SIRGAS Operations and the Regional LOCAL CORS Network Scene

Claudio Brunini
President
Laura Sánchez
Vice President

Sonia Maria Alves Costa
SIRGAS-WGI: Reference System
Tomas Marino Herrera
SIRGAS-WGII: Geocentric Datum
William Martínez Díaz
SIRGAS-WGIII: Vertical Datum

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Overview

- ✓ Background
- ✓ SIRGAS Realizations
  - ✓ SIRGAS 1995 Realization
  - ✓ SIRGAS 2000 Realization
  - ✓ SIRGAS Continuously Operating Network (SIRGAS-CON)
- ✓ SIRGAS Densifications
  - ✓ Passive networks
  - ✓ National continuously operating networks
- ✓ Velocity Model for SIRGAS – VEMOS
- ✓ Ongoing Activities
  - ✓ Experimental Analisys Centers
  - ✓ Regional Ionospheric Maps
- ✓ Final remarks

SIRGAS

"SIstema de Referencia Geocentrico para América del Sur"

"South American Geocentric Reference System"

(until February 2001)

"SIstema de Referencia Geocentrico para las AméricaS"

"Geocentric Reference System for the Americas"

Background

- ✓ Before SIRGAS
  - ✓ South American countries adopted different reference systems ⇒ problems to define borders, for mapping, etc.
    - ✓ PSAD56
    - ✓ SAD69
    - ✓ Bogotá
    - ✓ Yacaré
    - ✓ Campo Inchauspe

Classical systems are not accurate comparing to GPS

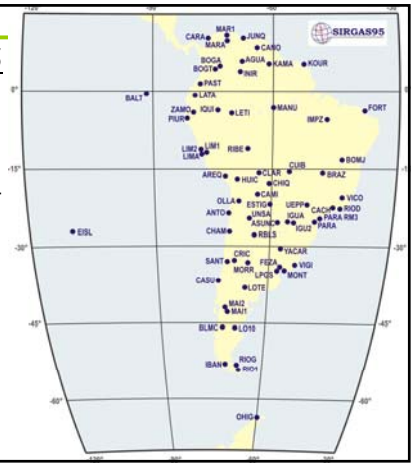
- ✓ Objectives
  - ✓ To define and establish a geocentric reference system for the continent ⇒ ITRF
  - ✓ To define and establish a geocentric datum ⇒ GRS80
  - ✓ To define and establish a unified vertical datum

The SIRGAS 95 Realization

- ✓ First SIRGAS GPS Campaign
- ✓ Is a regional densification of the global International Terrestrial Reference Frame (ITRF)
  - ✓ from May 26 to June 04, 1995 (10 days)
  - ✓ Included 58 stations over South America
  - ✓ Coordinates in ITRF94, epoch 1995.4
  - ✓ Processing data:
    - ✓ DGFI (Deutsches Geodätisches Forschungsinstitut)-Bernse
    - ✓ NGA (National Geospatial-Intelligence Agency) - GIPSY-OASIS II
  - ✓ Official results (coordinates and std.dev.) presented during the IAG Rio'97 Scientific Assembly

SIRGAS 95

58 stations
Coordinates: ITRF94,
Epoch 1995.4



The SIRGAS2000 Realization

- Second SIRGAS GPS Campaign
- From May 10 to 19, 2000 (10 days)
- To support computation of velocity for the SIRGAS GPS stations
  - Collection of GPS data for WG III activities
    - Stations at tide gauges to support the link between the classical altimetric systems and the new unified one
    - Stations close to international borders to facilitate the link between national vertical reference systems
  - 184 stations occupied (participation of North America, Central America and the Caribbean)
  - Official results (coordinates and std.dev.) released in Feb 2003
  - Coordinates in ITRF200, epoch 2000.4
  - Velocity model - VEMOS

SIRGAS 2000

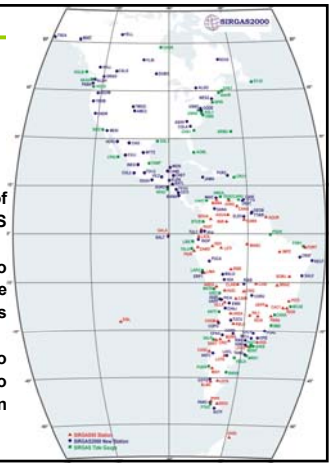
184 stations

Coordinates: ITRF2000,

Epoch 2000.4

Objectives:

- To support computation of velocity for the SIRGAS stations;
- Stations at tide gauges to support the link between the classical vertical systems and the new unified one;
- Stations close to international borders to facilitate the link between national vertical systems.



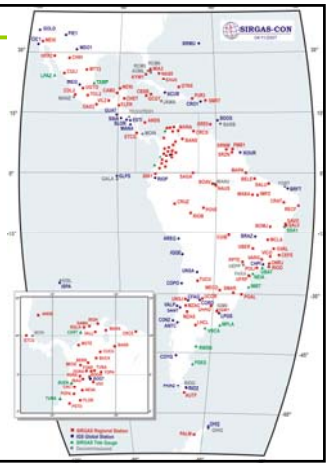
SIRGAS Continuosly Observing Network SIRGAS – CON (1/2)

- Third realization of SIRGAS
- GNSS Network under continuous operation
- At the present it is composed by 130 stations (50 are IGS stations)
- More than 30 institutions contribute by its operation - install and operate the permanent stations and voluntarily provide the tracking data for the weekly processing of the network
- Data is weekly processed by IGS Regional Network Associate Analysis Centre for SIRGAS (IGS-RNAAC-SIR) at DGFI.
- Deliver three types of solutions:
  - weekly free normal equations for the IGS polyhedron solutions
  - multi annual solutions (coordinates + velocities),
  - Constrained weekly coordinates for practical applications in Latin America.

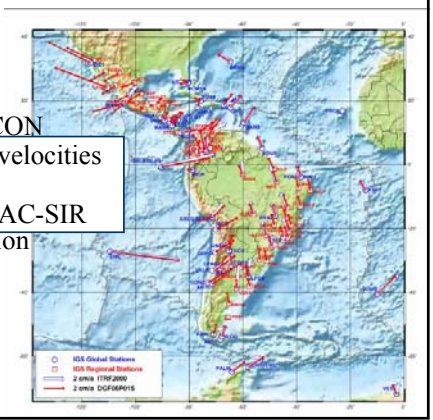
SIRGAS Continuosly Observing Network SIRGAS – CON (2/2)

- SIRGAS guidelines are recomendations for:
  - Monumentation of geodetic stations
  - Characteristics and installation of continuously operating GNSS stations
- SIRGAS mail exploder (sirgasmail@dgfi.badw.de) informs about events related to the SIRGAS-CON network: station configuration changes, tracking problems, data inconsistencies, new solutions.
- Coordinates, log files, maps, etc. are available at: www.sirgas.org

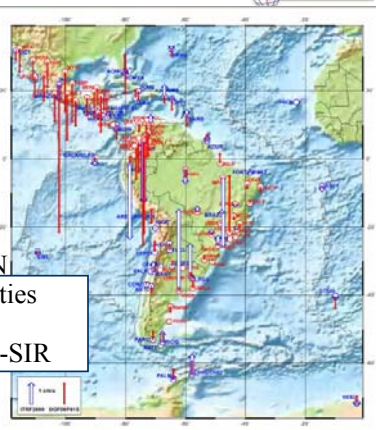
SIRGAS-CON realization (status nov/2007)



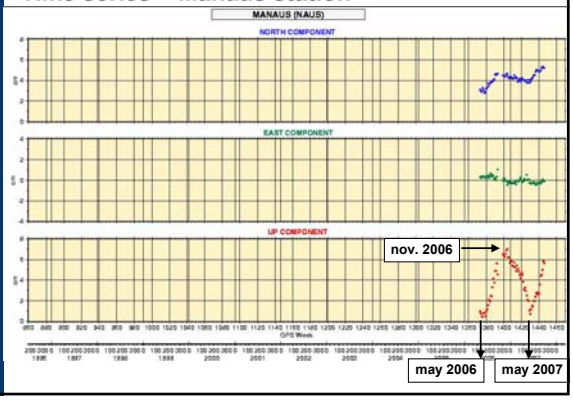
SIRGAS-CON horizontal velocities from the IGS-RNAAC-SIR 2006 solution



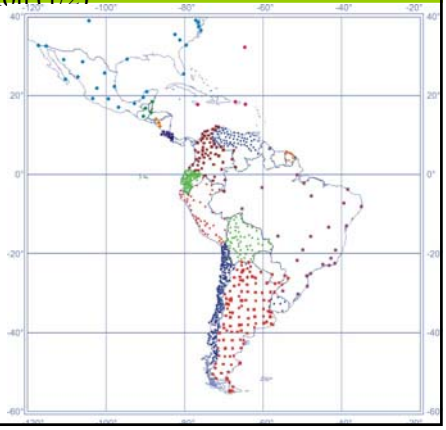
SIRGAS-CON vertical velocities from the IGS-RNAAC-SIR 2006 solution



Time series – Manaus station



SIRGAS (ITRF) Densification (1/2)



SIRGAS (ITRF) Densification (2/2)

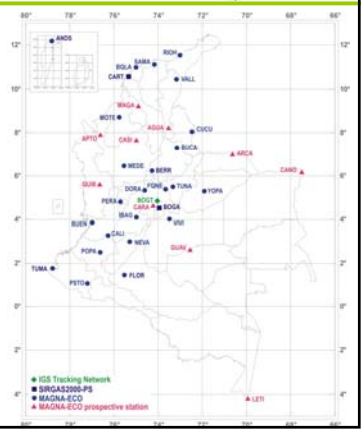
Country	SIRGAS Densification	Passive/ continuous stations	Official reference frame
Argentina	**POSGAR98**: Posiciones Geocésicas Argentinas, 1998 (SIRGAS95, epoch 1995.4) **RAMSAC**: Red Argentina de Monitoreo Satelital Continuo	139 / 15	POSGAR94 (WGS84, epoch 1993.8)
Bolivia	**MARGEN**: Marco Geodésico Nacional	125 / 0	SIRGAS95, epoch 1995.4
Brazil	**RBMC** (Red Brasileira de Monitoramento Contínuo)	0 / 38	SIRGAS2000, epoch 2000.4
Chile	**SIRGAS-CHILE** **Red de estaciones activas fijas**	269 / 9	SIRGAS2000, epoch 2002.0
Colombia	**MAGNA-SIRGAS**: Marco Geocéntrico Nacional de Referencia **MAGNA-ECO** (MAGNA Estaciones Continuas)	60 / 36	SIRGAS95, epoch 1995.4
Costa Rica	**CR05**: Sistema de Referencia Costa Rica 2005	34 / 1	ITRF2000, epoch 2005.8
Ecuador	**Fundamental GPS network**	135 / 3	SIRGAS95, epoch 1995.4
French Guyana	**RGFG**: Réseau Géodésique Français de Guyane	7 / 1	ITRF93, epoch 1995.0
Mexico	**RGNA**: Red Geodésica Nacional Activa	0 / 17	ITRF92, epoch 1988.0
Peru	**PERU96**: Sistema Geodésico Nacional	47 / 1	SIRGAS95, epoch 1995.4
Uruguay	**SIRGAS-ROU98**	7 / 0	SIRGAS95, epoch 1995.4
Venezuela	**SIRGAS-REGVEN**: Red Geocéntrica Venezolana **REMOS** (Red de estaciones de monitoreo satelital GPS)	156 / 3	SIRGAS95, epoch 1995.4

National continuously operating networks

RBMC:
Rede Brasileira de Monitoramento Contínuo (by IBGE)

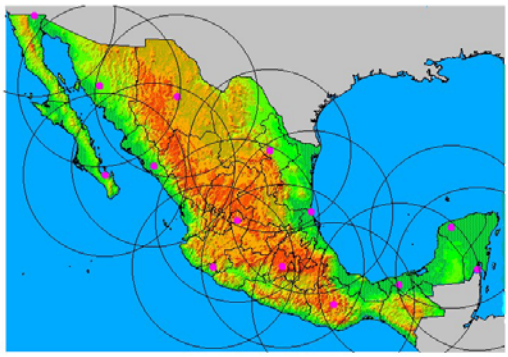
National continuously operating networks

MAGNA-ECO:
Marco Geocéntrico Nacional de Referencia - Estaciones Continuas (by IGAC)

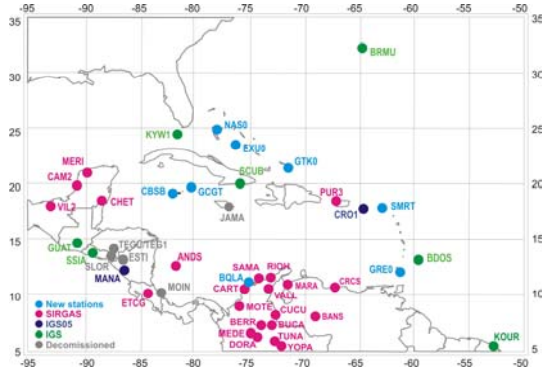


National continuously operating networks

RBMC: Red Geodésica Nacional Activa (by INEGI)

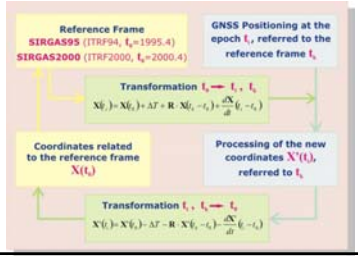


Continuously operating network in Central America and the Caribbean



Use of velocities in GNSS applications

The coordinates processed at the IGS-RNAAC-SIR refer to the (present) ITRF2005 and they are valid for the observation day. To be compatible with SIRGAS and its national densifications, the coordinates of new points (referred to the continuously operating GPS sites) have to be reduced to the reference epoch and to the adopted ITRF, i.e. ITRF94, epoch 1995.4 or ITRF2000, epoch 2000.4



Velocity Model for SIRGAS - VEMOS (1/2)

- ✓ **The following information was used:**
  - ✓ **SIRGAS 1995 GPS Campaign results**
    - ✓ **Referred to ITRF94, epoch 1995.4**
  - ✓ **SIRGAS 2000 GPS Campaign results**
    - ✓ **Referred to ITRF2000, epoch 2000.4**
  - ✓ **IGS RNAAC-SIR velocities**
  - ✓ **Results of geodynamic projects in South America (CAP, CASA, SAGA, and SNAPP)**
- ✓ **Combining least-squares collocation and finite elements methods**
- ✓ **This model corresponds to a 1° x 1° grid with horizontal velocities, which can be interpolated with the VELINTER program**

Velocity Model for SIRGAS – VEMOS (2/2)

referred to ITRF2000

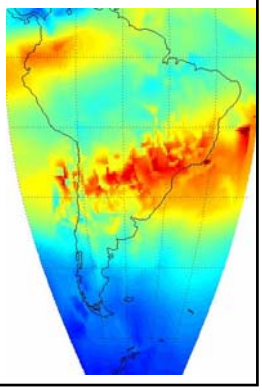
Ongoing Activities – Experimental Analysis Centers

Establishment of 5 analysis centers in Latin America:

- ✓**Instituto Nacional de Estadística, Geografía e Informática (INEGI, Mexico)**
- ✓**Instituto Geográfico Agustín Codazzi (IGAC, Colombia),**
- ✓**Instituto Brasileiro de Geografia e Estatistica (IBGE, Brazil)**
- ✓**Instituto Geográfico Militar de la Argentina (IGMA)**
- ✓**Universidad Nacional de La Plata (UNLP, Argentina)**

Regional Ionospheric Maps

- South American Regional Ionosphere Maps (SAIM) are daily produced by GESA (Centro de Procesamiento de La Plata, Georreferenciación Satelitaria) applying La Plata Ionospheric Model (LPIM). Nearly 50 GPS SIRGAS-CON stations are used.
- This service routinely operates since July 2005 and provides hourly regional maps with vertical TEC in 1° x 1° grids over South America .
- The hourly SAIM products are available at http://cplat.fcaglp.unlp.edu.ar/iono/us/



Final Remarks

- The SIRGAS project encompasses all activities necessary to maintain a modern geodetic framework in the continent, compatible with the most accurate positioning techniques currently available;
- The adoption of an accurate and unified reference frame in the continent as the first layer of Spatial Data Infrastructures guarantees the consistency of information between countries;
- Nowadays WGS84 can be considered coincident with SIRGAS2000→GPS results automatically referred to SIRGAS2000;
- Especial efforts are being carried out in order to get Central America and Caribbean countries involved in the project;

Thank You!

For more information : www.sirgas.org

Contact us : sirgas@dgfi.badw.de