The Processing of the SIRGAS Core Network at DGFI

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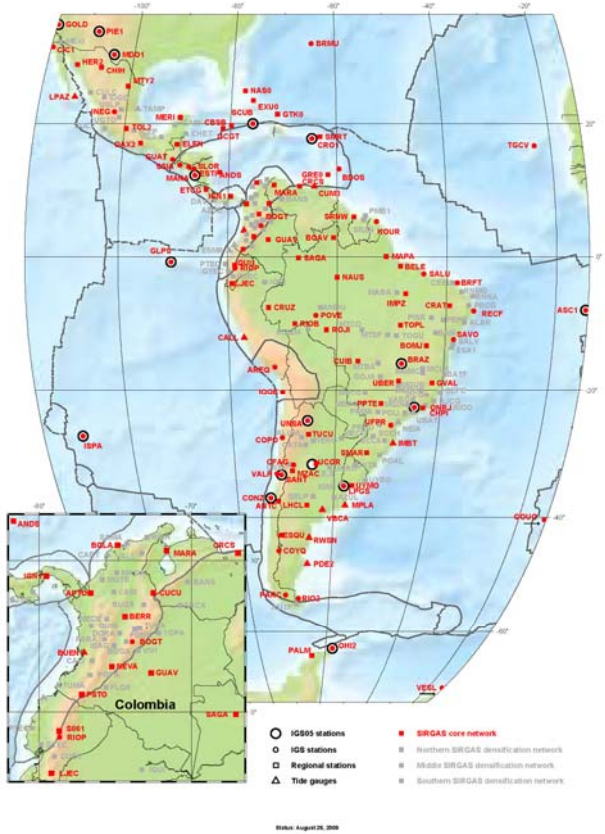

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Introduction

Until GPS week 1495 (August 30, 2008) the loosely constrained weekly solutions for the SIRGAS Continuously Operating Network (SIRGAS-CON) were computed by the IGS Regional Network Associate Analysis Centre for SIRGAS (IGS RNAAC SIR) at DGFI for the entire network. Afterwards the SIRGAS-CON network was divided into four sub-networks:

- One core network covering homogeneously Latin America and the Caribbean (SIRGAS-CON-C) and
- Three densification networks (SIRGAS-CON-D) distributed on the northern, the middle, and the southern part of the region

These four sub-networks are individually processed by four SIRGAS Processing Centres, which generate loosely constrained weekly solutions to be combined into an integral solution for the entire network. This presentation reports about the SIRGAS-CON-C network, the used input data, and the strategy of processing. Comparisons with IGS weekly solutions are shown.

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The four SIRGAS Sub-Networks and Processing Centres

Since June 1996 the IGS Regional Network Associate Analysis Centre for SIRGAS (IGS RNAAC SIR) at DGFI is in charge for processing the entire SIRGAS-CON network. Starting with GPS week 1495 (August 2008) the SIRGAS-CON network is computed by four SIRGAS Analysis Centres of two hierarchical levels:

1. One continental network (SIRGAS-CON-C), the ITRF densification in Latin America. It has a good continental coverage and stabile site locations to ensure high long-term stability of the reference frame
2. Densification networks (SIRGAS-CON-D), which comprise the national reference networks and provide accessibility to the reference frame. Actually three SIRGAS-CON-D networks exist, one northern, one middle and one southern part

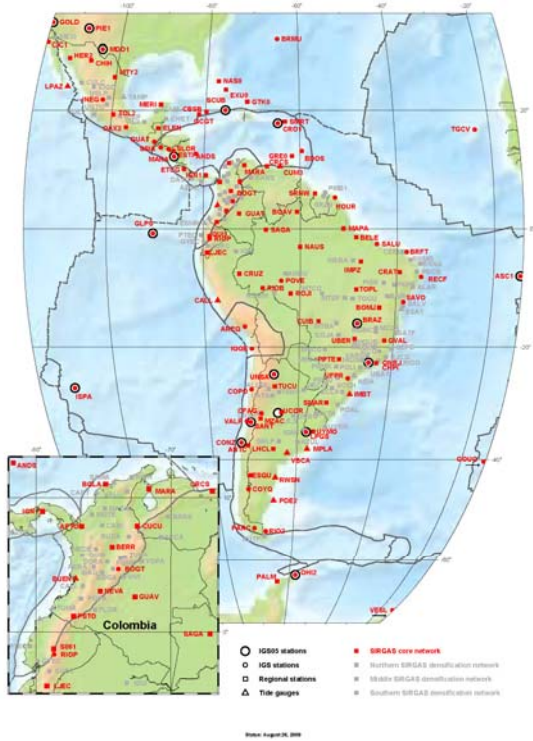
   (Figure 1)

The SIRGAS-CON-C network is processed by the IGS RNAAC SIR at DGFI, the SIRGAS-CON-D networks by the Instituto Geografico Agustin Codazzi, Colombia (IGAC), Instituto Brasileiro de Geografia e Estatistica, Brazil (IBGE), and Instituto de Geodesia y Geodinamica de la Universidad Nacional del Cuyo, Argentina (IGG-CIMA).

Processed by IBGE (Brazil)

Processed by IGAC (Colombia)

Processed by DGFI (Germany)



Processed by CIMA (Argentina)

Figure 1: The four SIRGAS sub-networks of the SIRGAS-CON network

15 stations (ITRF2005/IGS05)
are prossed by 4 Analysis Centres

8 stations are processed by
3 Analysis Centres

84 stations are processed by
2 Analysis Centres

101 stations by only
1 Analysis Centre

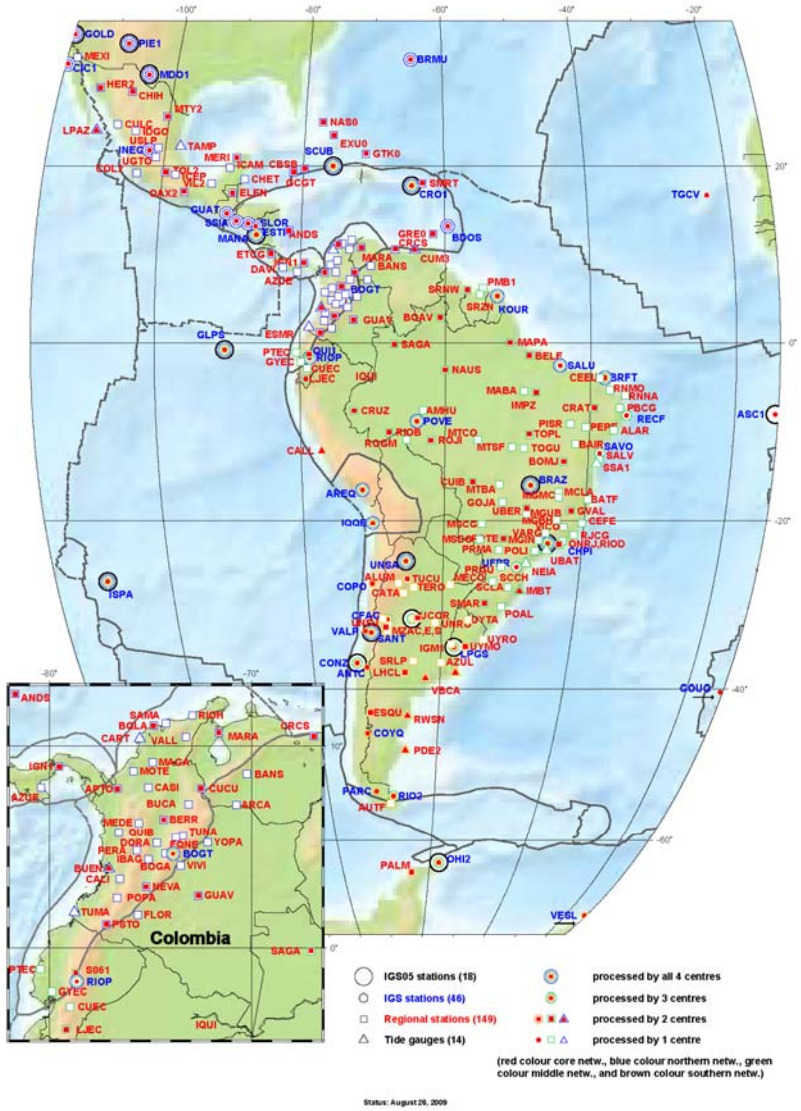


Figure 2: Number of processing centres per station of SIRGAS-CON network

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SIRGAS Core Network (SIRGAS-CON-C)

- The SIRGAS-CON-C network contains 108 stations including all 48 ITRF2005 (IGS05) stations and 61 regional stations (including 8 tide gauges) of the entire SIRGAS-CON network (208 stations including 25 decommissioned stations, status of August 26, 2009) (Figure 3)
- Each week a loosely constrained coordinate solution with an average of about 95 stations is delivered to be combined with the densification sub-networks solutions

The SIRGAS-CON-C containes
108 stations with all ITRF2005 (IGS05)
stations and 9 tide gauges included

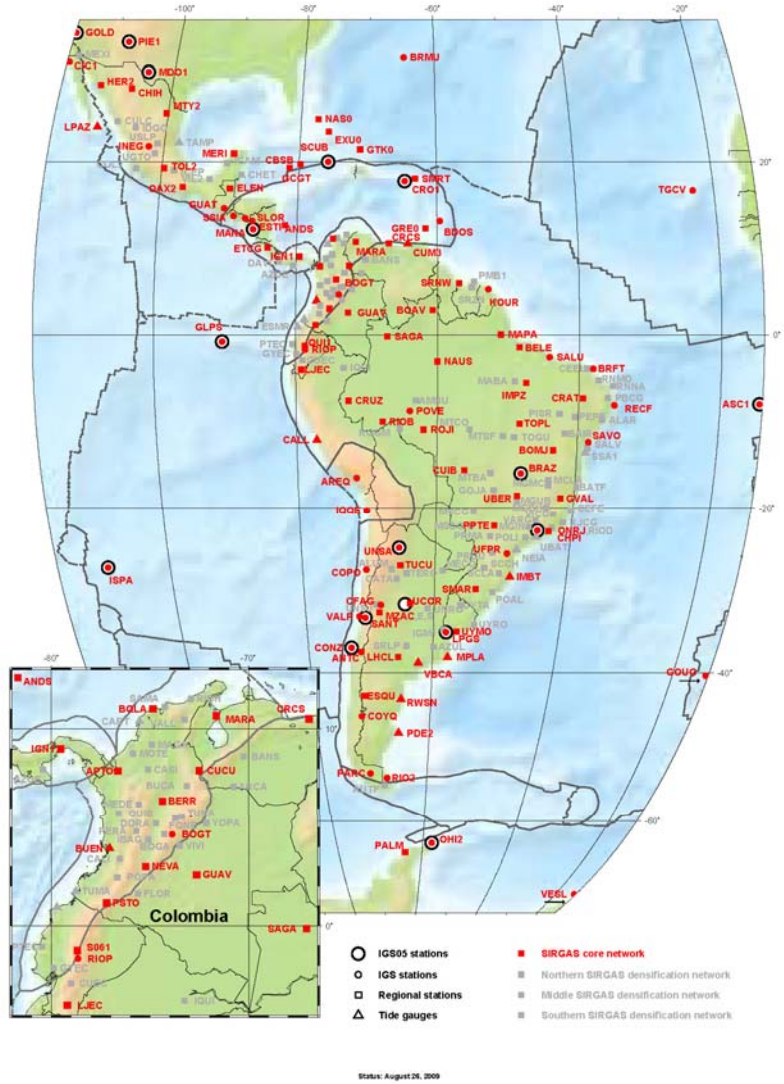

Figure 3: SIRGAS-CON-C Network

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Processing Strategy

The main processing characteristics for the generation of the loosely constrained weekly solution for the SIRGAS-CON-C network are (SIRGAS guidelines):

- Absolute calibration values for the antenna phase centre corrections, published by the IGS, are applied
- Elevation mask and data sampling are set to 3° and 30 sec., respectively
- Satellite orbits, satellite clock offsets, and Earth orientation parameters are fixed to the combined IGS weekly solutions.
- The quasi ionosphere free (QIF) strategy is applied for solving the L1 and L2 phase ambiguities

Processing Strategy (Cont‘d)

- Periodic site movements due to ocean tide loading are modelled according to the FES2004 ocean tide model (provided by M.S. Bos and H.-G. Scherneck at http://www.oso.chalmers.se/~loading)
- Zenith delay due to the tropospheric refraction (wet part) is estimated at a 2 hours interval within the network adjustment. The Niell (1996) dry mapping function is applied to the a priory delay (dry part) modelled using the Saastamoinen model
- Free daily normal equations are combined for computing a loosely constrained weekly solution for station coordinates (all station coordinates are constrained to ±1 m)
- Daily station sessions with larger residuals in the weekly combination (more than ±20 mm in the N and E component, and more than ±30 mm in the Up component) are excluded. The last two steps are iterative

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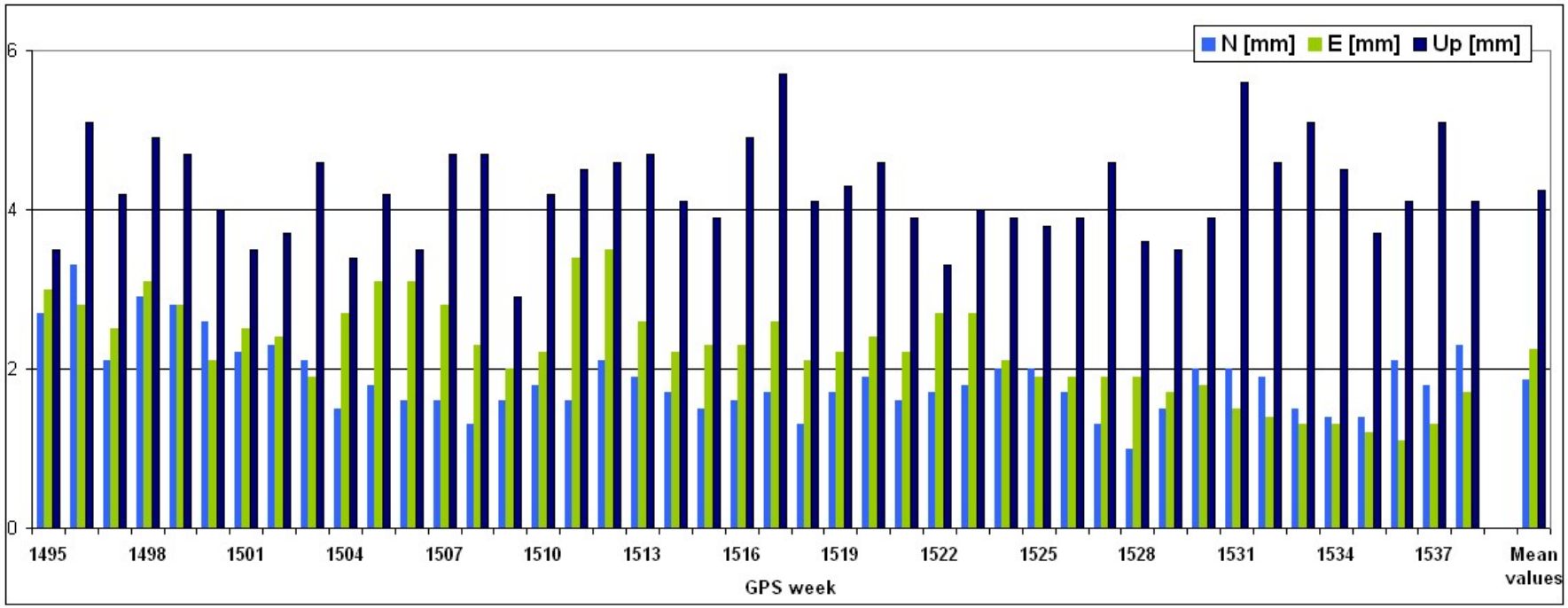
Comparison with IGS weekly solutions

A comparison of the weekly solutions of SIRGAS-CON-C with the corresponding IGS weekly solutions are shown here (RMS residuals after a 7-parameter similarity transformation). The reliability of the weekly solutions for the SIRGAS core network is estimated to be ±2 mm in N-E and ±4 mm in UP component



Conclusions

- The distributed processing of the SIRGAS-CON network by one continental SIRGAS-CON-C and three SIRGAS-CON-D local processing centres since GPS week 1495 works fine
- The SIRGAS-CON-C loosely constrained weekly solutions contain in average 95 stations with coordinates
- The precision of the SIRGAS-CON-C weekly solutions is about ±2 mm in the horizontal, and ±4 mm in the vertical, the same values are valid for the combined solutions of the four weekly solutions of the SIRGAS-CON analysis centres
- The comparison with the IGS weekly solution show similar values in the accuracy of the core network