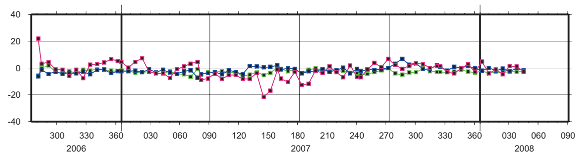
CRO1-IGAC Coordinate variations [mm]



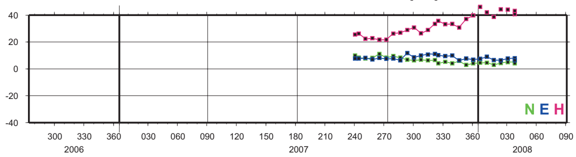
CRO1-DGFI Coordinate variations [mm]



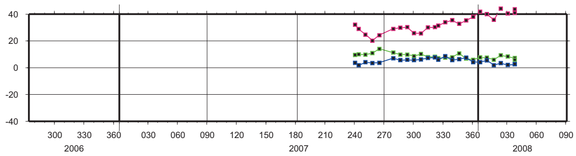
CRO1-CPLAT Coordinate variations [mm]



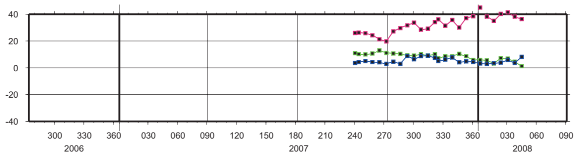
CRUZ-Combined Solution Coordinate variations [mm]



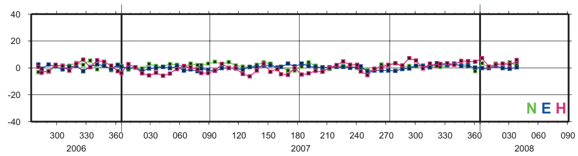
CRUZ-DGFI Coordinate variations [mm]



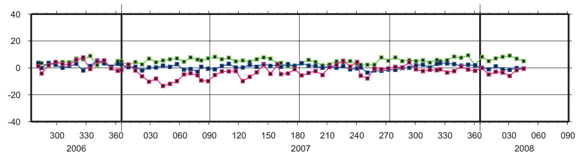
CRUZ-IBGE Coordinate variations [mm]



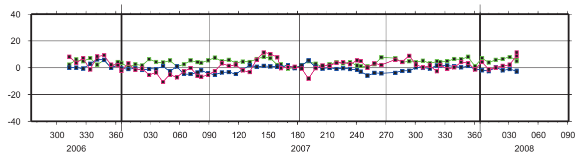
CUCU-Combined Solution Coordinate variations [mm]



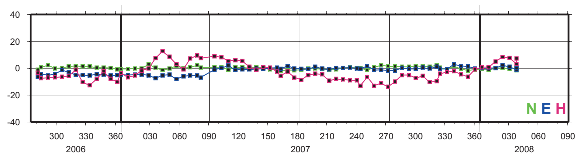
CUCU-IGAC Coordinate variations [mm]



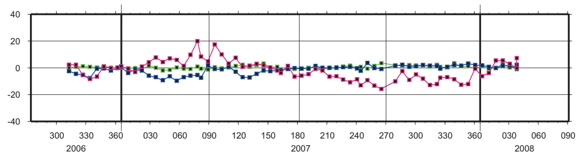
CUCU-DGFI Coordinate variations [mm]



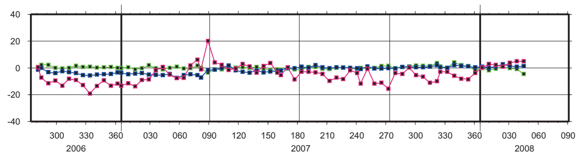
CUIB-Combined Solution Coordinate variations [mm]



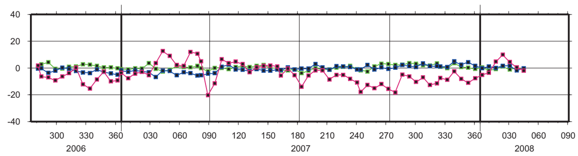
CUIB-DGFI Coordinate variations [mm]



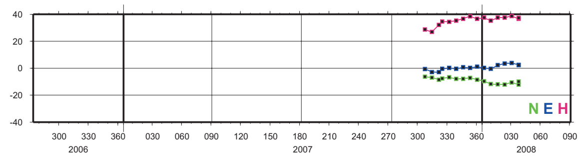
CUIB-IBGE Coordinate variations [mm]



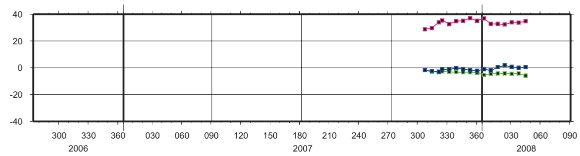
CUIB-CPLAT Coordinate variations [mm]



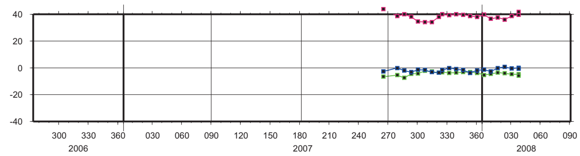
CULC-Combined Solution Coordinate variations [mm]



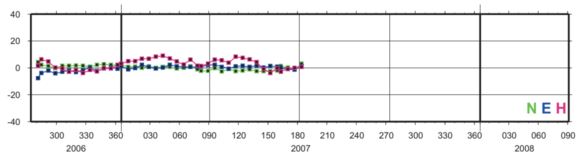
CULC-IGAC Coordinate variations [mm]



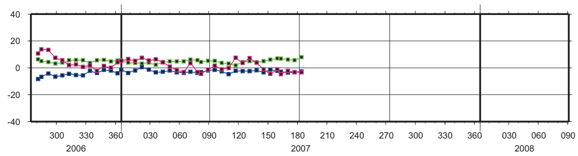
CULC-DGFI Coordinate variations [mm]



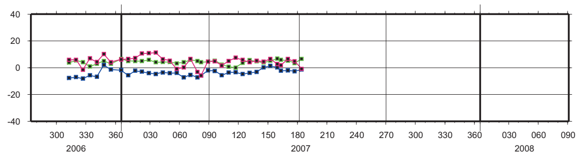
CULI-Combined Solution Coordinate variations [mm]



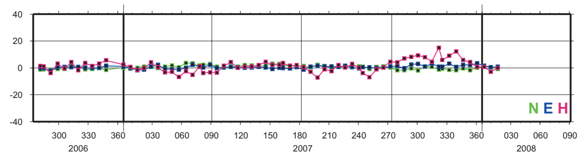
CULI-IGAC Coordinate variations [mm]



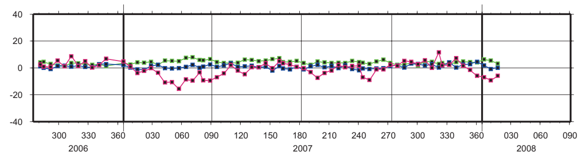
CULI-DGFI Coordinate variations [mm]



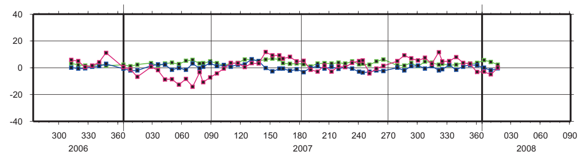
DORA-Combined Solution Coordinate variations [mm]



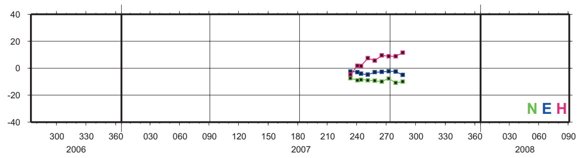
DORA-IGAC Coordinate variations [mm]



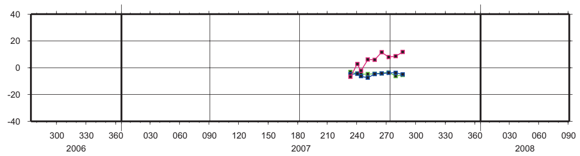
DORA-DGFI Coordinate variations [mm]



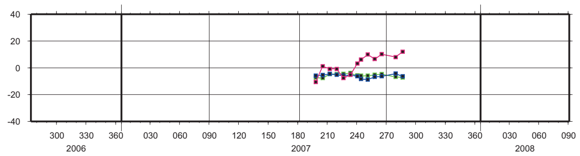
ELEN-Combined Solution Coordinate variations [mm]



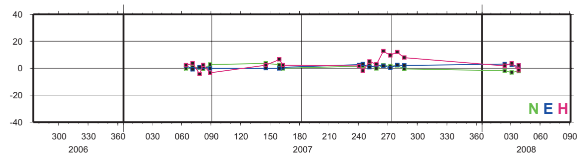
ELEN-IGAC Coordinate variations [mm]



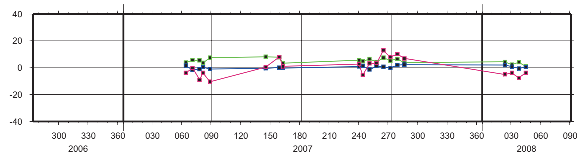
ELEN-DGFI Coordinate variations [mm]



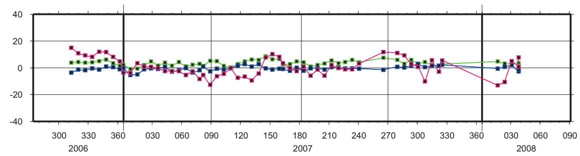
ETCG-Combined Solution Coordinate variations [mm]



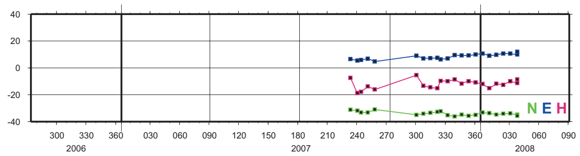
ETCG-IGAC Coordinate variations [mm]



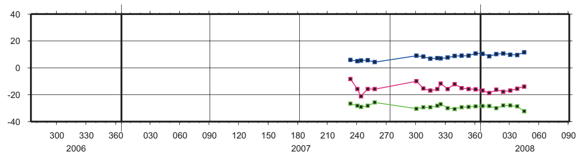
ETCG-DGFI Coordinate variations [mm]



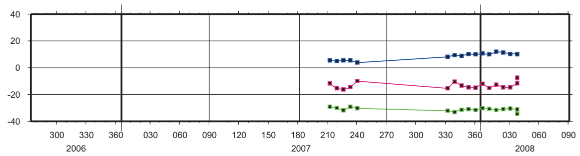
EXU0-Combined Solution Coordinate variations [mm]



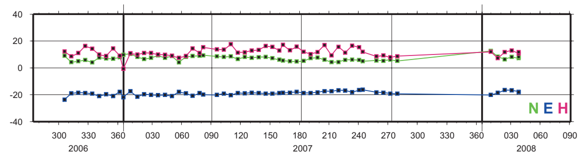
EXU0-IGAC Coordinate variations [mm]



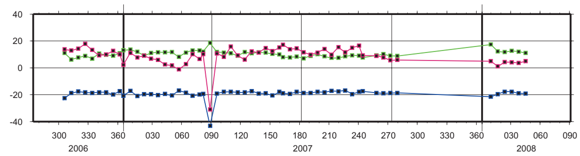
EXU0-DGFI Coordinate variations [mm]



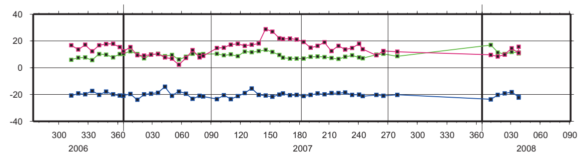
FLOR-Combined Solution Coordinate variations [mm]



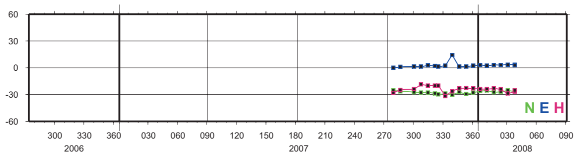
FLOR-IGAC Coordinate variations [mm]



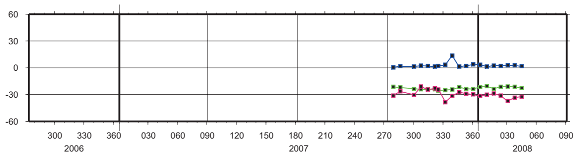
FLOR-DGFI Coordinate variations [mm]



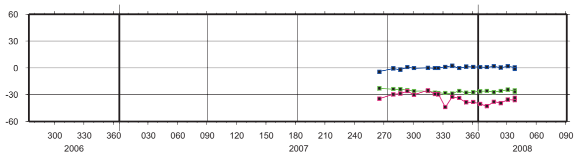
FQNE-Combined Solution Coordinate variations [mm]



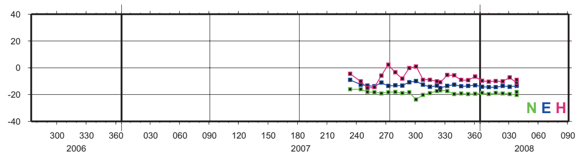
FQNE-IGAC Coordinate variations [mm]



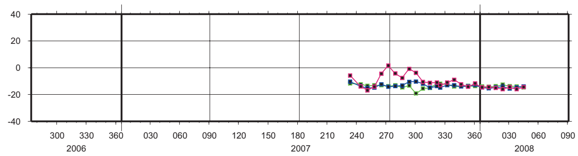
FQNE-DGFI Coordinate variations [mm]



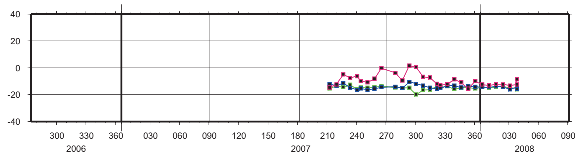
GCGT-Combined Solution Coordinate variations [mm]



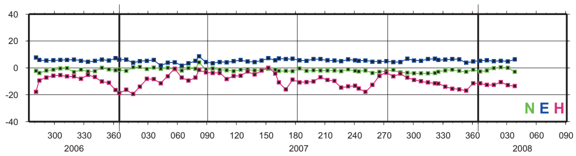
GCGT-IGAC Coordinate variations [mm]



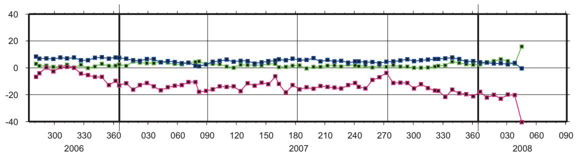
GCGT-DGFI Coordinate variations [mm]



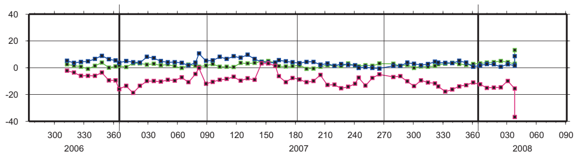
GLPS-Combined Solution Coordinate variations [mm]



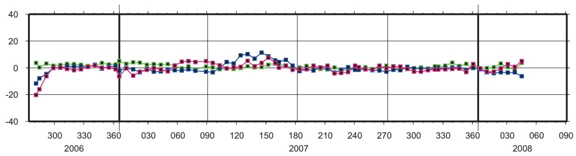
GLPS-IGAC Coordinate variations [mm]



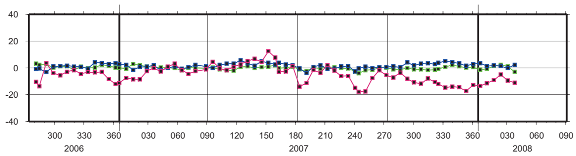
GLPS-DGFI Coordinate variations [mm]



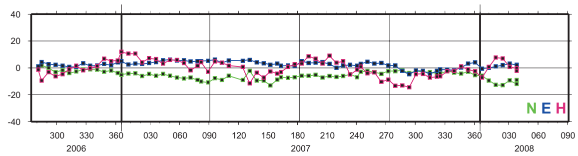
GLPS-IBGE Coordinate variations [mm]



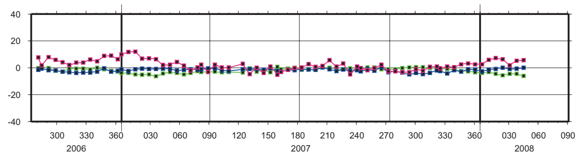
GLPS-CPLAT Coordinate variations [mm]



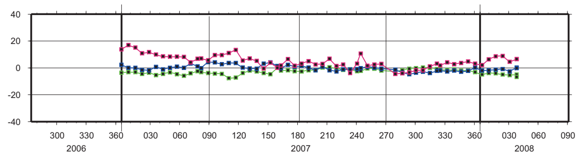
GOLD-Combined Solution Coordinate variations [mm]



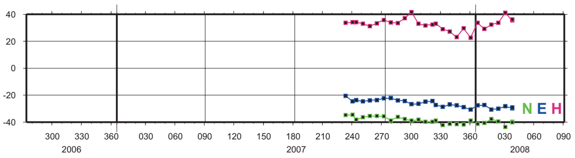
GOLD-IGAC Coordinate variations [mm]



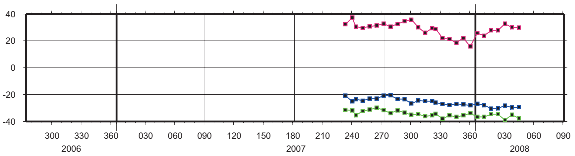
GOLD-DGFI Coordinate variations [mm]



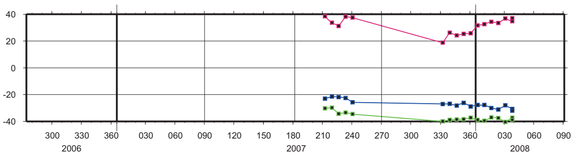
GRE0-Combined Solution Coordinate variations [mm]



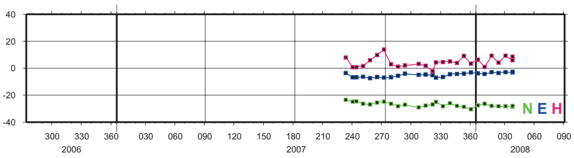
GRE0-IGAC Coordinate variations [mm]



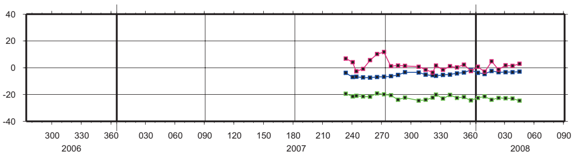
GRE0-DGFI Coordinate variations [mm]



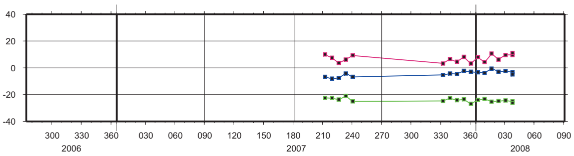
GTK0-Combined Solution Coordinate variations [mm]



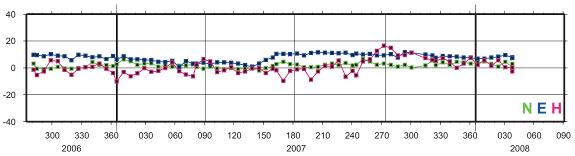
GTK0-IGAC Coordinate variations [mm]



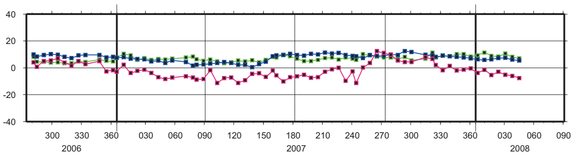
GTK0-DGFI Coordinate variations [mm]



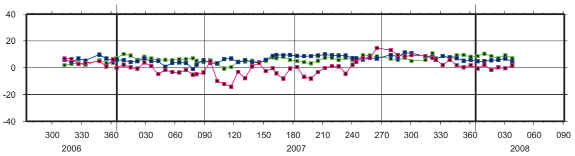
GUAT-Combined Solution Coordinate variations [mm]



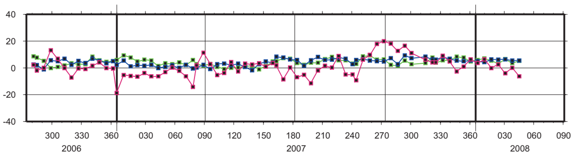
GUAT-IGAC Coordinate variations [mm]



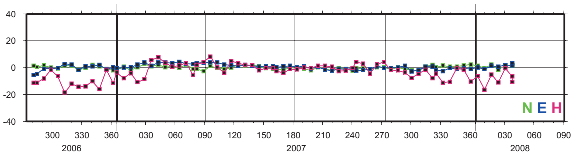
GUAT-DGFI Coordinate variations [mm]



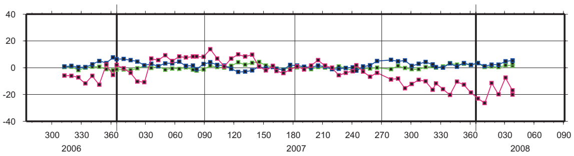
GUAT-CPLAT Coordinate variations [mm]



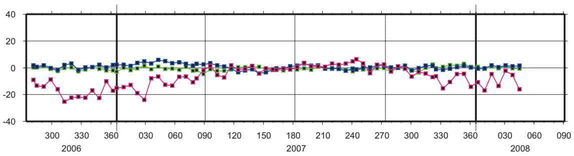
GVAL-Combined Solution Coordinate variations [mm]



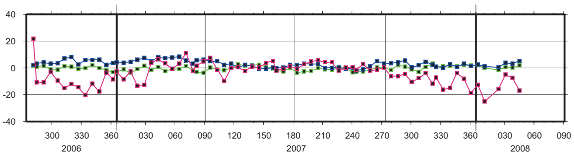
GVAL-DGFI Coordinate variations [mm]



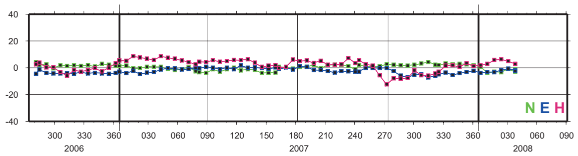
GVAL-IBGE Coordinate variations [mm]



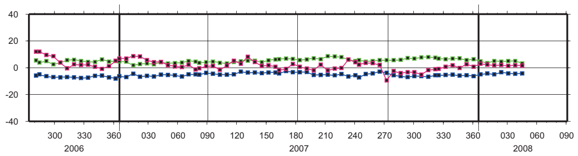
GVAL-CPLAT Coordinate variations [mm]



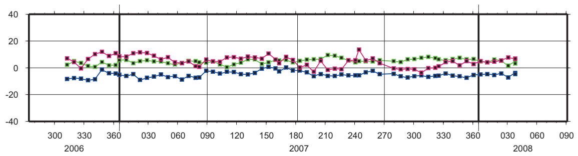
HER2-Combined Solution Coordinate variations [mm]



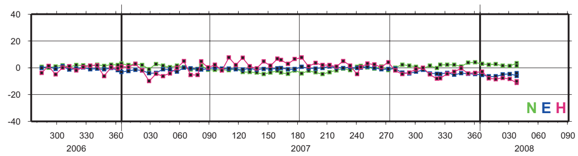
HER2-IGAC Coordinate variations [mm]



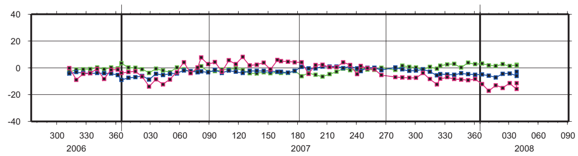
HER2-DGFI Coordinate variations [mm]



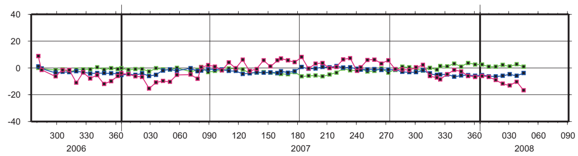
IGM1-Combined Solution Coordinate variations [mm]



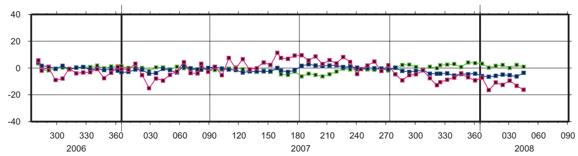
IGM1-DGFI Coordinate variations [mm]



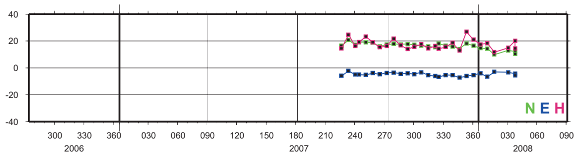
IGM1-IBGE Coordinate variations [mm]



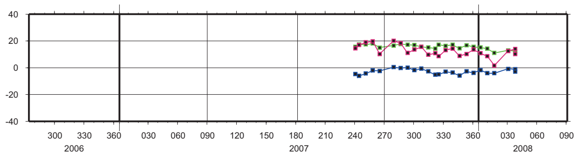
IGM1-CPLAT Coordinate variations [mm]



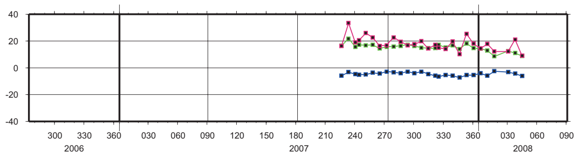
IMBT-Combined Solution Coordinate variations [mm]



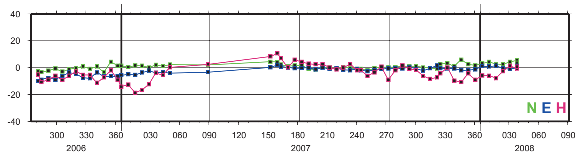
IMBT-DGFI Coordinate variations [mm]



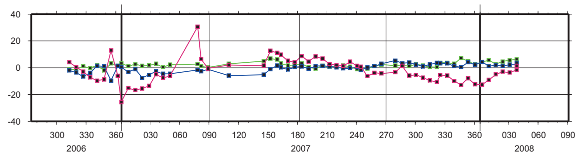
IMBT-IBGE Coordinate variations [mm]



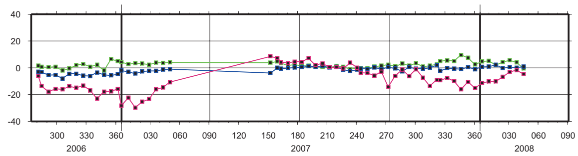
IMPZ-Combined Solution Coordinate variations [mm]



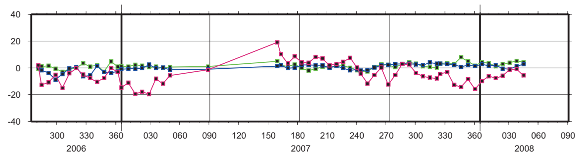
IMPZ-DGFI Coordinate variations [mm]



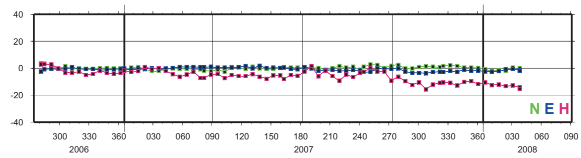
IMPZ-IBGE Coordinate variations [mm]



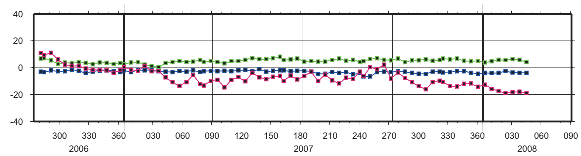
IMPZ-CPLAT Coordinate variations [mm]



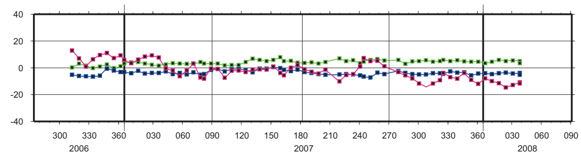
INEG-Combined Solution Coordinate variations [mm]



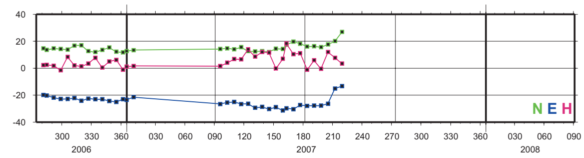
INEG-IGAC Coordinate variations [mm]



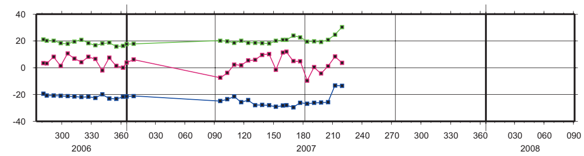
INEG-DGFI Coordinate variations [mm]



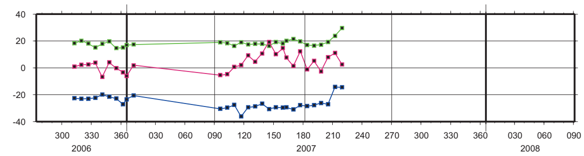
JAMA-Combined Solution Coordinate variations [mm]



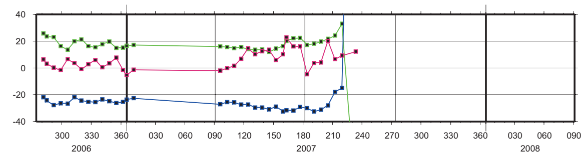
JAMA-IGAC Coordinate variations [mm]



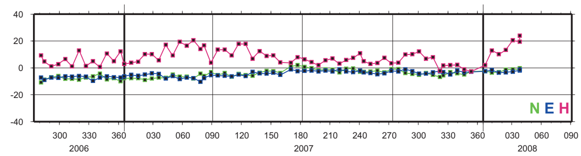
JAMA-DGFI Coordinate variations [mm]



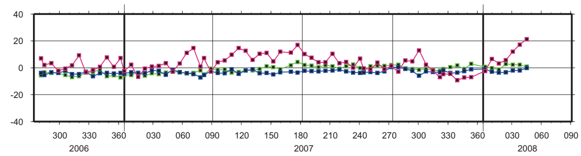
JAMA-CPLAT Coordinate variations [mm]



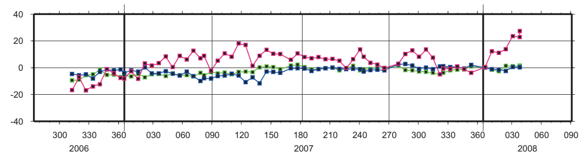
KOUR-Combined Solution Coordinate variations [mm]



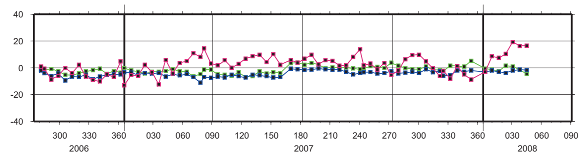
KOUR-IGAC Coordinate variations [mm]



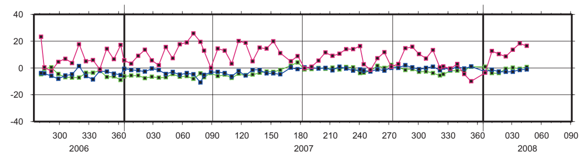
KOUR-DGFI Coordinate variations [mm]



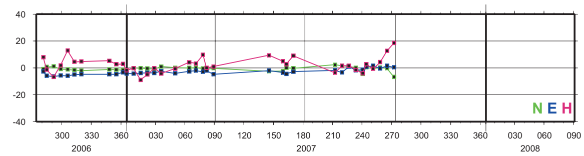
KOUR-IBGE Coordinate variations [mm]



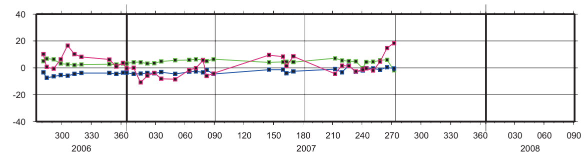
KOUR-CPLAT Coordinate variations [mm]



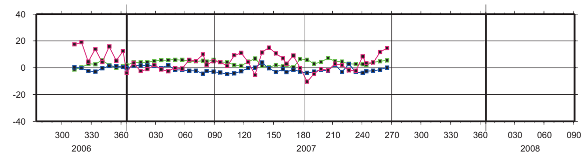
KYW1-Combined Solution Coordinate variations [mm]



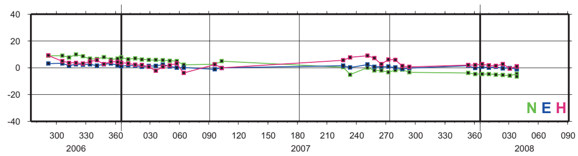
KYW1-IGAC Coordinate variations [mm]



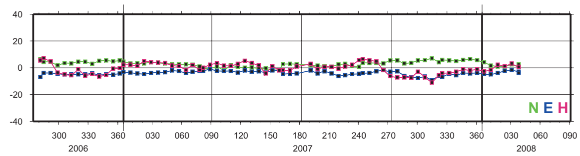
KYW1-DGFI Coordinate variations [mm]



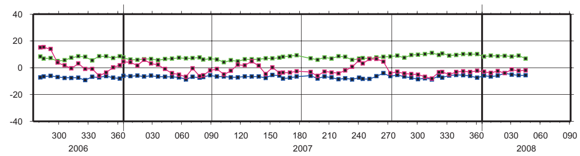
LHCL-Combined Solution Coordinate variations [mm]



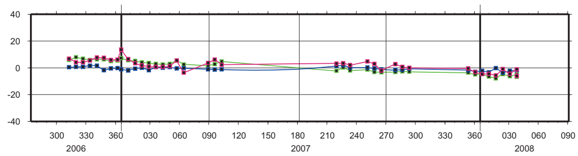
LPAZ-Combined Solution Coordinate variations [mm]



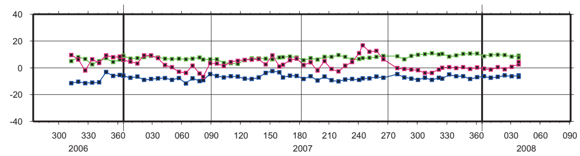
LPAZ-IGAC Coordinate variations [mm]



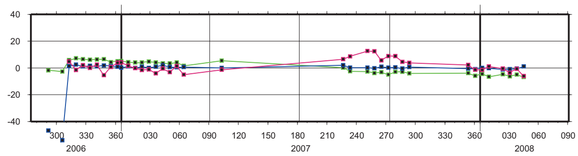
LHCL-DGFI Coordinate variations [mm]



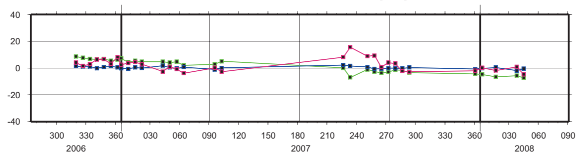
LPAZ-DGFI Coordinate variations [mm]



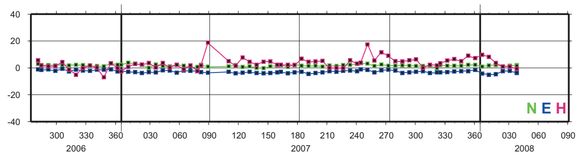
LHCL-IBGE Coordinate variations [mm]



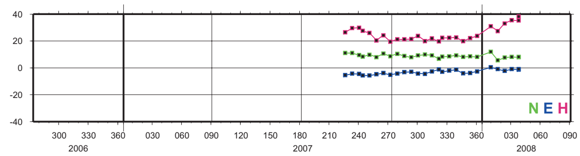
LHCL-CPLAT Coordinate variations [mm]



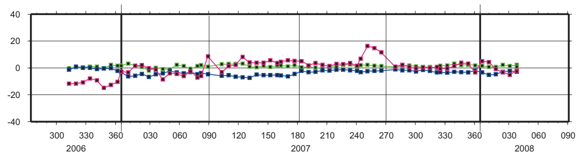
LPGS-Combined Solution Coordinate variations [mm]



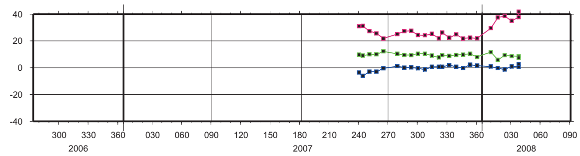
MABA-Combined Solution Coordinate variations [mm]



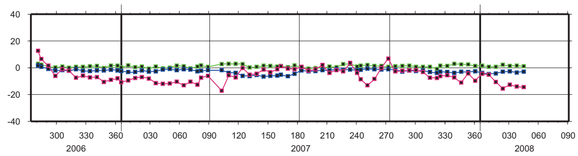
LPGS-DGFI Coordinate variations [mm]



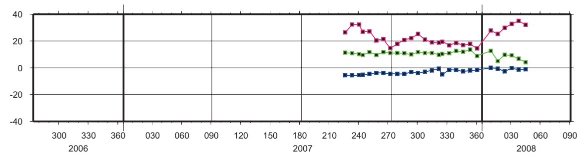
MABA-DGFI Coordinate variations [mm]



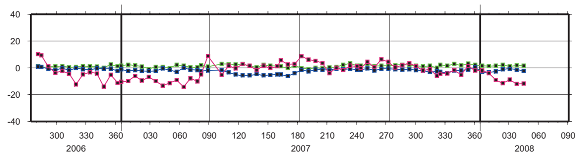
LPGS-IBGE Coordinate variations [mm]



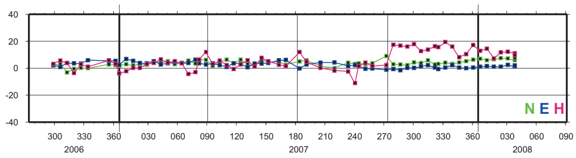
MABA-IBGE Coordinate variations [mm]



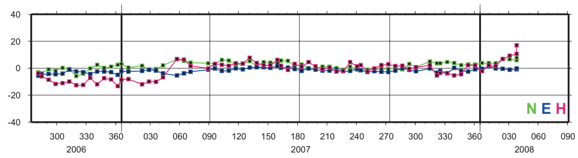
LPGS-CPLAT Coordinate variations [mm]



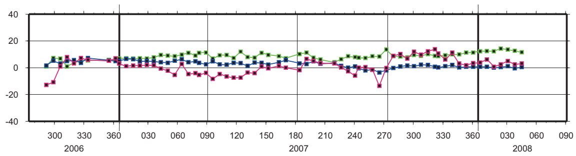
MANA-Combined Solution Coordinate variations [mm]



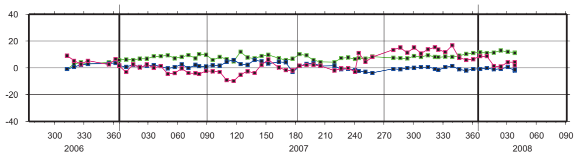
MAPA-Combined Solution Coordinate variations [mm]



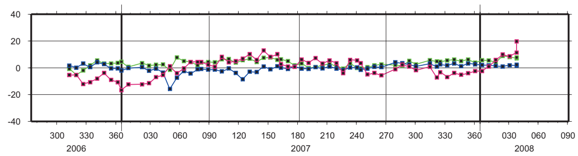
MANA-IGAC Coordinate variations [mm]



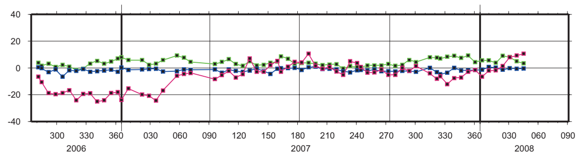
MANA-DGFI Coordinate variations [mm]



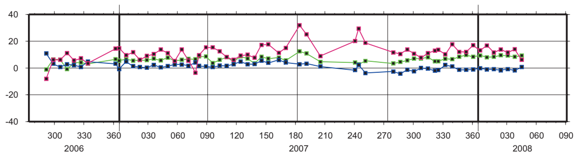
MAPA-DGFI Coordinate variations [mm]



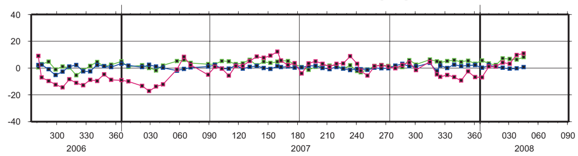
MAPA-IBGE Coordinate variations [mm]



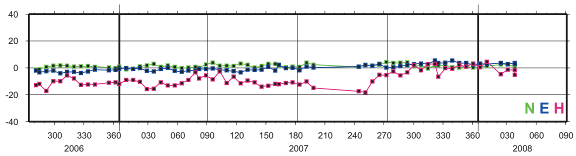
MANA-CPLAT Coordinate variations [mm]



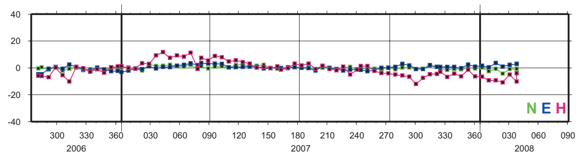
MAPA-CPLAT Coordinate variations [mm]



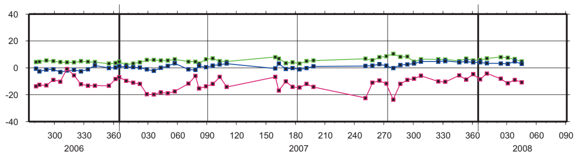
MARA-Combined Solution Coordinate variations [mm]



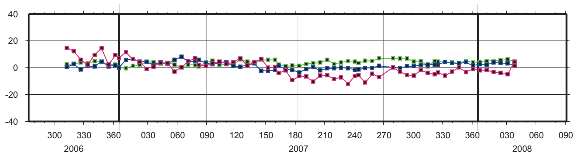
MCLA-Combined Solution Coordinate variations [mm]



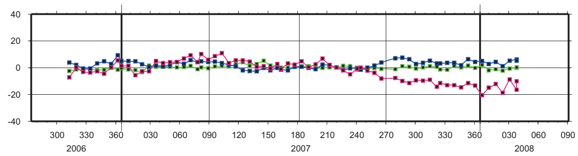
MARA-IGAC Coordinate variations [mm]



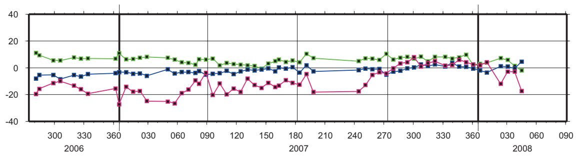
MARA-DGFI Coordinate variations [mm]



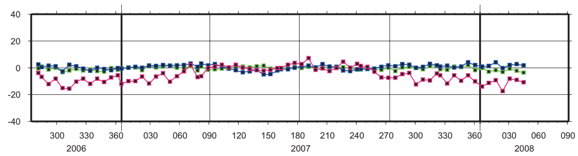
MCLA-DGFI Coordinate variations [mm]



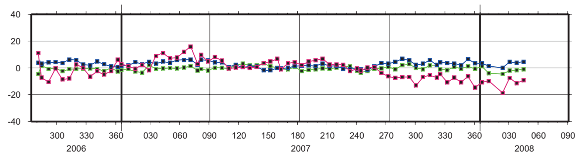
MARA-IBGE Coordinate variations [mm]



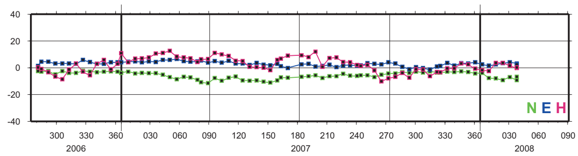
MCLA-IBGE Coordinate variations [mm]



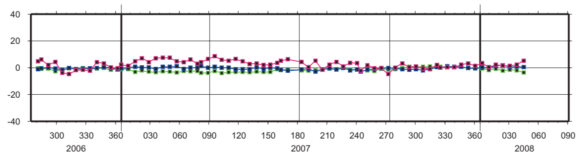
MCLA-CPLAT Coordinate variations [mm]



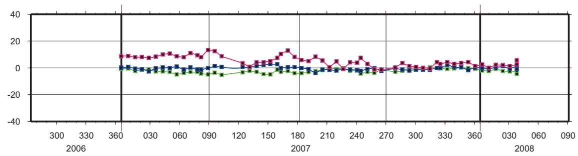
MDO1-Combined Solution Coordinate variations [mm]



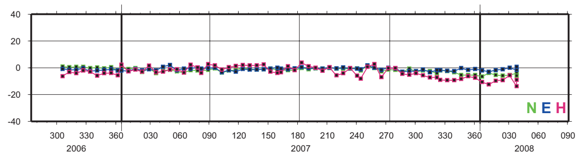
MDO1-IGAC Coordinate variations [mm]



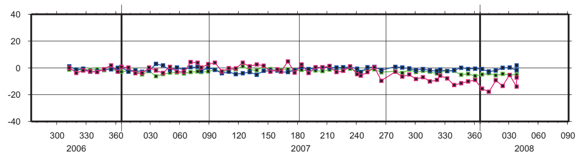
MDO1-DGFI Coordinate variations [mm]



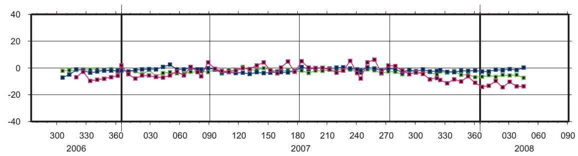
MECO-Combined Solution Coordinate variations [mm]



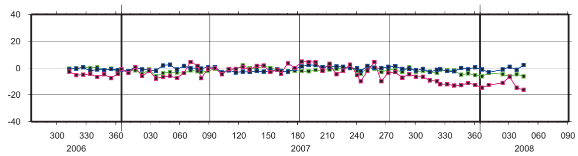
MECO-DGFI Coordinate variations [mm]



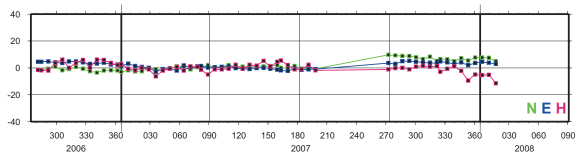
MECO-IBGE Coordinate variations [mm]



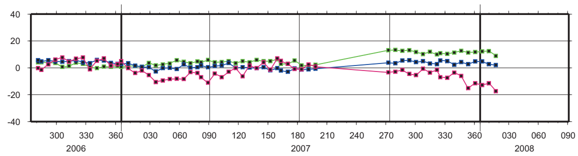
MECO-CPLAT Coordinate variations [mm]



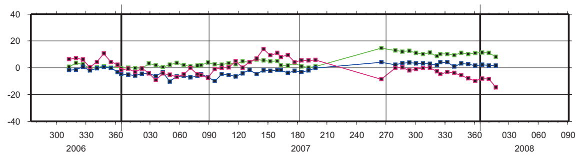
MEDE-Combined Solution Coordinate variations [mm]



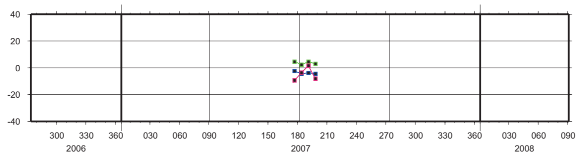
MEDE-IGAC Coordinate variations [mm]



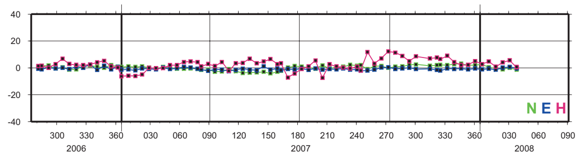
MEDE-DGFI Coordinate variations [mm]



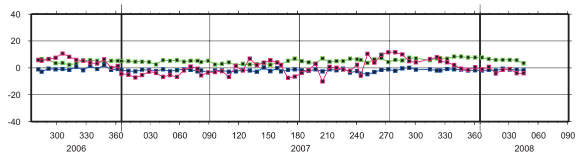
MEDE-IBGE Coordinate variations [mm]



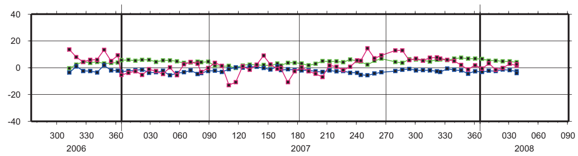
MERI-Combined Solution Coordinate variations [mm]



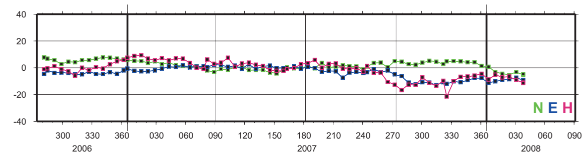
MERI-IGAC Coordinate variations [mm]



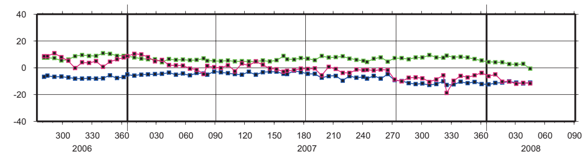
MERI-DGFI Coordinate variations [mm]



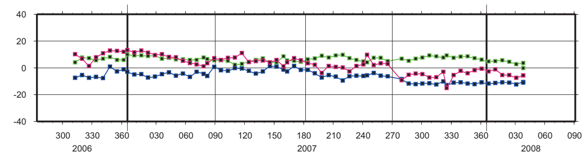
MEXI-Combined Solution Coordinate variations [mm]



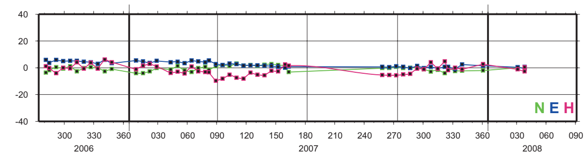
MEXI-IGAC Coordinate variations [mm]



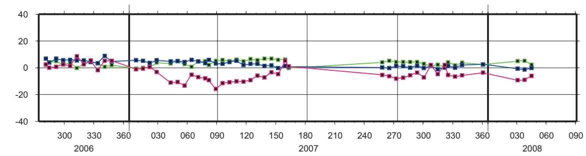
MEXI-DGFI Coordinate variations [mm]



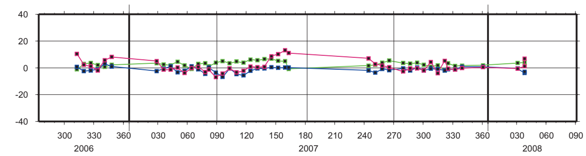
MOTE-Combined Solution Coordinate variations [mm]



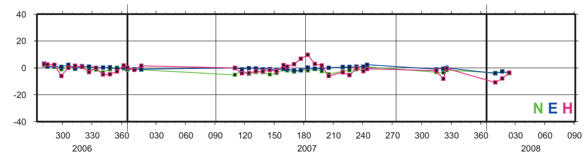
MOTE-IGAC Coordinate variations [mm]



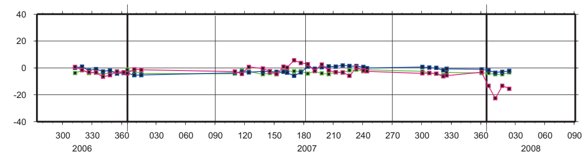
MOTE-DGFI Coordinate variations [mm]



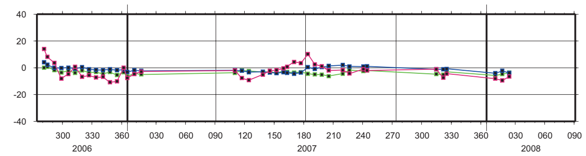
MPLA-Combined Solution Coordinate variations [mm]



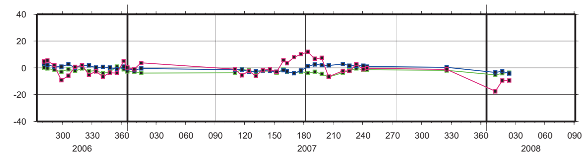
MPLA-DGFI Coordinate variations [mm]



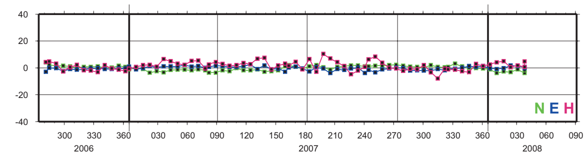
MPLA-IBGE Coordinate variations [mm]



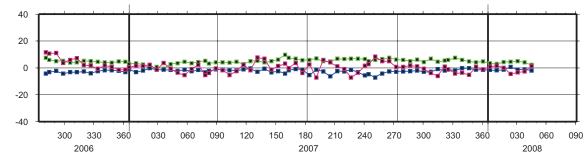
MPLA-CPLAT Coordinate variations [mm]



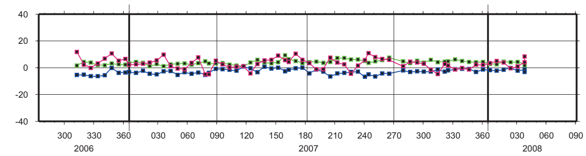
MTY2-Combined Solution Coordinate variations [mm]



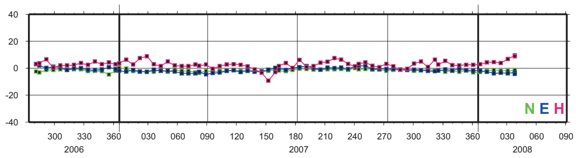
MTY2-IGAC Coordinate variations [mm]



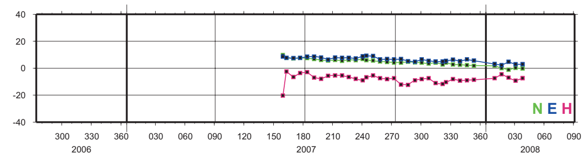
MTY2-DGFI Coordinate variations [mm]



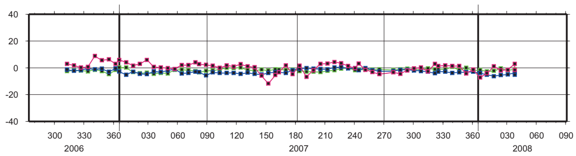
MZAC-Combined Solution Coordinate variations [mm]



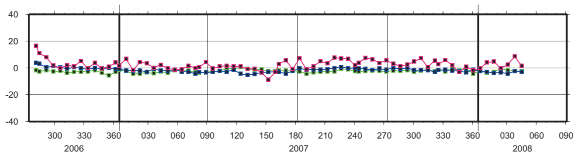
MZAE-Combined Solution Coordinate variations [mm]



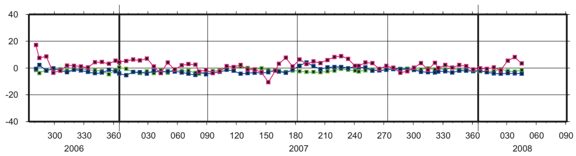
MZAC-DGFI Coordinate variations [mm]



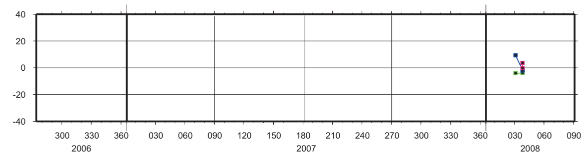
MZAC-IBGE Coordinate variations [mm]



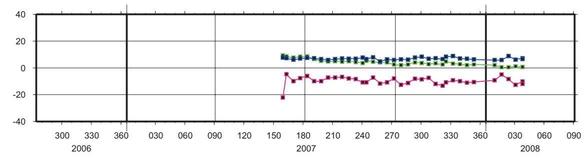
MZAC-CPLAT Coordinate variations [mm]



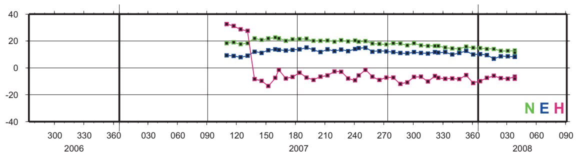
MZAE-DGFI Coordinate variations [mm]



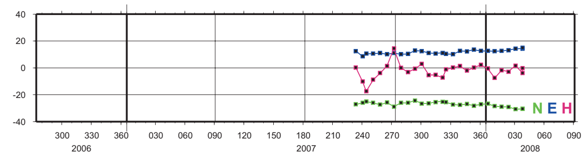
MZAE-IBGE Coordinate variations [mm]



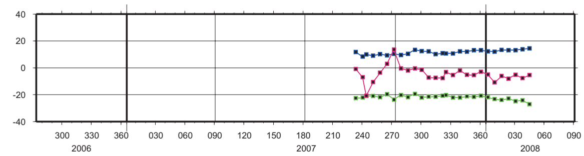
MZAS-Combined Solution Coordinate variations [mm]



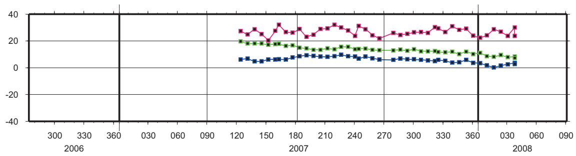
NAS0-Combined Solution Coordinate variations [mm]



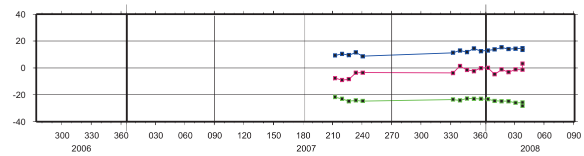
NAS0-IGAC Coordinate variations [mm]



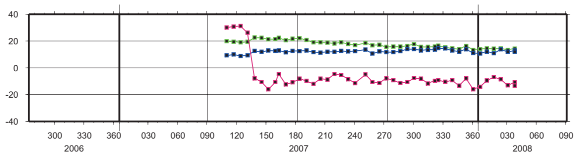
MZAS-DGFI Coordinate variations [mm]



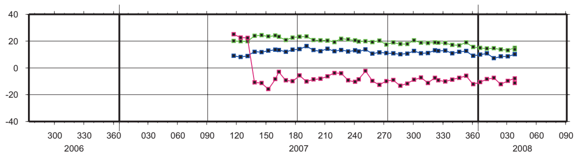
NAS0-DGFI Coordinate variations [mm]



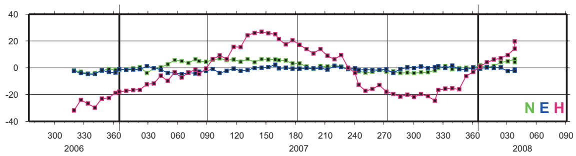
MZAS-IBGE Coordinate variations [mm]



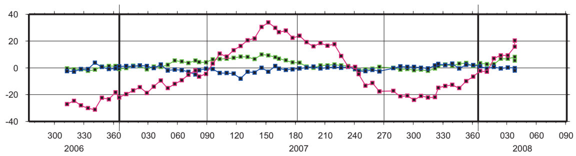
MZAS-CPLAT Coordinate variations [mm]



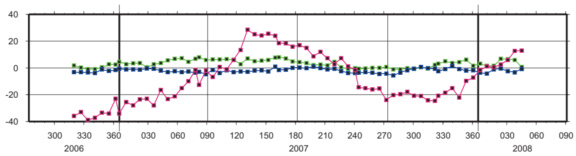
NAUS-Combined Solution Coordinate variations [mm]



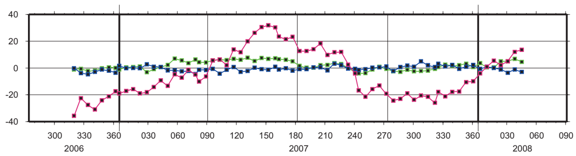
NAUS-DGFI Coordinate variations [mm]



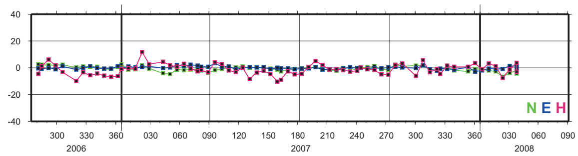
NAUS-IBGE Coordinate variations [mm]



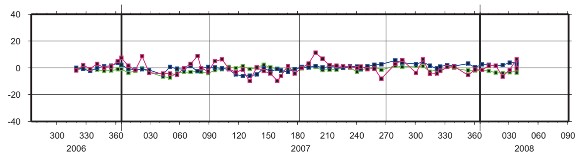
NAUS-CPLAT Coordinate variations [mm]



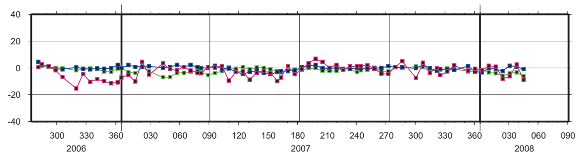
NEIA-Combined Solution Coordinate variations [mm]



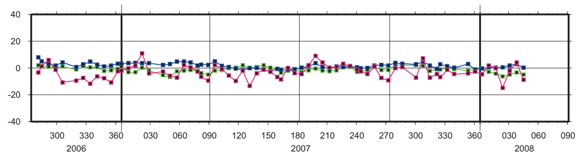
NEIA-DGFI Coordinate variations [mm]



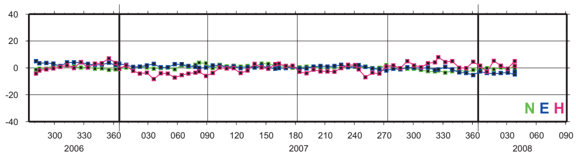
NEIA-IBGE Coordinate variations [mm]



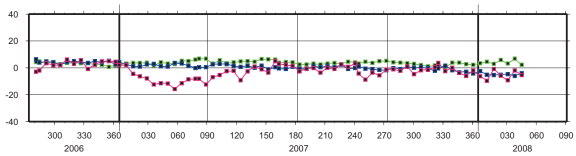
NEIA-CPLAT Coordinate variations [mm]



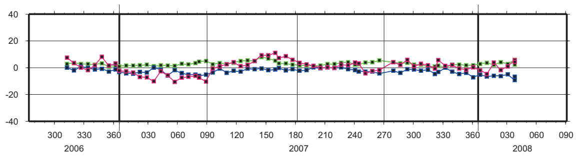
NEVA-Combined Solution Coordinate variations [mm]



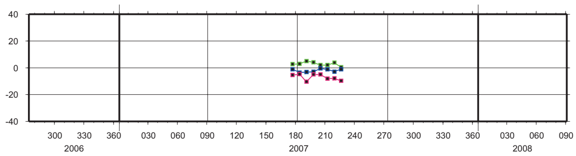
NEVA-IGAC Coordinate variations [mm]



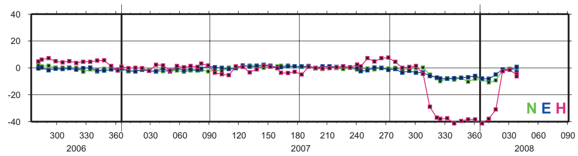
NEVA-DGFI Coordinate variations [mm]



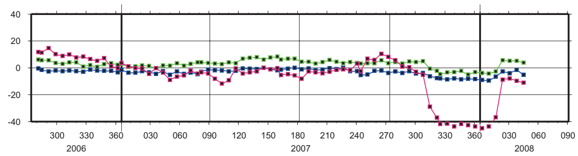
NEVA-IBGE Coordinate variations [mm]



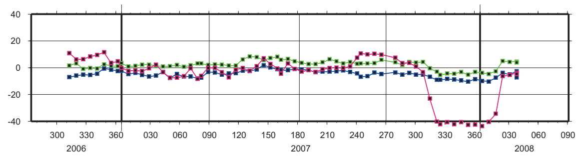
OAX2-Combined Solution Coordinate variations [mm]



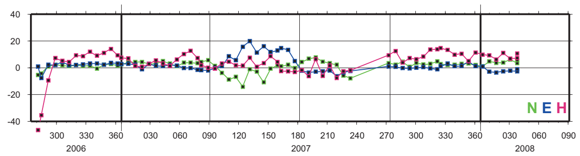
OAX2-IGAC Coordinate variations [mm]



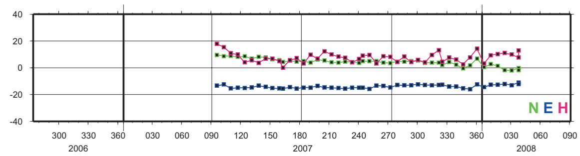
OAX2-DGFI Coordinate variations [mm]



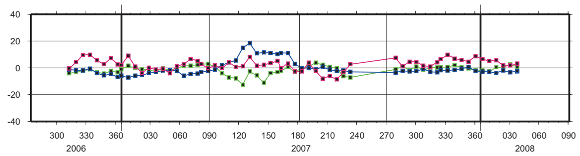
OHI2-Combined Solution Coordinate variations [mm]



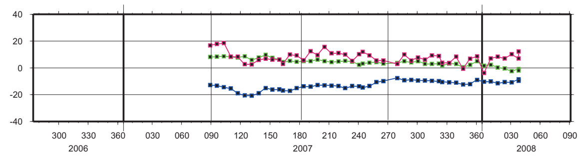
ONRJ-Combined Solution Coordinate variations [mm]



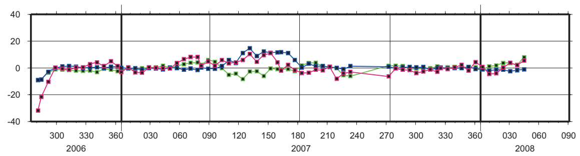
OHI2-DGFI Coordinate variations [mm]



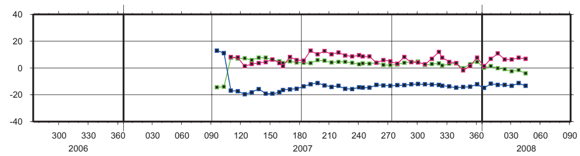
ONRJ-DGFI Coordinate variations [mm]



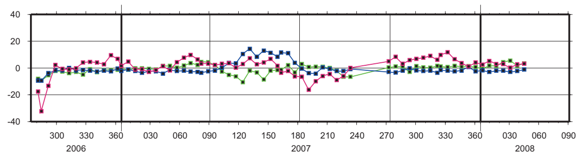
OHI2-IBGE Coordinate variations [mm]



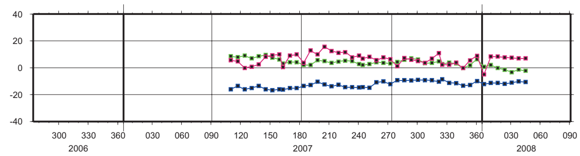
ONRJ-IBGE Coordinate variations [mm]



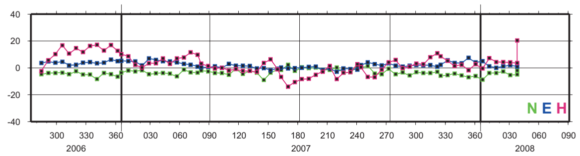
OHI2-CPLAT Coordinate variations [mm]



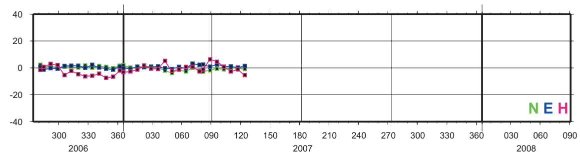
ONRJ-CPLAT Coordinate variations [mm]



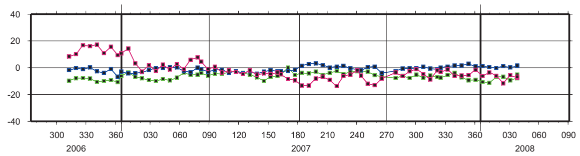
PALM-Combined Solution Coordinate variations [mm]



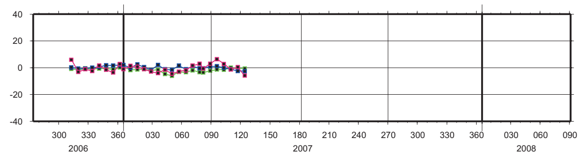
PARA-Combined Solution Coordinate variations [mm]



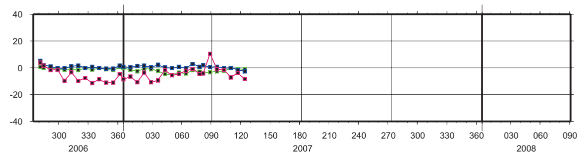
PALM-DGFI Coordinate variations [mm]



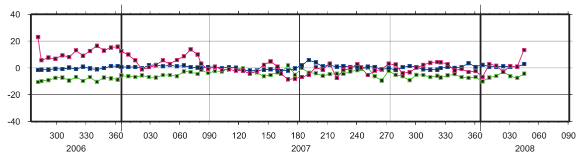
PARA-DGFI Coordinate variations [mm]



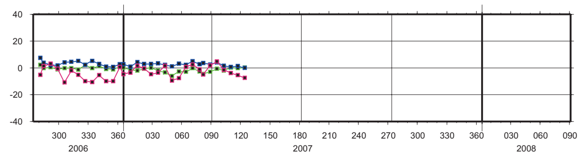
PARA-IBGE Coordinate variations [mm]



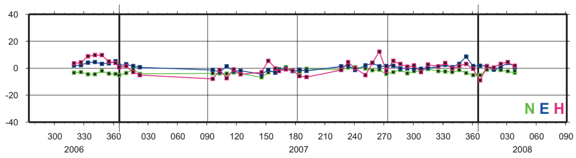
PALM-CPLAT Coordinate variations [mm]



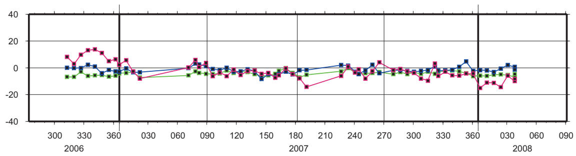
PARA-CPLAT Coordinate variations [mm]



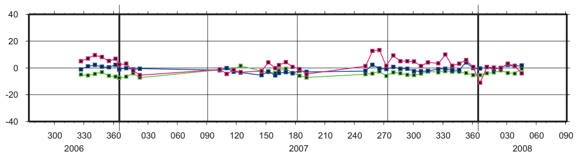
PARC-Combined Solution Coordinate variations [mm]



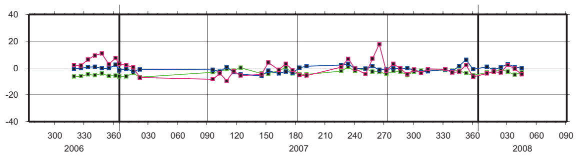
PARC-DGFI Coordinate variations [mm]



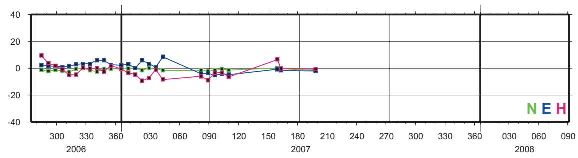
PARC-IBGE Coordinate variations [mm]



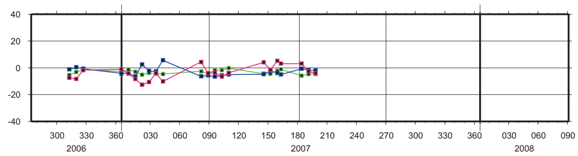
PARC-CPLAT Coordinate variations [mm]



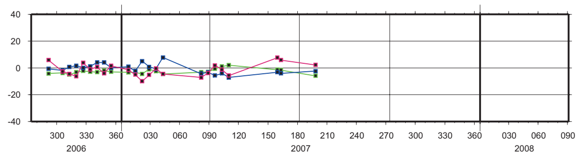
PDES-Combined Solution Coordinate variations [mm]



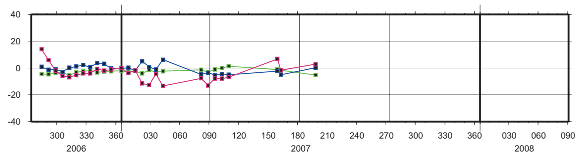
PDES-DGFI Coordinate variations [mm]



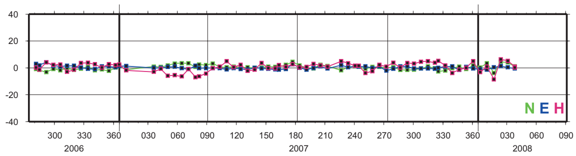
PDES-IBGE Coordinate variations [mm]



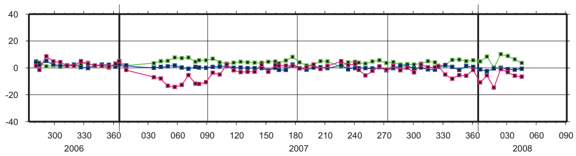
PDES-CPLAT Coordinate variations [mm]



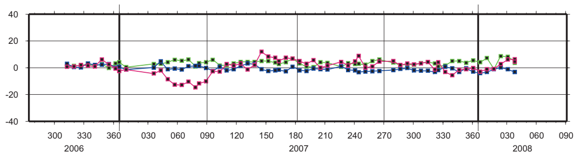
PERA-Combined Solution Coordinate variations [mm]



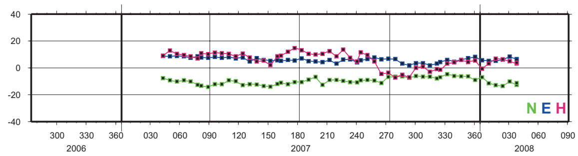
PERA-IGAC Coordinate variations [mm]



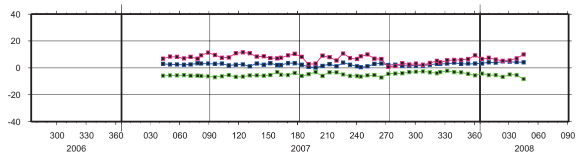
PERA-DGFI Coordinate variations [mm]



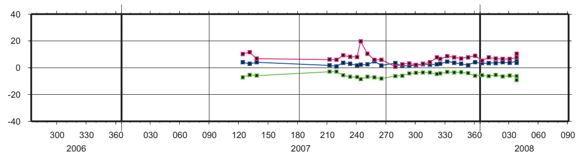
PIE1-Combined Solution Coordinate variations [mm]



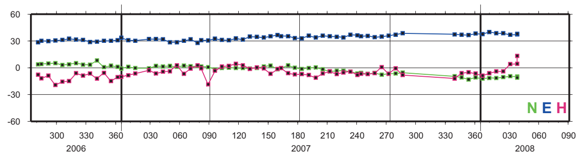
PIE1-IGAC Coordinate variations [mm]



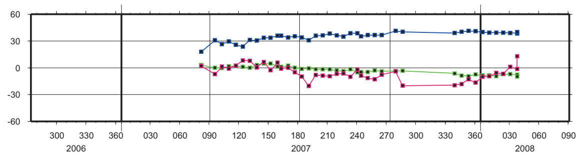
PIE1-DGFI Coordinate variations [mm]



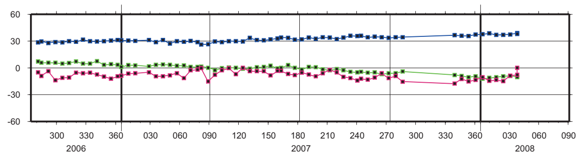
PMB1-Combined Solution Coordinate variations [mm]



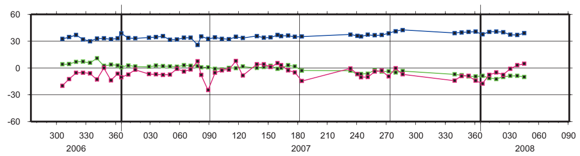
PMB1-DGFI Coordinate variations [mm]



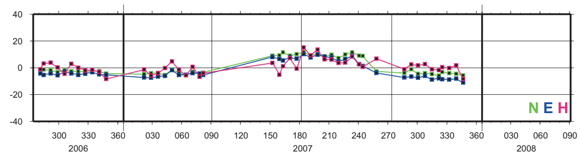
PMB1-IBGE Coordinate variations [mm]



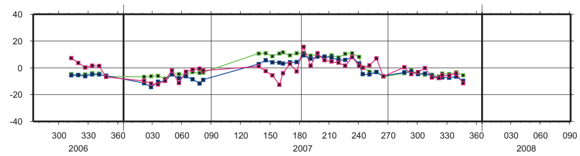
PMB1-CPLAT Coordinate variations [mm]



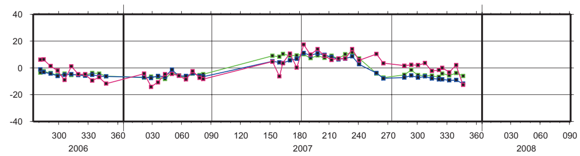
POAL-Combined Solution Coordinate variations [mm]



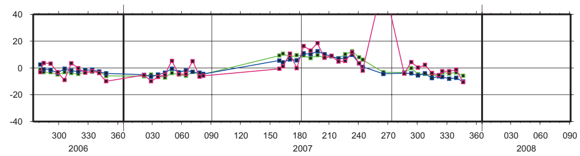
POAL-DGFI Coordinate variations [mm]



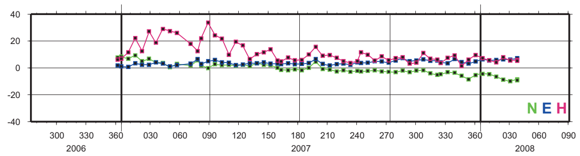
POAL-IBGE Coordinate variations [mm]



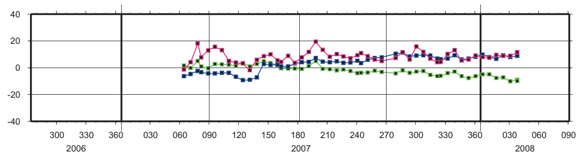
POAL-CPLAT Coordinate variations [mm]



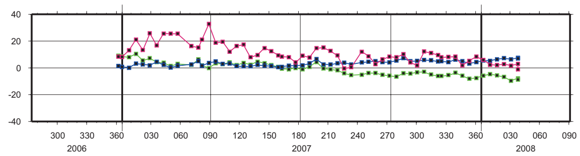
POLI-Combined Solution Coordinate variations [mm]



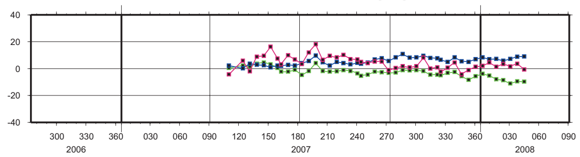
POLI-DGFI Coordinate variations [mm]



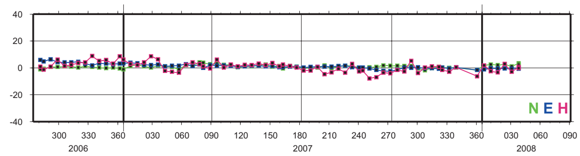
POLI-IBGE Coordinate variations [mm]



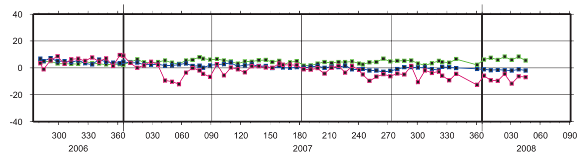
POLI-CPLAT Coordinate variations [mm]



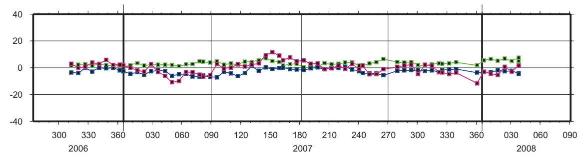
POPA-Combined Solution Coordinate variations [mm]



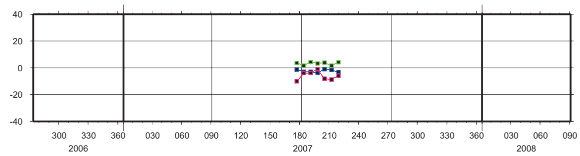
POPA-IGAC Coordinate variations [mm]



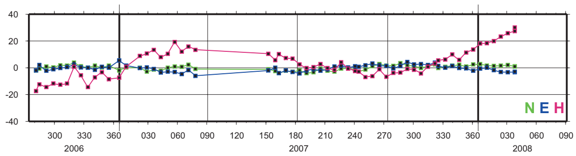
POPA-DGFI Coordinate variations [mm]



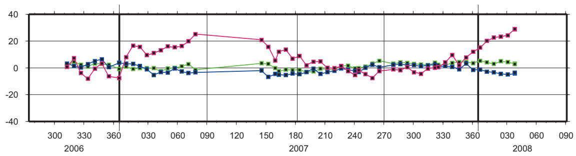
POPA-IBGE Coordinate variations [mm]



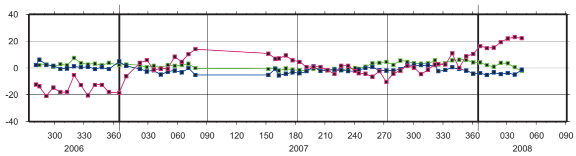
POVE-Combined Solution Coordinate variations [mm]



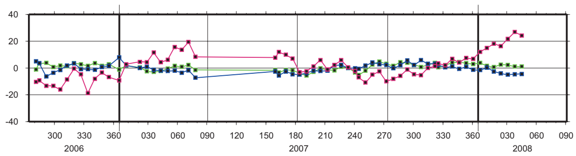
POVE-DGFI Coordinate variations [mm]



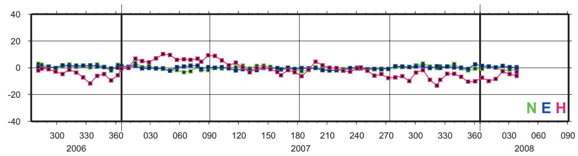
POVE-IBGE Coordinate variations [mm]



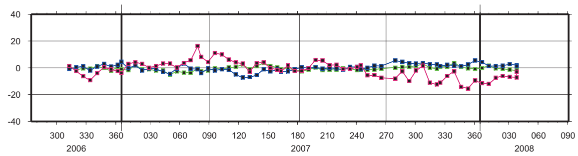
POVE-CPLAT Coordinate variations [mm]



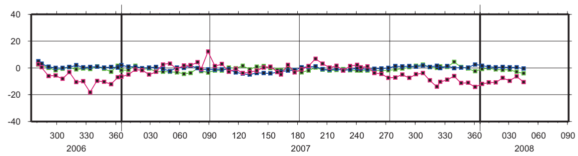
PPTE-Combined Solution Coordinate variations [mm]



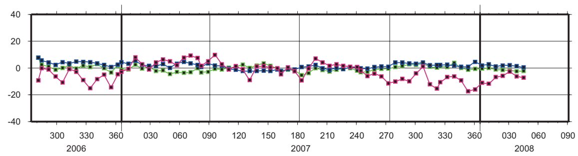
PPTE-DGFI Coordinate variations [mm]



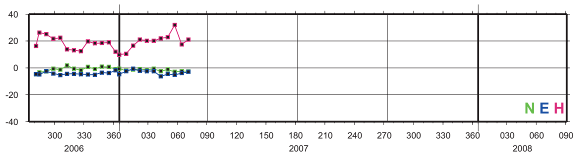
PPTE-IBGE Coordinate variations [mm]



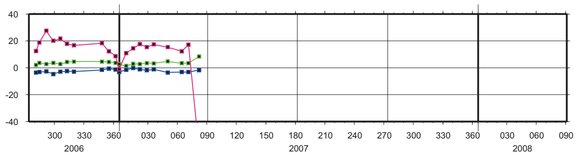
PPTE-CPLAT Coordinate variations [mm]



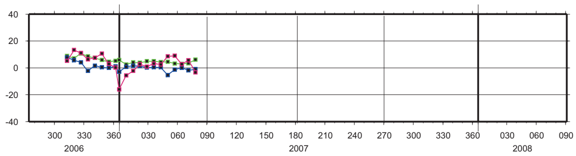
PUR3-Combined Solution Coordinate variations [mm]



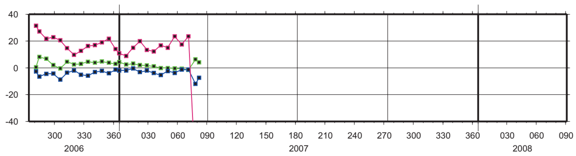
PUR3-IGAC Coordinate variations [mm]



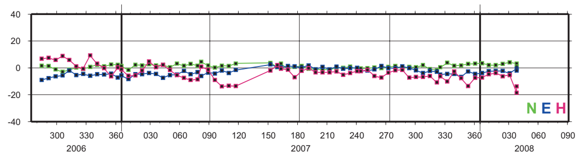
PUR3-DGFI Coordinate variations [mm]



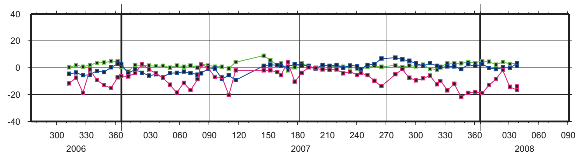
PUR3-CPLAT Coordinate variations [mm]



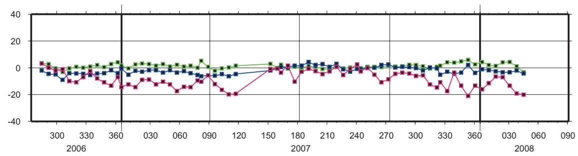
RECF-Combined Solution Coordinate variations [mm]



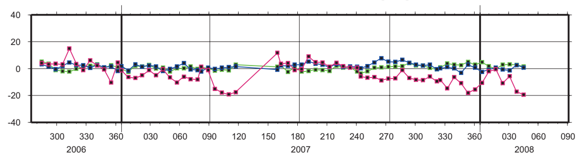
RECF-DGFI Coordinate variations [mm]



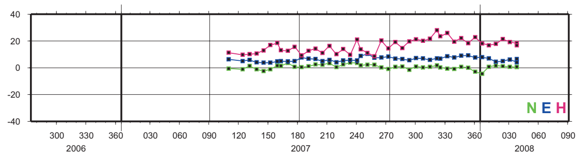
RECF-IBGE Coordinate variations [mm]



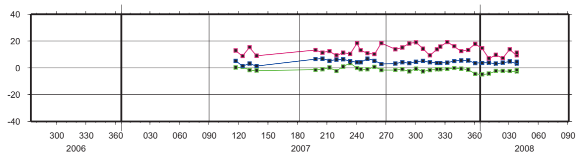
RECF-CPLAT Coordinate variations [mm]



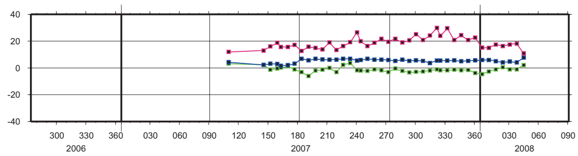
RIO2-Combined Solution Coordinate variations [mm]



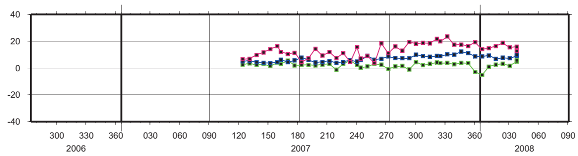
RIO2-DGFI Coordinate variations [mm]



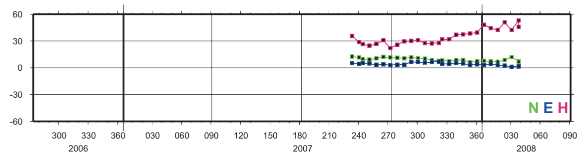
RIO2-IBGE Coordinate variations [mm]



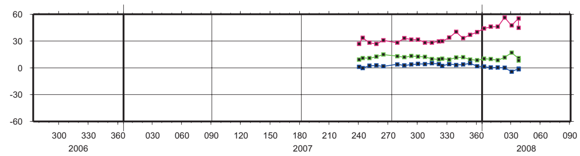
RIO2-CPLAT Coordinate variations [mm]



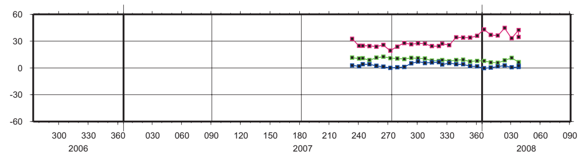
RIOB-Combined Solution Coordinate variations [mm]



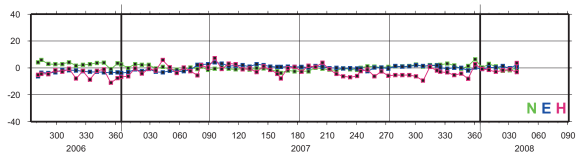
RIOB-DGFI Coordinate variations [mm]



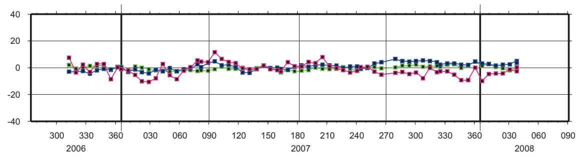
RIOB-IBGE Coordinate variations [mm]



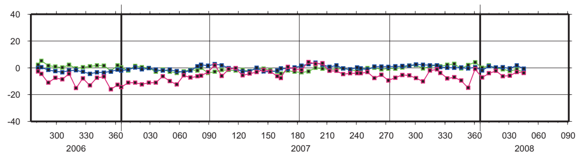
RIOD-Combined Solution Coordinate variations [mm]



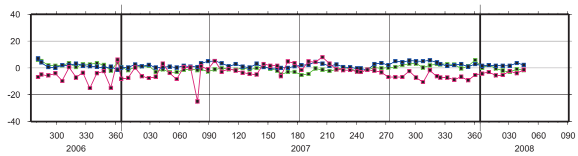
RIOD-DGFI Coordinate variations [mm]



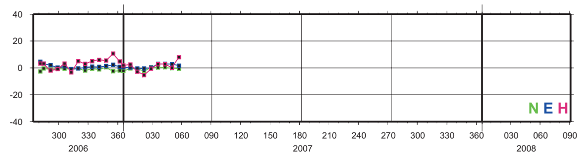
RIOD-IBGE Coordinate variations [mm]



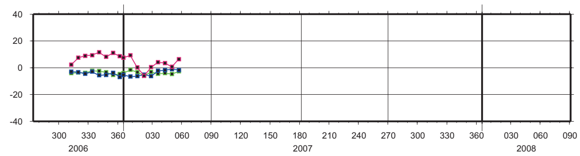
RIOD-CPLAT Coordinate variations [mm]



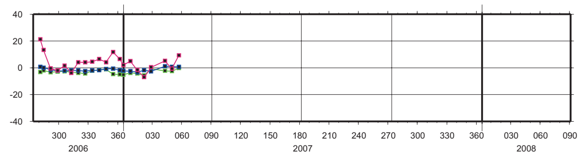
RIOG-Combined Solution Coordinate variations [mm]



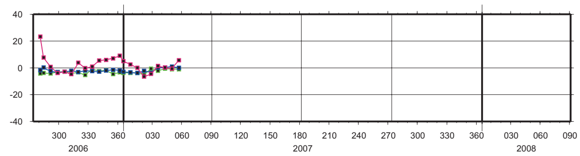
RIOG-DGFI Coordinate variations [mm]



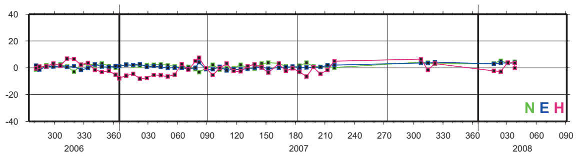
RIOG-IBGE Coordinate variations [mm]



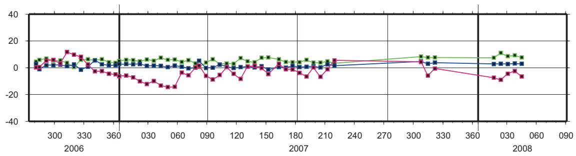
RIOG-CPLAT Coordinate variations [mm]



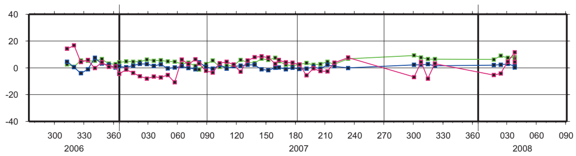
RIOH-Combined Solution Coordinate variations [mm]



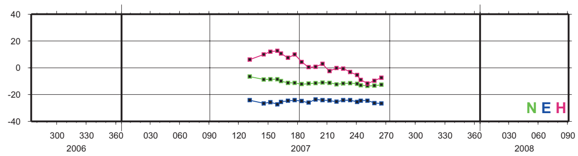
RIOH-IGAC Coordinate variations [mm]



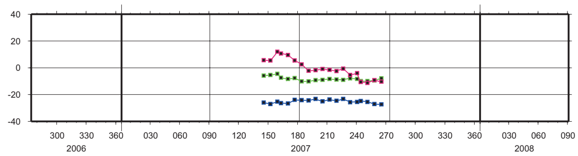
RIOH-DGFI Coordinate variations [mm]



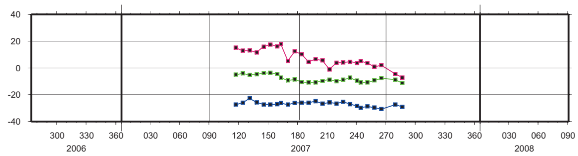
RIOP-Combined Solution Coordinate variations [mm]



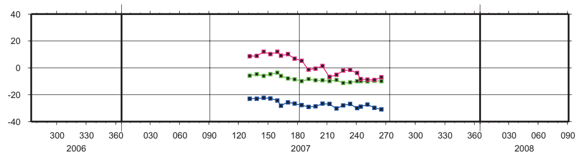
RIOP-IGAC Coordinate variations [mm]



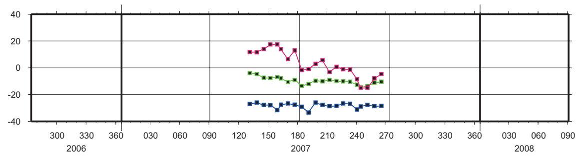
RIOP-DGFI Coordinate variations [mm]



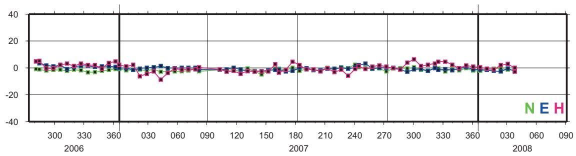
RIOP-IBGE Coordinate variations [mm]



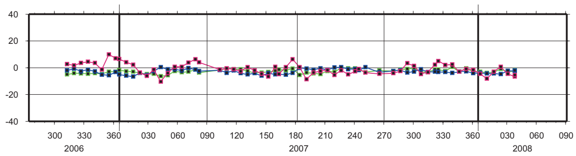
RIOP-CPLAT Coordinate variations [mm]



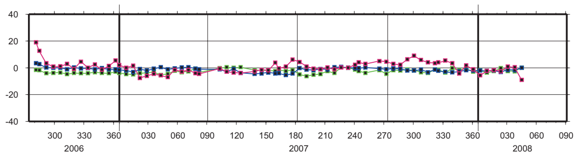
RWSN-Combined Solution Coordinate variations [mm]



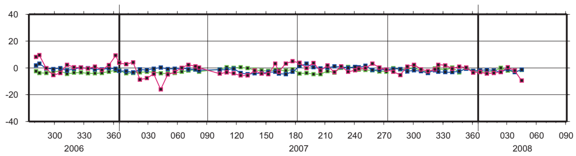
RWSN-DGFI Coordinate variations [mm]



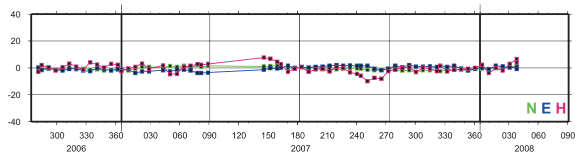
RWSN-IBGE Coordinate variations [mm]



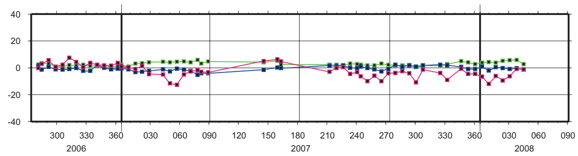
RWSN-CPLAT Coordinate variations [mm]



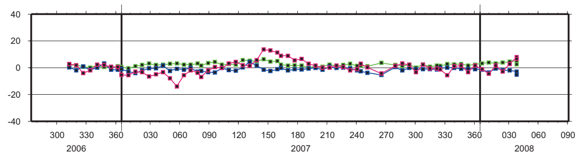
S061-Combined Solution Coordinate variations [mm]



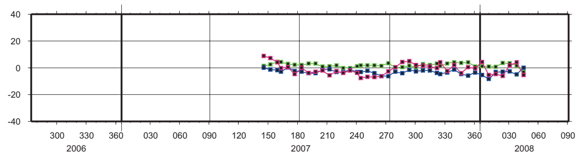
S061-IGAC Coordinate variations [mm]



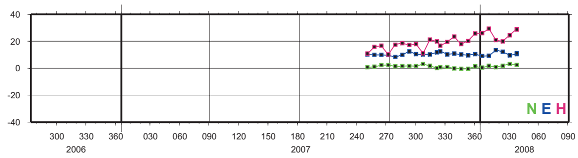
S061-DGFI Coordinate variations [mm]



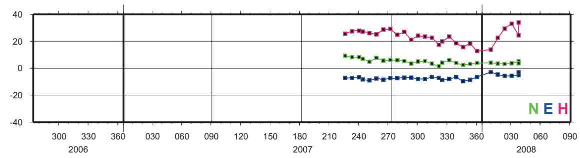
S061-IBGE Coordinate variations [mm]



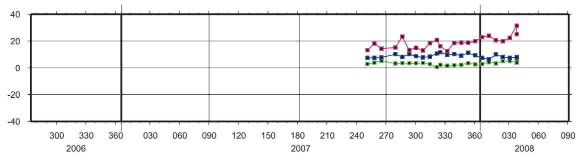
SAGA-Combined Solution Coordinate variations [mm]



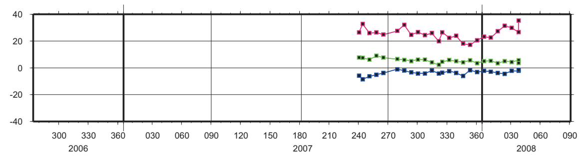
SALU-Combined Solution Coordinate variations [mm]



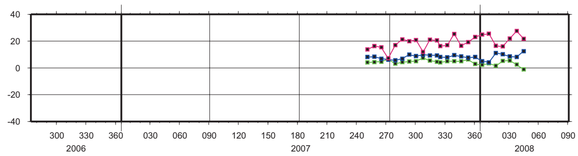
SAGA-DGFI Coordinate variations [mm]



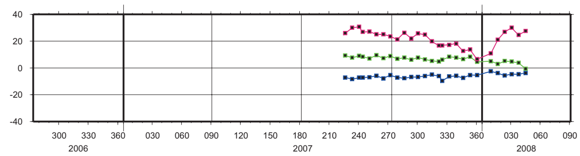
SALU-DGFI Coordinate variations [mm]



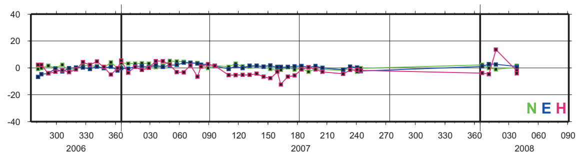
SAGA-IBGE Coordinate variations [mm]



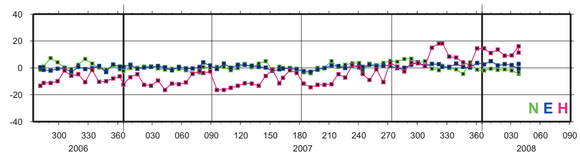
SALU-IBGE Coordinate variations [mm]



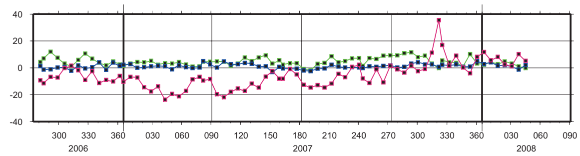
SALV-Combined Solution Coordinate variations [mm]



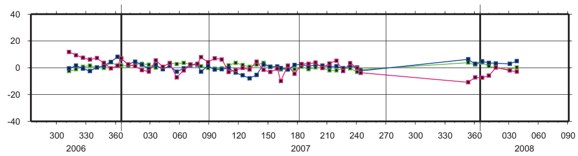
SAMA-Combined Solution Coordinate variations [mm]



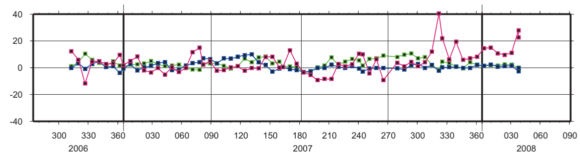
SAMA-IGAC Coordinate variations [mm]



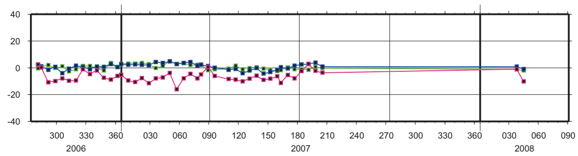
SALV-DGFI Coordinate variations [mm]



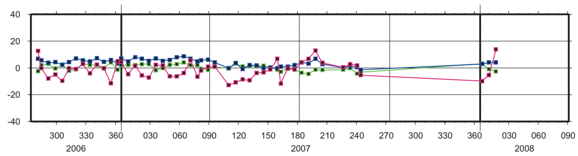
SAMA-DGFI Coordinate variations [mm]



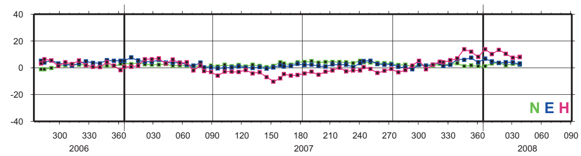
SALV-IBGE Coordinate variations [mm]



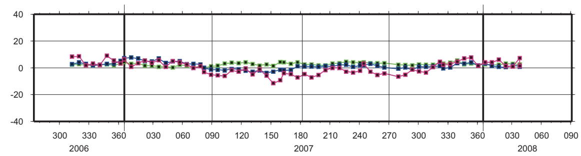
SALV-CPLAT Coordinate variations [mm]



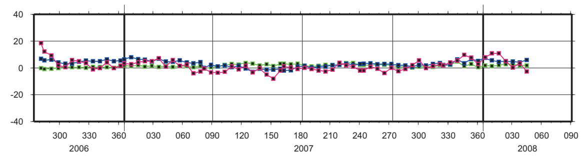
SANT-Combined Solution Coordinate variations [mm]



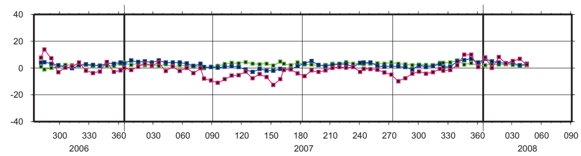
SANT-DGFI Coordinate variations [mm]



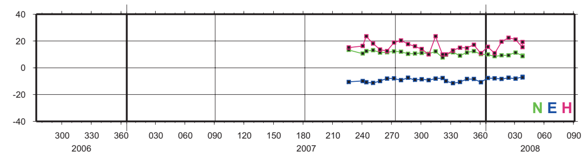
SANT-IBGE Coordinate variations [mm]



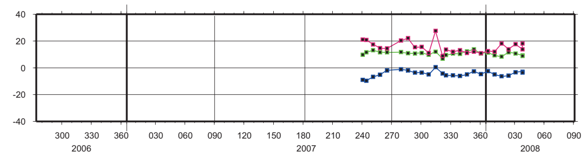
SANT-CPLAT Coordinate variations [mm]



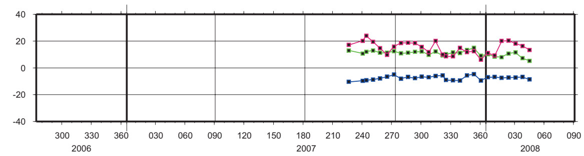
SAVO-Combined Solution Coordinate variations [mm]



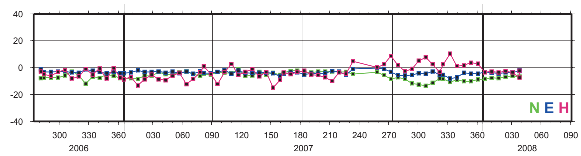
SAVO-DGFI Coordinate variations [mm]



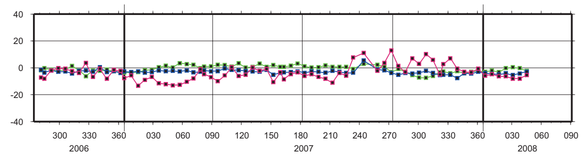
SAVO-IBGE Coordinate variations [mm]



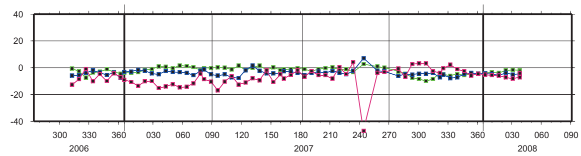
SCUB-Combined Solution Coordinate variations [mm]



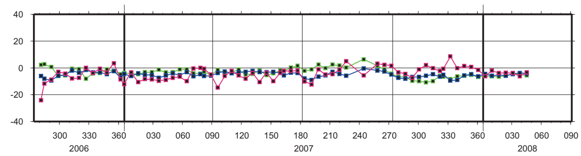
SCUB-IGAC Coordinate variations [mm]



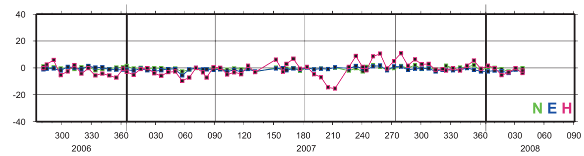
SCUB-DGFI Coordinate variations [mm]



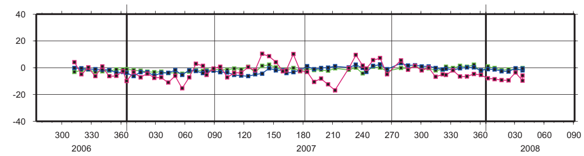
SCUB-CPLAT Coordinate variations [mm]



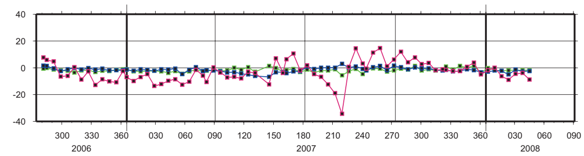
SMAR-Combined Solution Coordinate variations [mm]



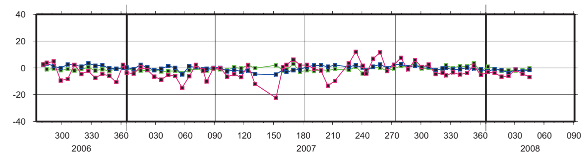
SMAR-DGFI Coordinate variations [mm]



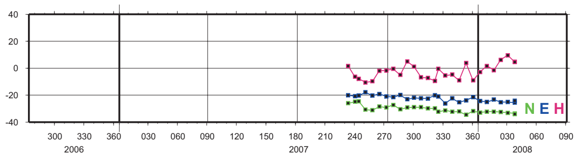
SMAR-IBGE Coordinate variations [mm]



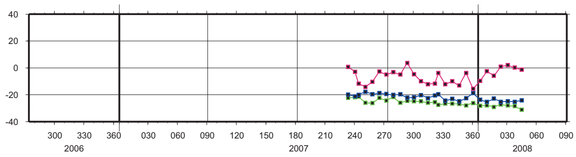
SMAR-CPLAT Coordinate variations [mm]



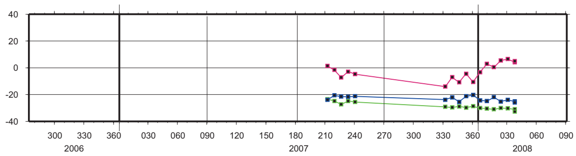
SMRT-Combined Solution Coordinate variations [mm]



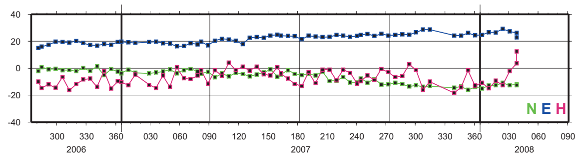
SMRT-IGAC Coordinate variations [mm]



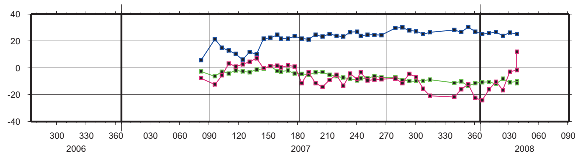
SMRT-DGFI Coordinate variations [mm]



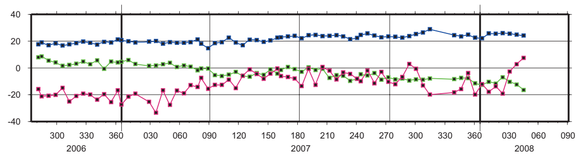
SRNW-Combined Solution Coordinate variations [mm]



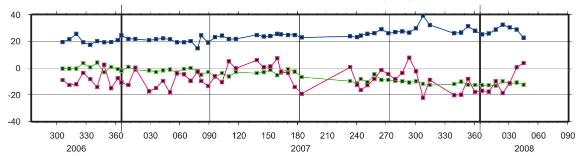
SRNW-DGFI Coordinate variations [mm]



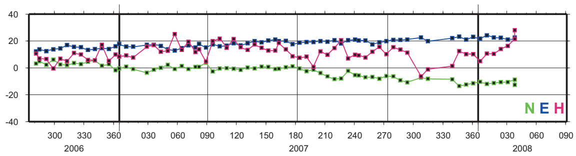
SRNW-IBGE Coordinate variations [mm]



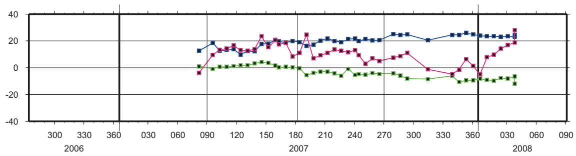
SRNW-CPLAT Coordinate variations [mm]



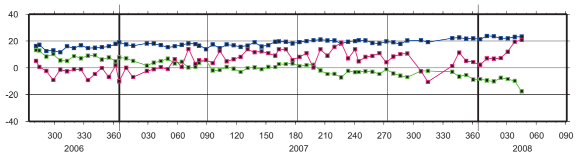
SRZN-Combined Solution Coordinate variations [mm]



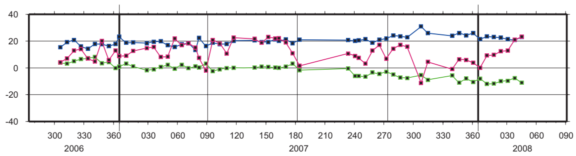
SRZN-DGFI Coordinate variations [mm]



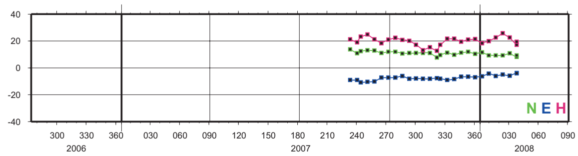
SRZN-IBGE Coordinate variations [mm]



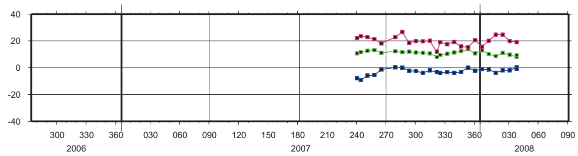
SRZN-CPLAT Coordinate variations [mm]



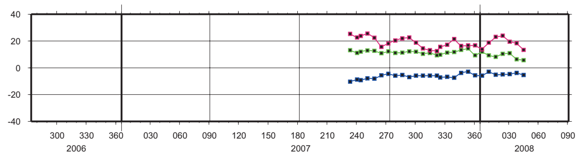
SSA1-Combined Solution Coordinate variations [mm]



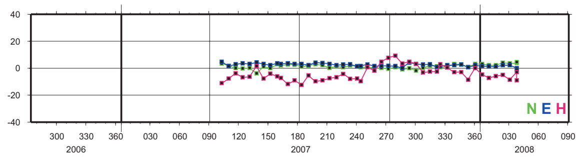
SSA1-DGFI Coordinate variations [mm]



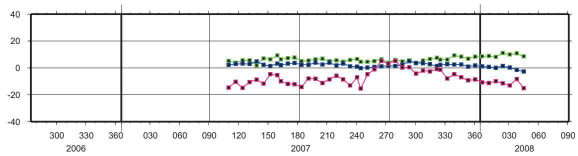
SSA1-IBGE Coordinate variations [mm]



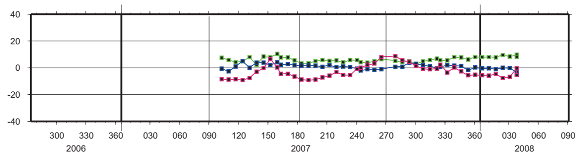
SSIA-Combined Solution Coordinate variations [mm]



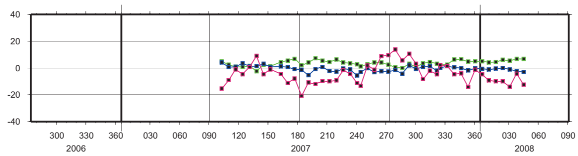
SSIA-IGAC Coordinate variations [mm]



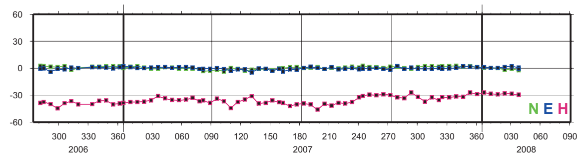
SSIA-DGFI Coordinate variations [mm]



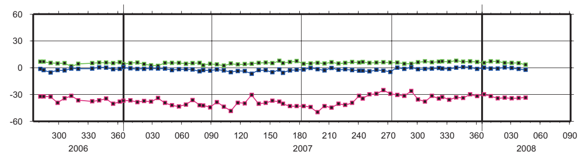
SSIA-CPLAT Coordinate variations [mm]



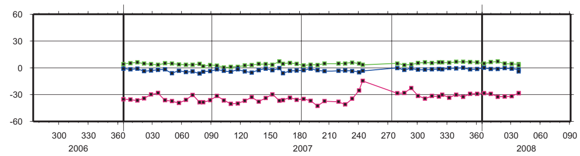
TAMP-Combined Solution Coordinate variations [mm]



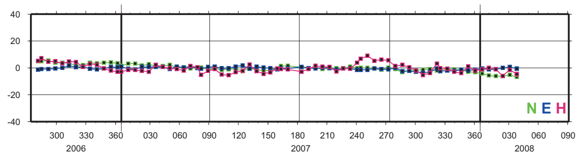
TAMP-IGAC Coordinate variations [mm]



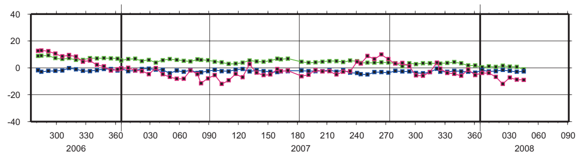
TAMP-DGFI Coordinate variations [mm]



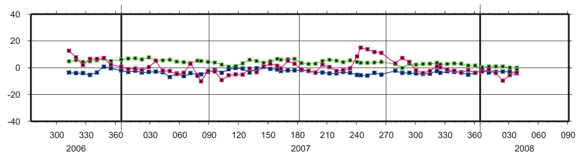
TOL2-Combined Solution Coordinate variations [mm]



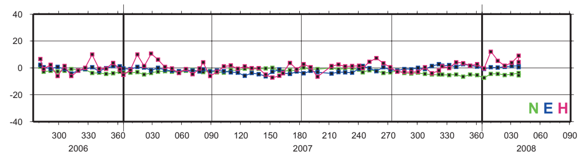
TOL2-IGAC Coordinate variations [mm]



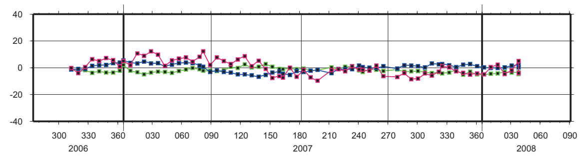
TOL2-DGFI Coordinate variations [mm]



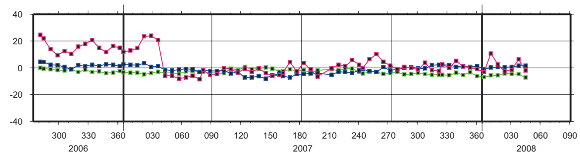
TUCU-Combined Solution Coordinate variations [mm]



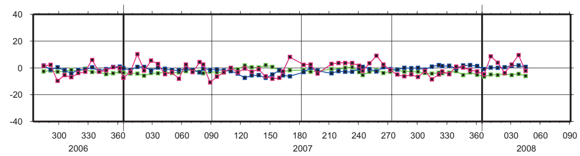
TUCU-DGFI Coordinate variations [mm]



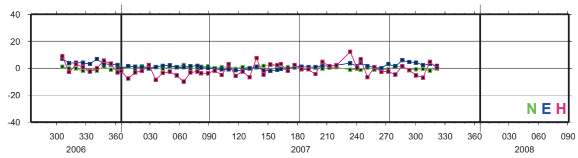
TUCU-IBGE Coordinate variations [mm]



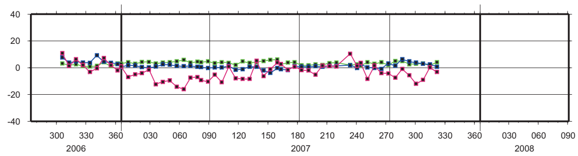
TUCU-CPLAT Coordinate variations [mm]



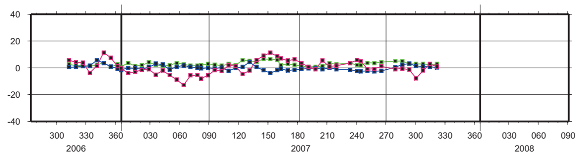
TUMA-Combined Solution Coordinate variations [mm]



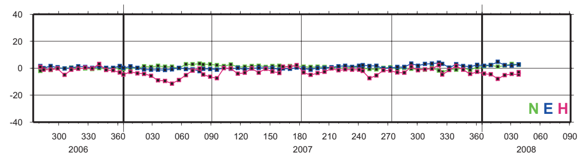
TUMA-IGAC Coordinate variations [mm]



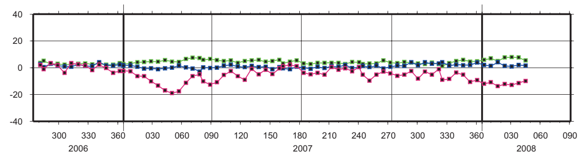
TUMA-DGFI Coordinate variations [mm]



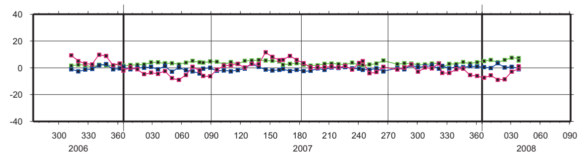
TUNA-Combined Solution Coordinate variations [mm]



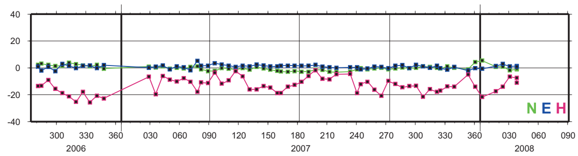
TUNA-IGAC Coordinate variations [mm]



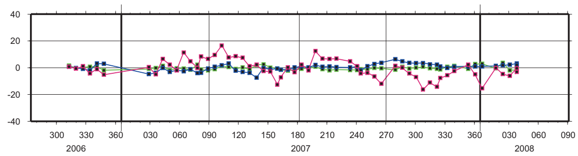
TUNA-DGFI Coordinate variations [mm]



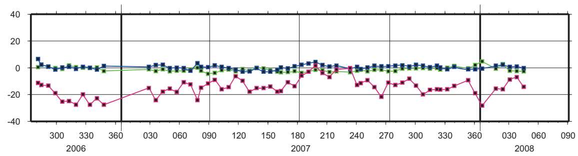
UBAT-Combined Solution Coordinate variations [mm]



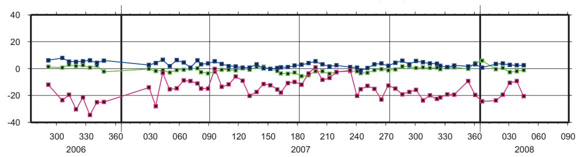
UBAT-DGFI Coordinate variations [mm]



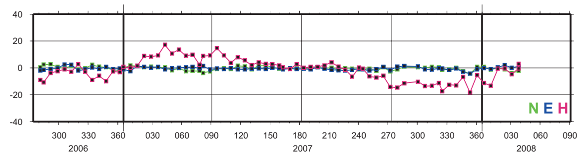
UBAT-IBGE Coordinate variations [mm]



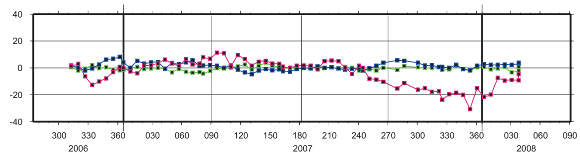
UBAT-CPLAT Coordinate variations [mm]



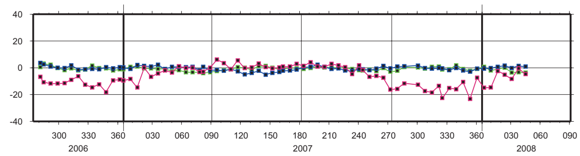
UBER-Combined Solution Coordinate variations [mm]



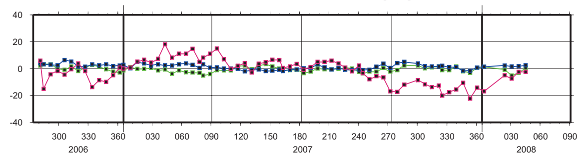
UBER-DGFI Coordinate variations [mm]



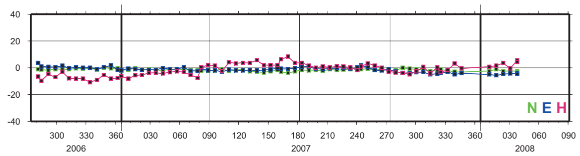
UBER-IBGE Coordinate variations [mm]



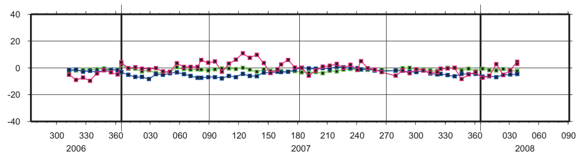
UBER-CPLAT Coordinate variations [mm]



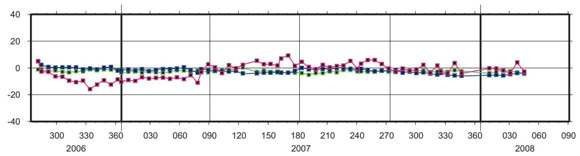
UCOR-Combined Solution Coordinate variations [mm]



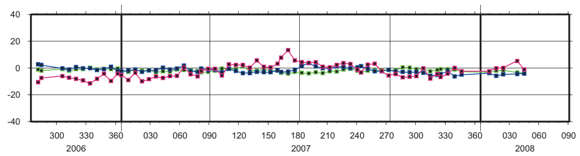
UCOR-DGFI Coordinate variations [mm]



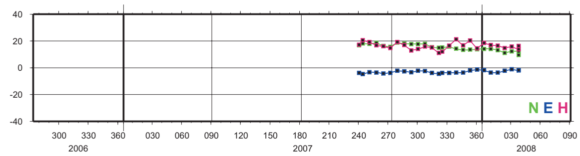
UCOR-IBGE Coordinate variations [mm]



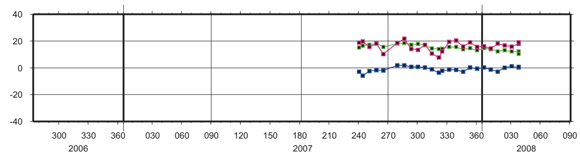
UCOR-CPLAT Coordinate variations [mm]



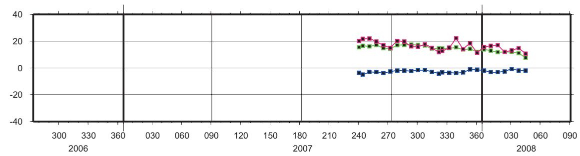
UFPR-Combined Solution Coordinate variations [mm]



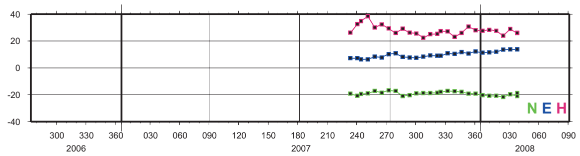
UFPR-DGFI Coordinate variations [mm]



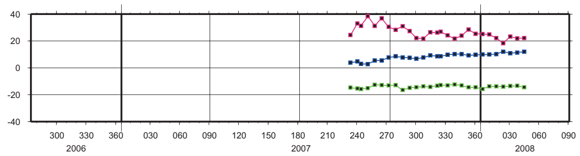
UFPR-IBGE Coordinate variations [mm]



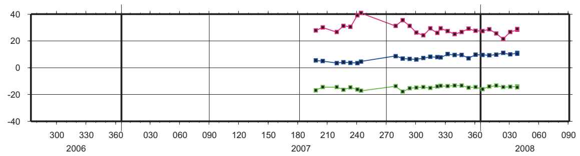
UGTO-Combined Solution Coordinate variations [mm]



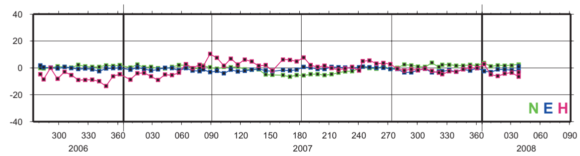
UGTO-IGAC Coordinate variations [mm]



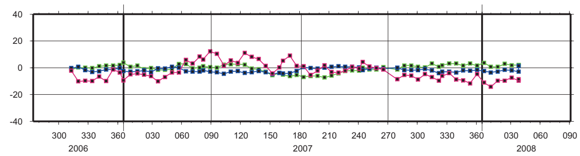
UGTO-DGFI Coordinate variations [mm]



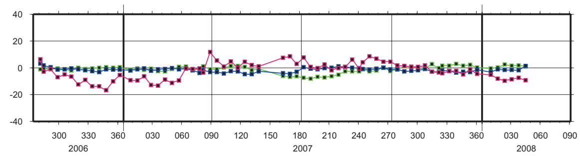
UNRO-Combined Solution Coordinate variations [mm]



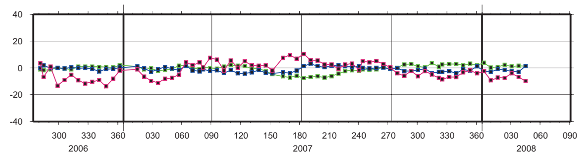
UNRO-DGFI Coordinate variations [mm]



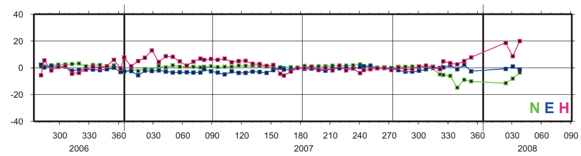
UNRO-IBGE Coordinate variations [mm]



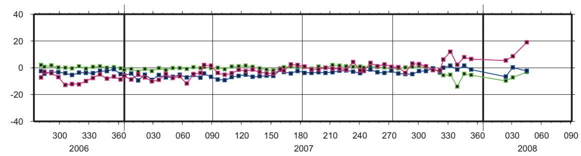
UNRO-CPLAT Coordinate variations [mm]



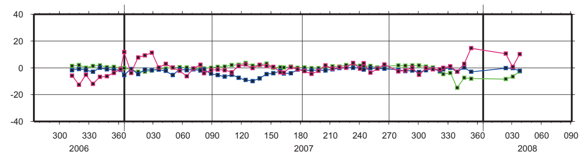
UNSA-Combined Solution Coordinate variations [mm]



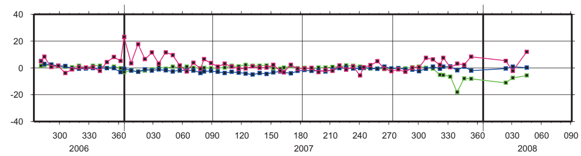
UNSA-IGAC Coordinate variations [mm]



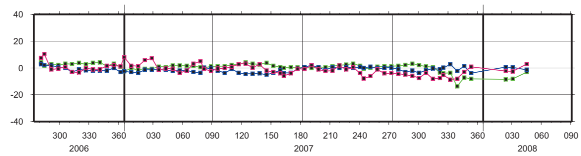
UNSA-DGFI Coordinate variations [mm]



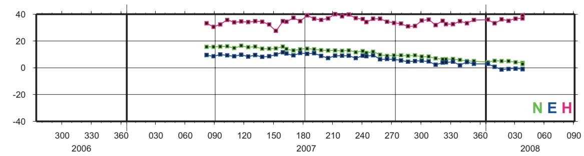
UNSA-IBGE Coordinate variations [mm]



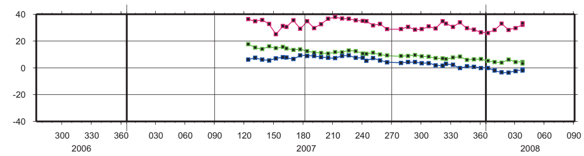
UNSA-CPLAT Coordinate variations [mm]



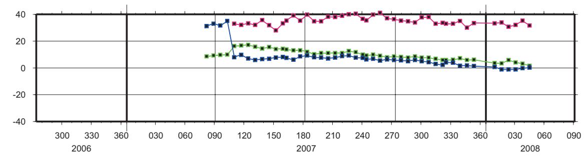
UNSJ-Combined Solution Coordinate variations [mm]



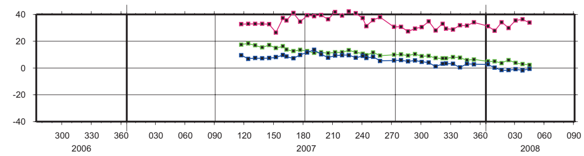
UNSJ-DGFI Coordinate variations [mm]



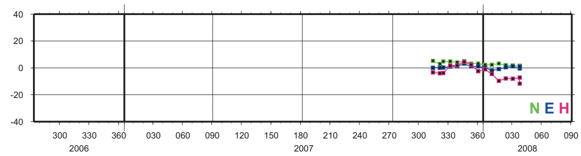
UNSJ-IBGE Coordinate variations [mm]



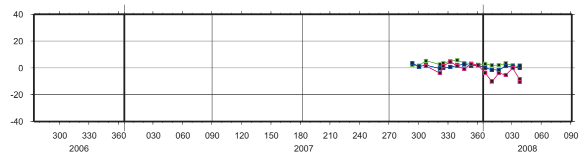
UNSJ-CPLAT Coordinate variations [mm]



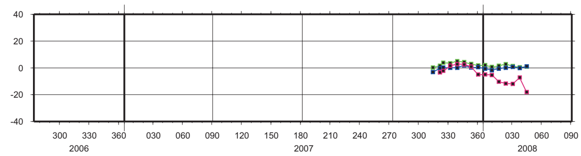
UYMO-Combined Solution Coordinate variations [mm]



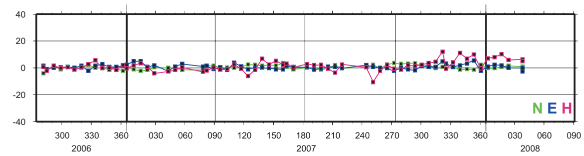
UYMO-DGFI Coordinate variations [mm]



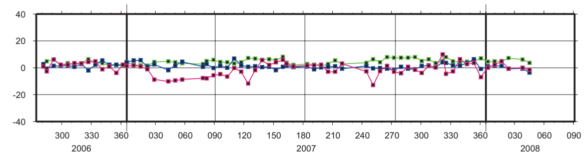
UYMO-IBGE Coordinate variations [mm]



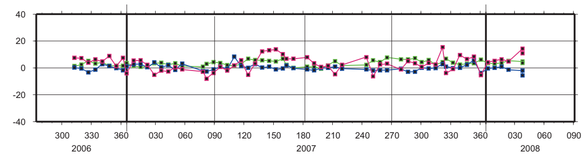
VALL-Combined Solution Coordinate variations [mm]



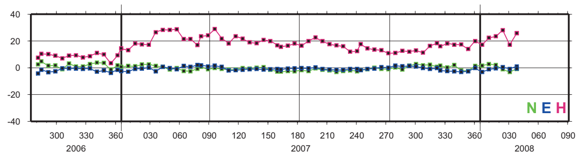
VALL-IGAC Coordinate variations [mm]



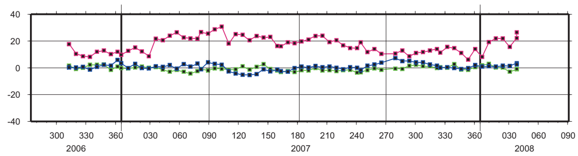
VALL-DGFI Coordinate variations [mm]



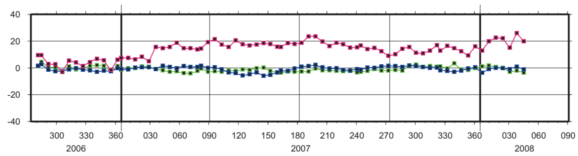
VARG-Combined Solution Coordinate variations [mm]



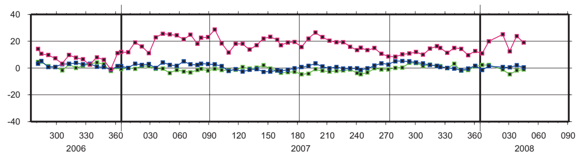
VARG-DGFI Coordinate variations [mm]



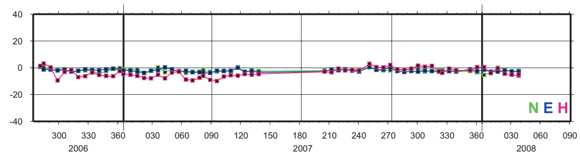
VARG-IBGE Coordinate variations [mm]



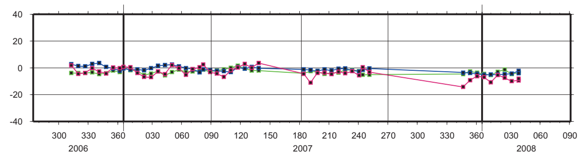
VARG-CPLAT Coordinate variations [mm]



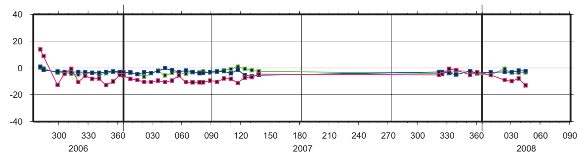
VBCA-Combined Solution Coordinate variations [mm]



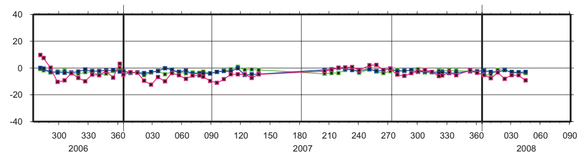
VBCA-DGFI Coordinate variations [mm]



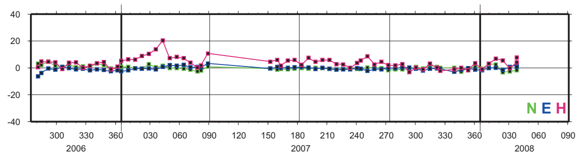
VBCA-IBGE Coordinate variations [mm]



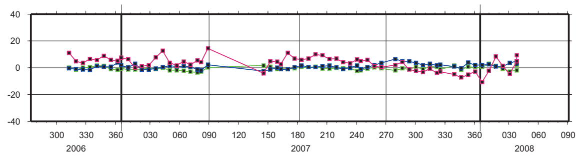
VBCA-CPLAT Coordinate variations [mm]



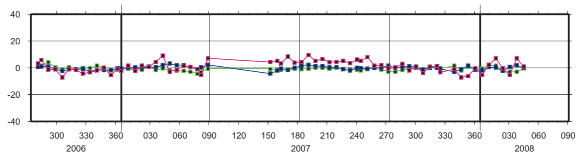
VICO-Combined Solution Coordinate variations [mm]



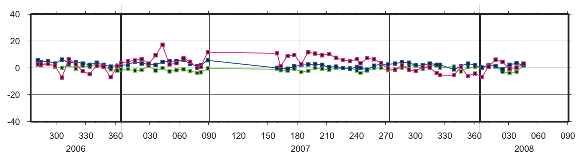
VICO-DGFI Coordinate variations [mm]



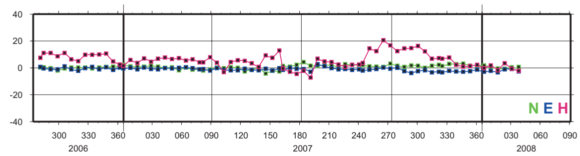
VICO-IBGE Coordinate variations [mm]



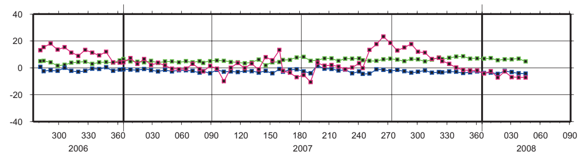
VICO-CPLAT Coordinate variations [mm]



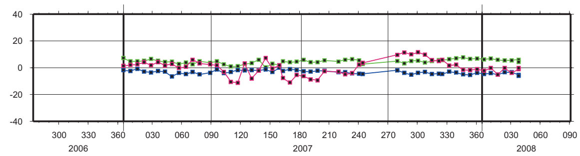
VIL2-Combined Solution Coordinate variations [mm]



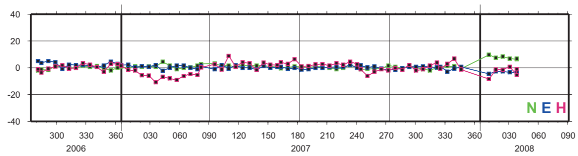
VIL2-IGAC Coordinate variations [mm]



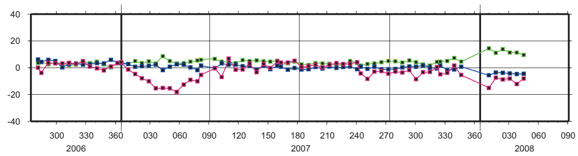
VIL2-DGFI Coordinate variations [mm]



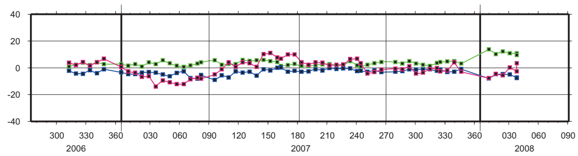
VIVI-Combined Solution Coordinate variations [mm]



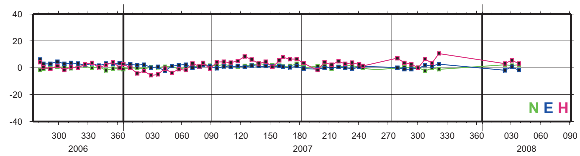
VIVI-IGAC Coordinate variations [mm]



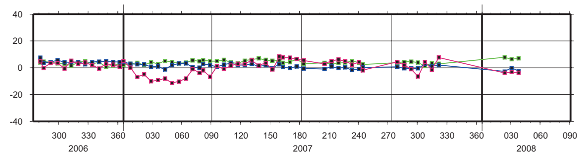
VIVI-DGFI Coordinate variations [mm]



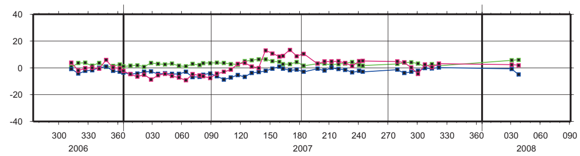
YOPA-Combined Solution Coordinate variations [mm]



YOPA-IGAC Coordinate variations [mm]



YOPA-DGFI Coordinate variations [mm]



YOPA-IBGE Coordinate variations [mm]