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SIRGAS-CON Network - Working Group I

IBGE Analysis Center - Combination Report  
Period (GPS weeks) 1547 to 1601

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Begining of Activities	GPS week 1495
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Software Used	Bernese GPS Software Version 5.0
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List of IBGE's products and reports generated for GPS week 'www'	<b>ftp://geoftp.ibge.gov.br/SIRGAS/Resultados/Combinacao/</b> <b>IBGwww.SUM</b> Summary file of Repeatability (1 WEEK) <b>IBGwwwS.SNX</b> Loosely constrained weekly solutions <b>IBGyyPwww.SNX</b> Constrained weekly solutions  <b>ftp://geoftp.ibge.gov.br/SIRGAS/Relatorios/Combinacao/</b> <b>IBGE_RESULTS_www.pdf</b> Weekly Reports of Official Centers  Description of reports content: The files in this directory are the weekly reports of the combined results of seven processing centers SIRGAS identified in the report by the abbreviations: CIM: Institute of Geodesy Geodynamics y de la Facultad de Ingeniería de la Universidad Nacional de Cuyo (Argentina) DGF: Deutsches Geodätisches Forschungsintitut (Germany) ECU: Military Geographic Institute of Ecuador (Ecuador) IBG: Brazilian Institute of Geography and Statistics (Brazil) IGA: Instituto Geográfico Agustin Codazzi (Colombia) LUZ: Laboratorio y Satellite Geodesy Physics, Universidad del Zulia (Venezuela) URY: Servicio Geográfico Militar del Uruguay (Uruguay)  The reports are divided into 8 parts containing the
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following information:

- (1) Statistics of the combined solution (table showing the total number of stations in the solution of each processing center, and the mean square error of unit weight a posteriori and the scale factor). In the last line is displayed the total number of stations combined and the final figures mean square error of unit weight a posteriori and the scale factor.
- (2) Stations IGS05 used to define the datum in the combined solution.
- (3) of the Helmert transformation parameters estimated from the combined solution and the solution of each processing center.
- (4) Problems encountered in the combination, such as station identification problems of receiver and antenna, etc..
- (5) combination of stations excluded due to problems in item (4), or stations with residuals above the pre-set tolerances.
- (6) Residuals from the comparison of existing station coordinates in the weekly solution of each processing center and the solution IGS05. The residuals from the comparison station coordinates from the combined solution and SIR solution (DGFI) and IGS weekly solution.
- (7) Names used for the SINEX files of the combined solution
- (8) Mean square error of residuals from the comparison of the station coordinates of different processing centers.

Remarks:

The solutions including the experimental Centers (INEGI and GNA) have the following identification:

**IBXwww.SUM** SUMMARY FILE OF Repeatability (1 WEEK)  
**IBXwwwS.SNX** Loosely constrained weekly solutions  
**IBXyyPwww.SNX** Constrained weekly solutions  
**IBGE\_EXP\_RESULTS\_www.pdf** Weekly Reports of Official and Experimental Centers

During this period two new Experimental Processing Centers became candidates to be Local Processing Centre, they are:

**GNA:** Instituto Geográfico Nacional - Argentina, IGN. This center is responsible for the processing of 54 stations of southern part of SIRGAS-CON network. Their activities started in week 1520 and software GAMIT/GLOBK is used to process GNSS data.

**INE:** Instituto Nacional de Estadística y Geografía - INEGI, Mexico. This centre is responsible for the processing of 26 stations from the northern part of SIRGAS-CON network. Their activities started in week 1563 and software GAMIT/GLOBK is used to process GNSS data.

The weekly solutions provided by INE and GNA were combined together with the weekly solutions provided by Local Processing Centres and the results were evaluated together. All weekly solutions were provided on time for the network Combination.

Activities under investigation in IBGE's analysis

IBGE has been working in the implementation of CATREF software and checking the results with the ones obtained with Bernese combination. CATREF was developed by IGN

(France) and it is the official software used for IGS combination. The intention is use this software in the future combination activities.

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 Computer platform | Windows Vista  
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Effective Date for | 26-Oct-2010  
 Data Analysis |  
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COMBINATION STRATEGY

- (1) Constraints are removed from the weekly solutions of each Processing Center, using free network solution strategy;
- (2) The free network solution of each processing center of is aligned to a set of stations that belong to IGS05 (2000.0) Reference network applying the conditions of "no net rotation" and "no net translation". The IGS05 stations are: BRAZ, CHPI, CONZ, CRO1, GOLD, ISPA, LPGS, MANA, MD01, OHI2, PIE1, SANT, SCUB, UNSA and VESL.
- (3) The coordinates from step (2) of each processing center, are compared with IGS05 (IGSyypwww.SNX solutions) and between them to identify possible high residuals. The stations with residuals bigger than 10 mm in the horizontal components and 20 mm in the vertical component will be analised. In the case of station exclusion the stages (1) and (2) will be repeated in order to refine the final solution and consequently the estimate the variance factor.
- (4) Covariance matrix of each solution is scaled by the variance factor or factor of scale.
- (5) The normal equations of each solution are combined to produce the loosely constrained weekly solution applying the weight of 1 meter in all the stations (OUTPUT: IBGwwwS.SNX).
- (6) The normal equations of each solution are combined to produce the constrained solution applying a weight of 1E-04 meters for IGS05 stations mentioned in the step (2) (OUTPUT: IBGyypwww.SNX).

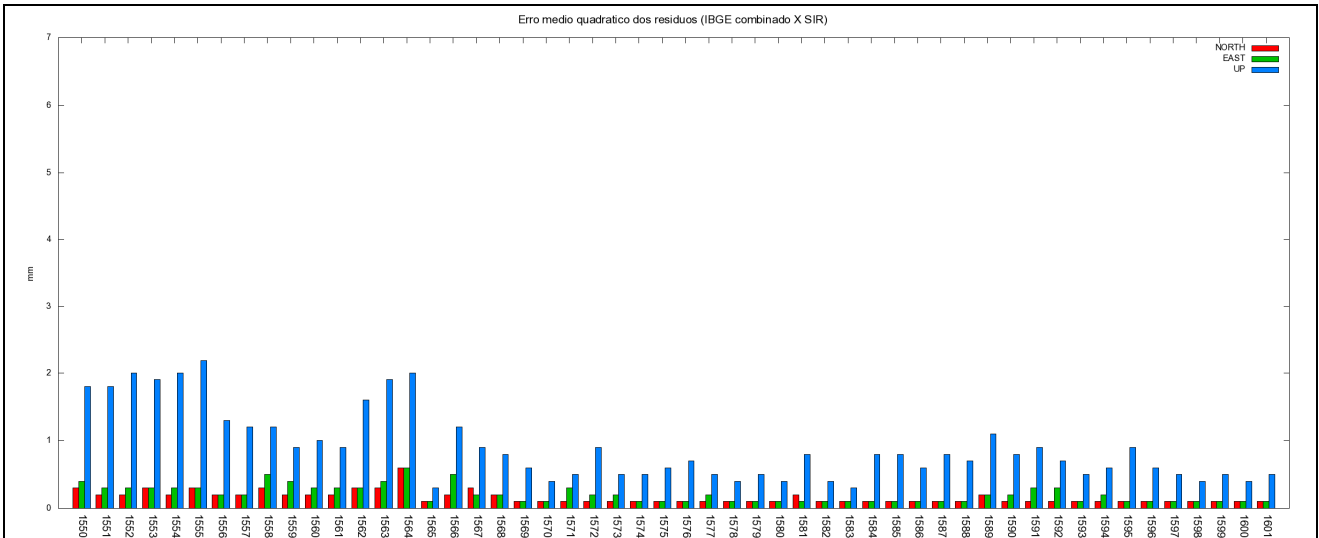
INFORMATION USED FOR THE WEEKLY COMBINATION

Satellite center of mass correction	IGS05 PCV model applied.
Satellite phase center calibrat.	IGS05 PCV model applied.

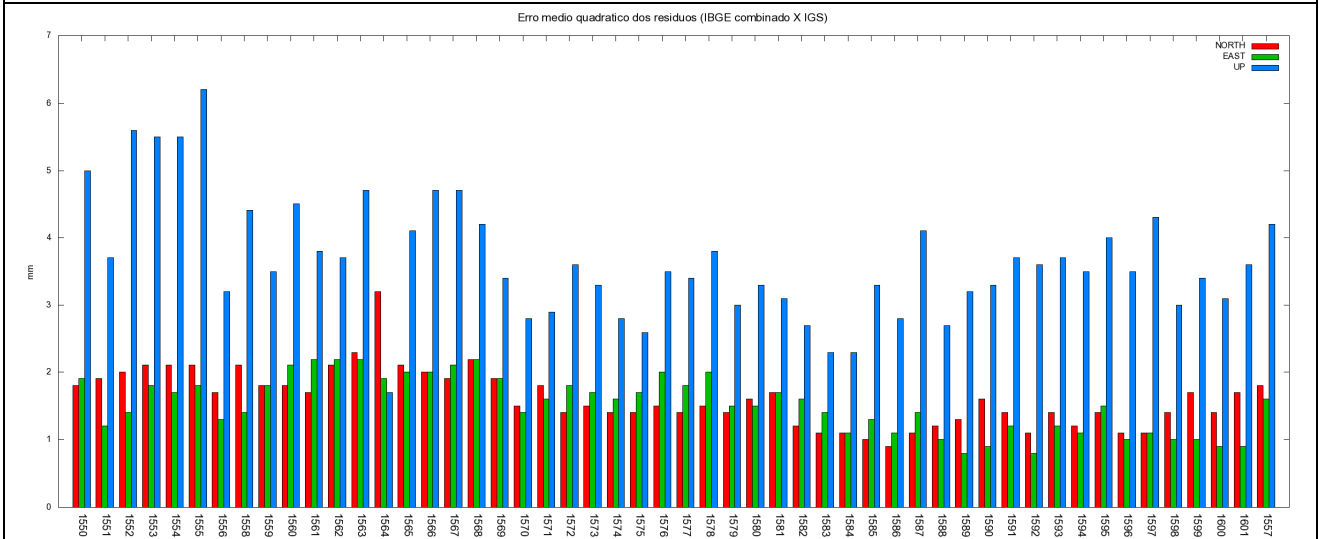
ESTIMATED PARAMETERS (APRIORI VALUES & SIGMAS)

Adjustment	Weighted least-squares algorithms
Station coordinates	Starting with GPS week 1400, the IGS realization of ITRF2005 (IGS05) is used. Notes: ABOUT 200 GNSS stations were included in analysis. Datum definition: . 3 no-net translation conditions . 3 no-net rotation conditions . geocenter coordinates constrained nominally to zero values IGS05 fiducial sites are selected as reference, if: . horizontal deviation < 10 mm . vertical deviation < 30 mm

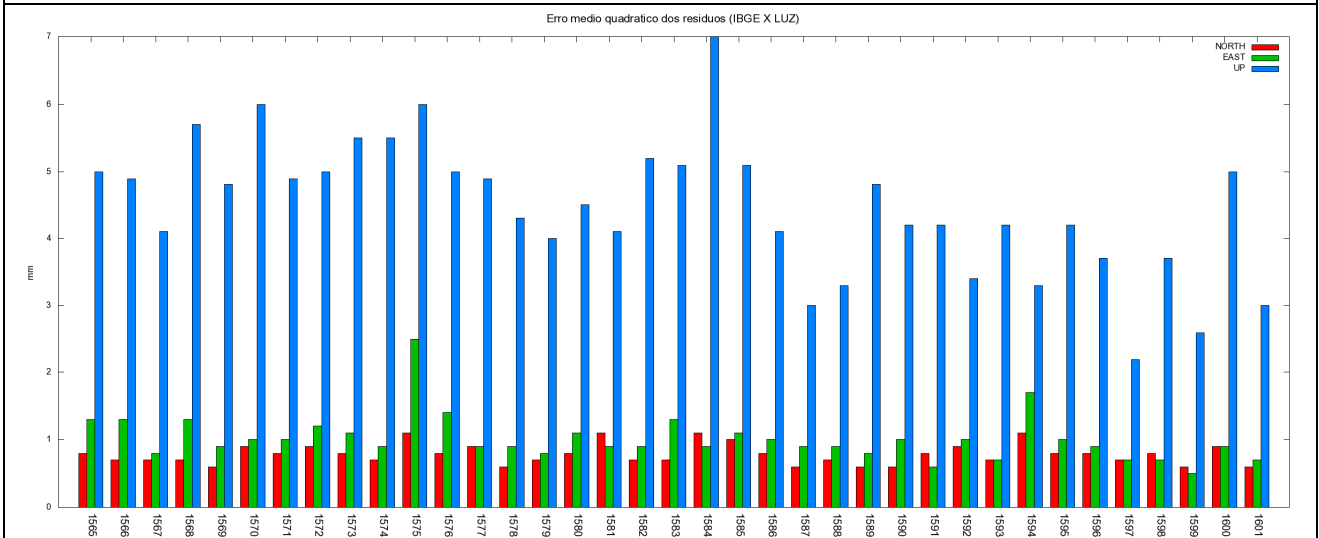
OFFICIAL CENTERS RESULTS



RMS of residuals of Helmert transformation between the weekly coordinates of IBGE and SIR solutions (IBGyyPwww.crd and SIRyyPwww.crd), from the period of 1550 to 1601 GPS week.

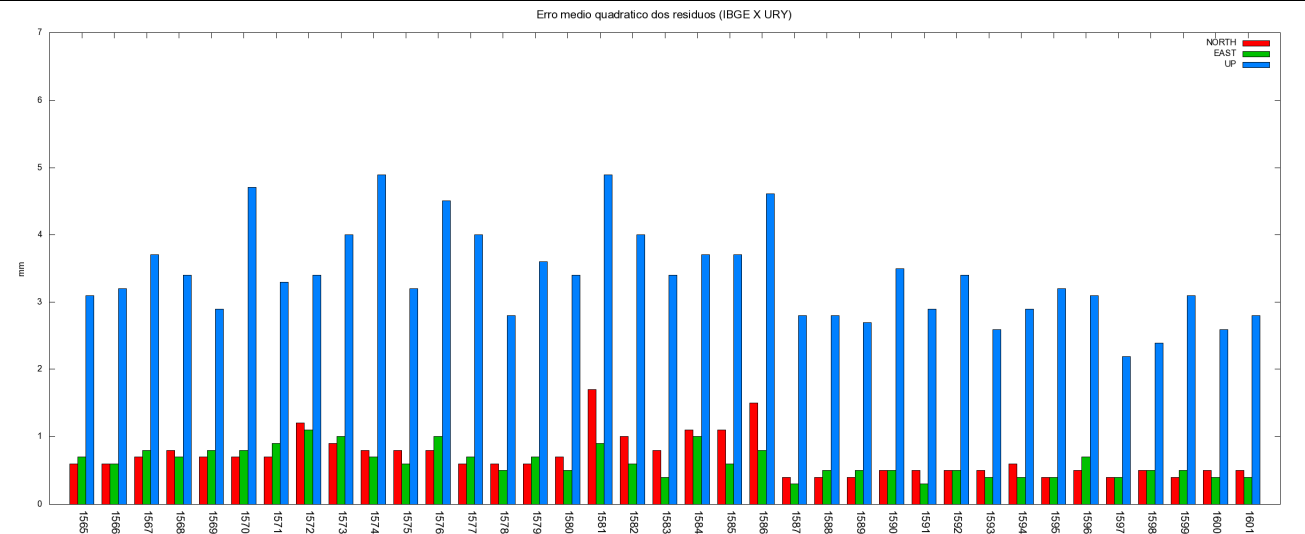


RMS of residuals of Helmert transformation between the weekly coordinates of IBGE and IGS solutions (IBGyyPwww.crd and IGSyyPwww.crd), from the period of 1555 to 1601 GPS week.

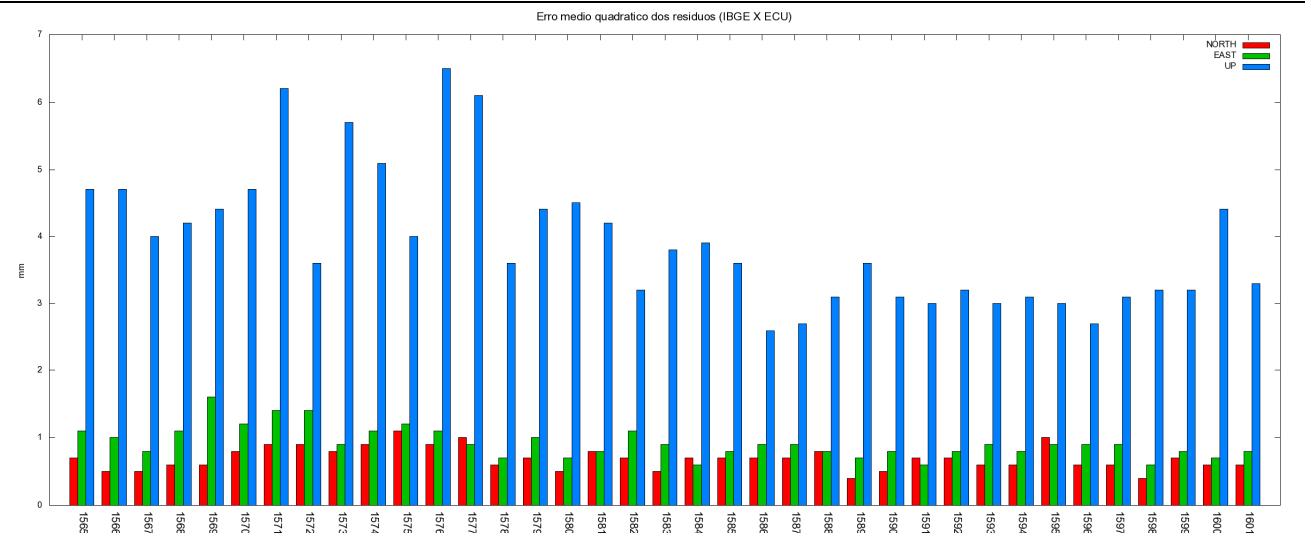


RMS of residuals of Helmert transformation between the weekly coordinates of IBGE and LUZ minimum constraint solutions, from the period of 1565 to 1601 GPS

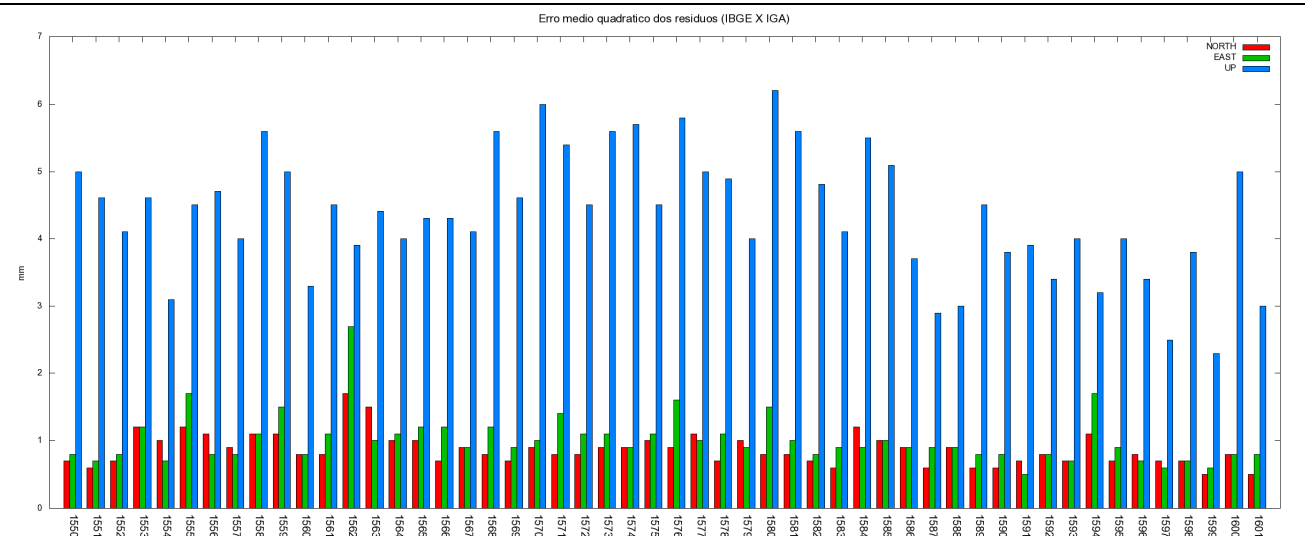
week.



RMS of residuals of Helmert transformation between the weekly coordinates of IBGE and URY minimum constraint solutions, from a period of 1565 to 1601 GPS week.

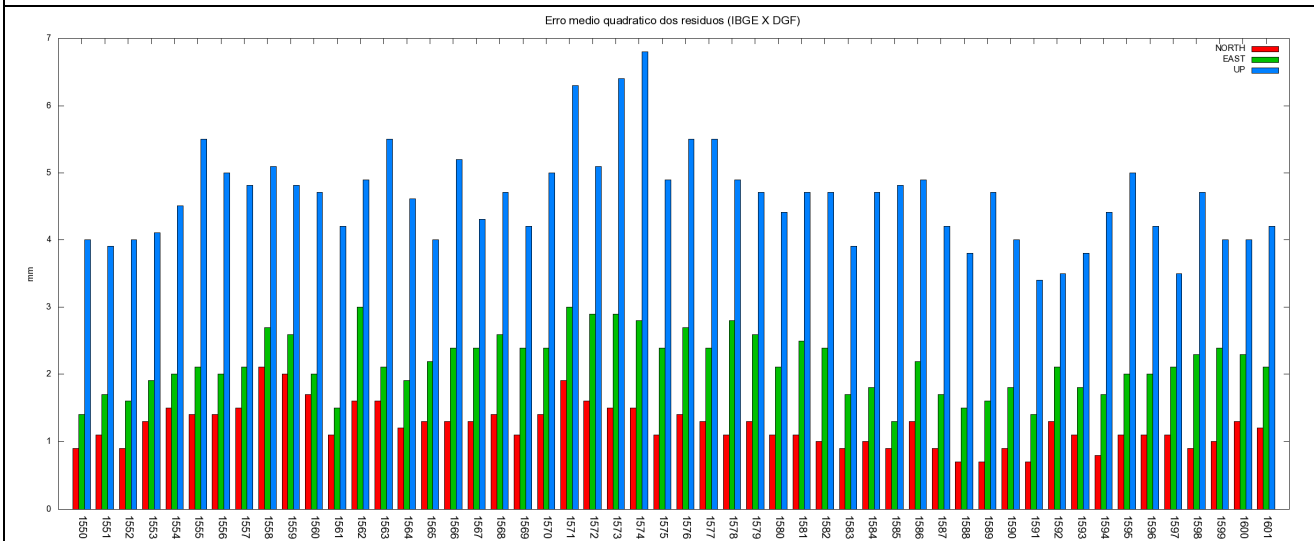


RMS of residuals of Helmert transformation between the weekly coordinates of IBGE and ECU minimum constraint solutions, from the period of 1565 to 1601 GPS week.

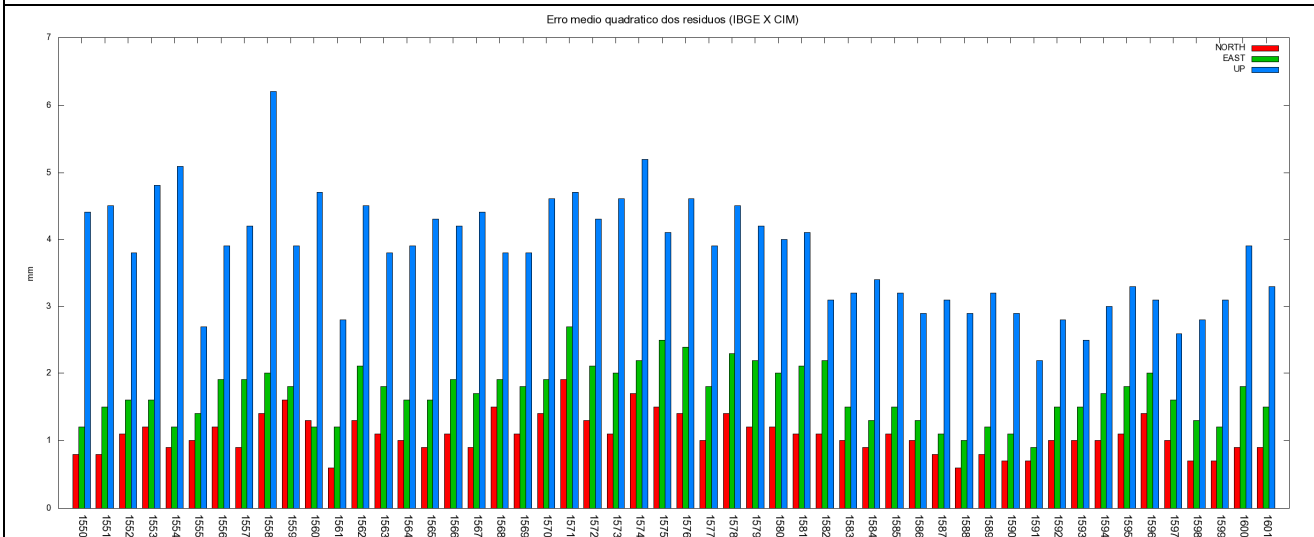


RMS of residuals of Helmert transformation between the weekly coordinates of

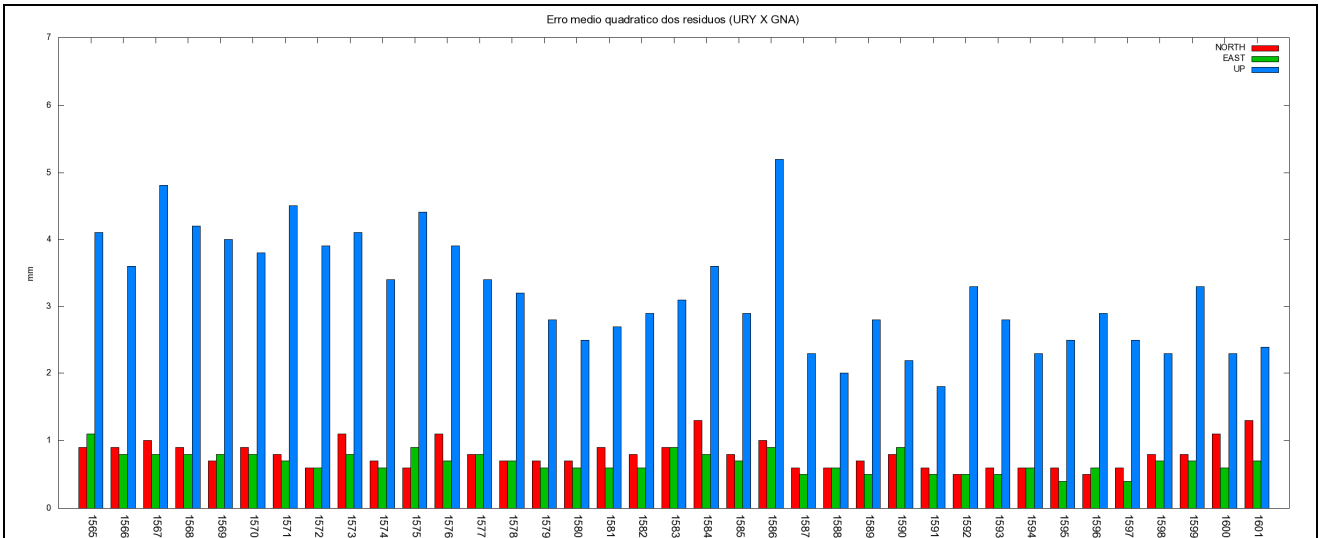
IBGE and IGA minimum constraint solutions, from the period of 1550 to 1601 GPS week.



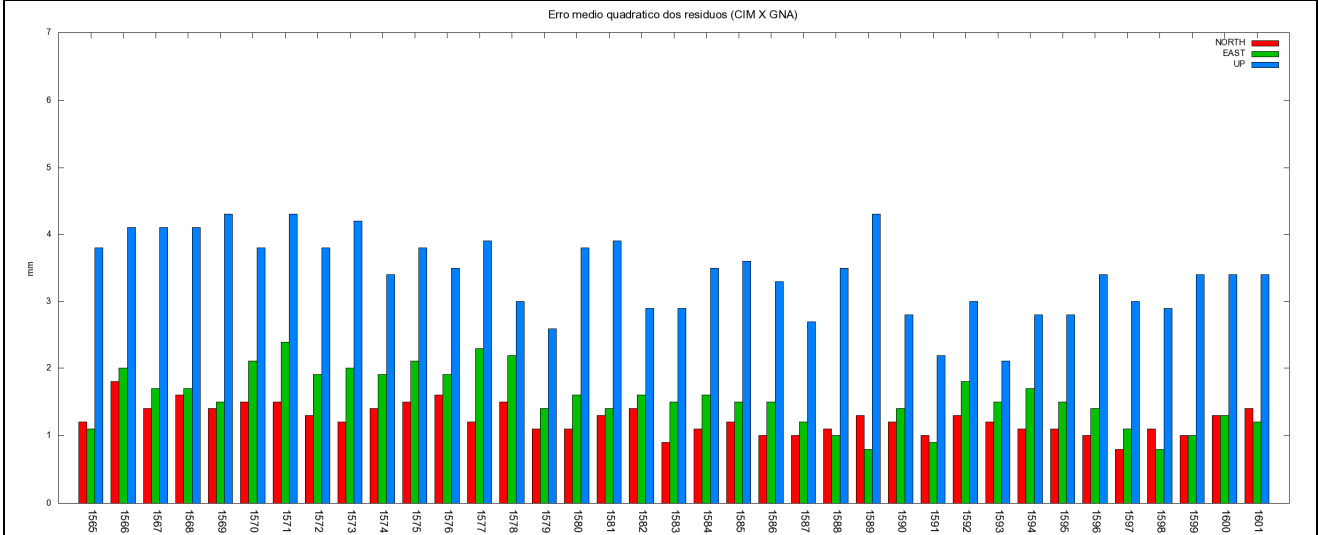
RMS of residuals of Helmert transformation between the weekly coordinates of IBGE and DGF minimum constraint solutions, from the period of 1550 to 1601 GPS week.



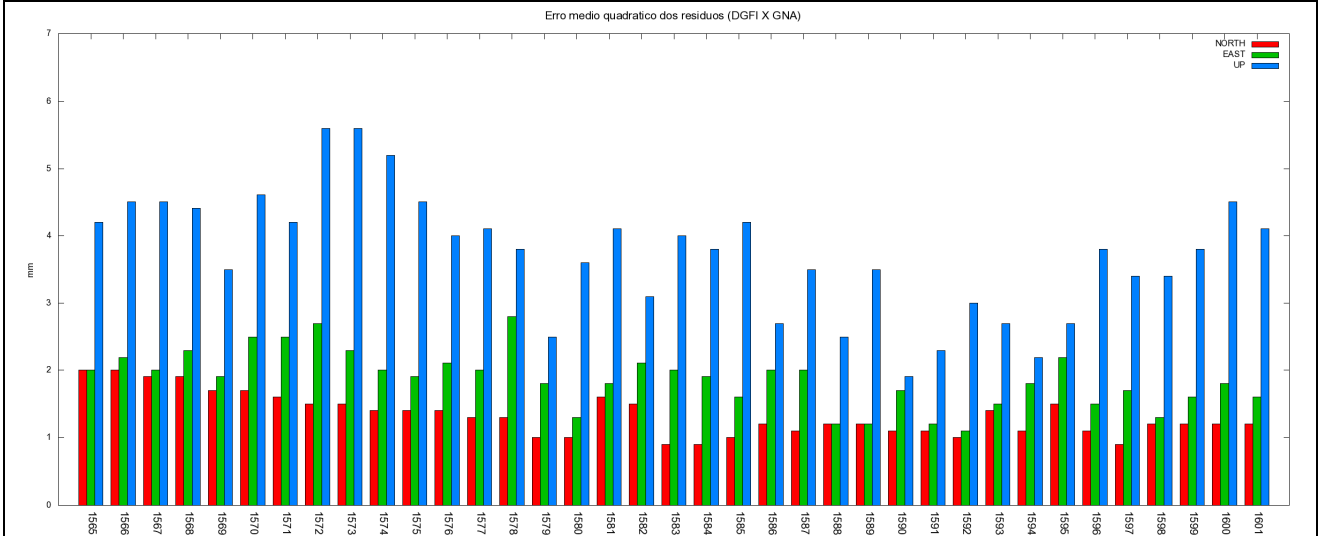
RMS of residuals of Helmert transformation between the weekly coordinates of IBGE and CIM minimum constraint solutions, from the period of 1550 to 1601 GPS week.



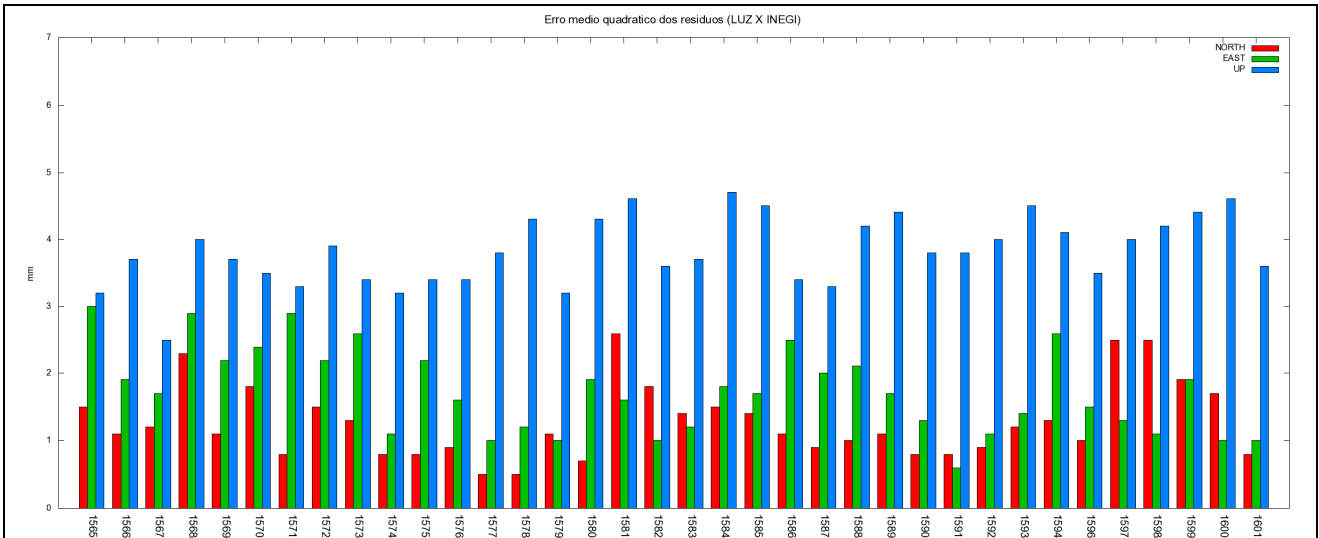
RMS of residuals of Helmert transformation between the weekly coordinates of URY and GNA minimum constraint solutions, from the period of 1565 to 1601 GPS week.



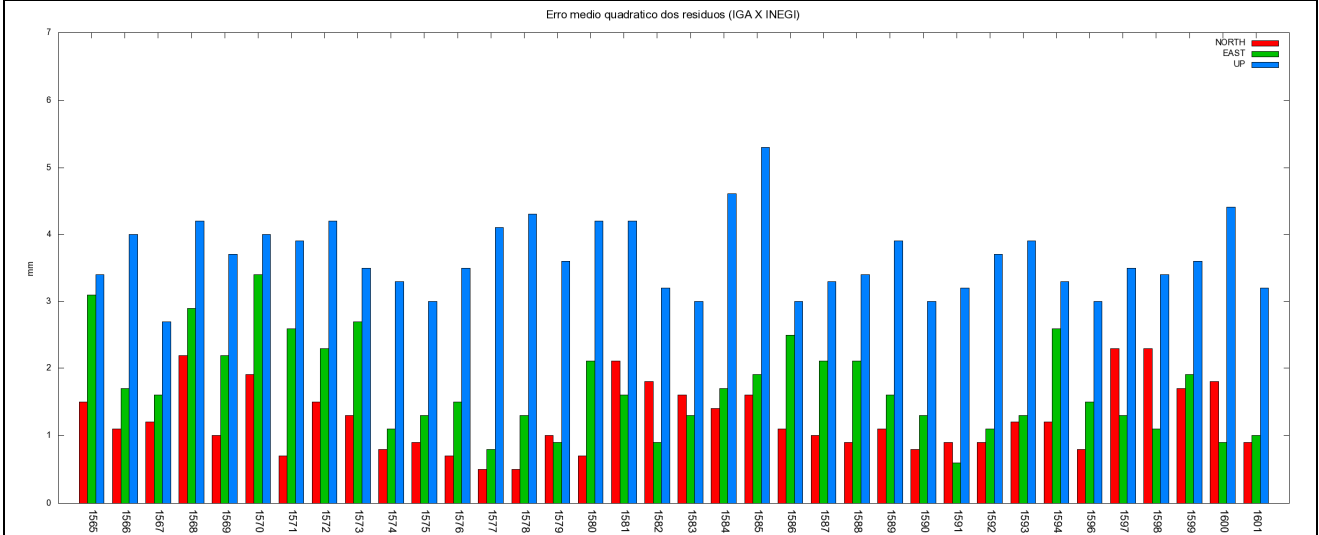
RMS of residuals of Helmert transformation between the weekly coordinates of CIM and GNA minimum constraint solutions, from the period of 1565 to 1601 GPS week.



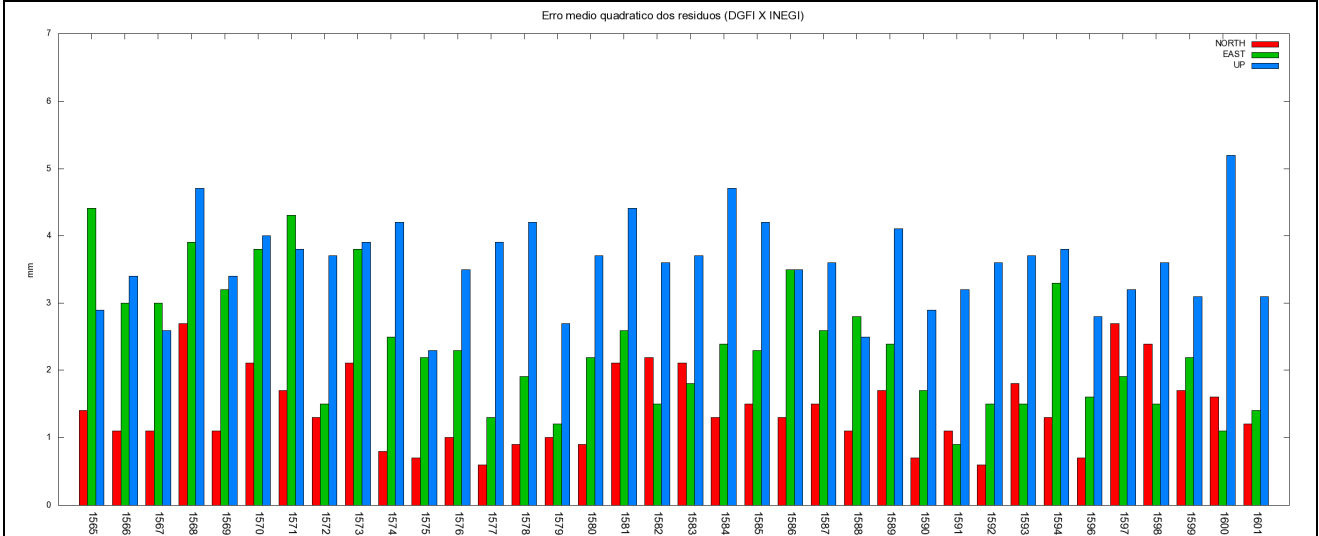
RMS of residuals of Helmert transformation between the weekly coordinates of DGF and GNA minimum constraint solutions, from the period of 1565 to 1601 GPS week.



RMS of residuals of Helmert transformation between the weekly coordinates of LUZ and INE minimum constraint solutions, from the period of 1565 to 1601 GPS week.



RMS of residuals of Helmert transformation between the weekly coordinates of IGA and INE minimum constraint solutions, from the period of 1565 to 1601 GPS week.



RMS of residuals of Helmert transformation between the weekly coordinates of DGF and INE minimum constraint solutions, from the period of 1565 to 1601 GPS week.



#### EVALUATION OF SOLUTIONS

For the period between GPS weeks 1547 to 1601, 225 stations participated in SIRGA-CON combination, the number of stations that had the participation in each processing center is available in IBGE weekly reports (<ftp://geoftp.ibge.gov.br/SIRGAS/Resultados/Combinacao/>).

Some problems related to equipment and antenna height were found. This is the case of stations: NEIA, OURI, PPTE, ROSA, SJRP, ONRJ, CRCS, ABPW, MPL2, CALI, MEDE, BRMU, BOGT. The station SJRP, OURI, ROSA for example, received the identification from one processing center without Domes number.

The participation of some stations were only during few weeks and probably it is better consult data centers if their will continue in operation or they can be dismissed. This is the case of following stations: APTO, BANS, CIC1, CRIS, EXU0, APSA, CRUZ, AMHU.