

SIRGAS: THE GEODETIC REFERENCE IN LATIN AMERICA AND THE CARIBBEAN



Claudio Brunini

President of SIRGAS

Universidad Nacional de La Plata, Argentina



Laura Sánchez

Vice-president of SIRGAS

Deutsches Geodätisches Forschungsinstitut, Germany

On behalf of SIRGAS

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Sistema de Referencia Geocéntrico para Las Américas

Geocentric Reference System for the Americas

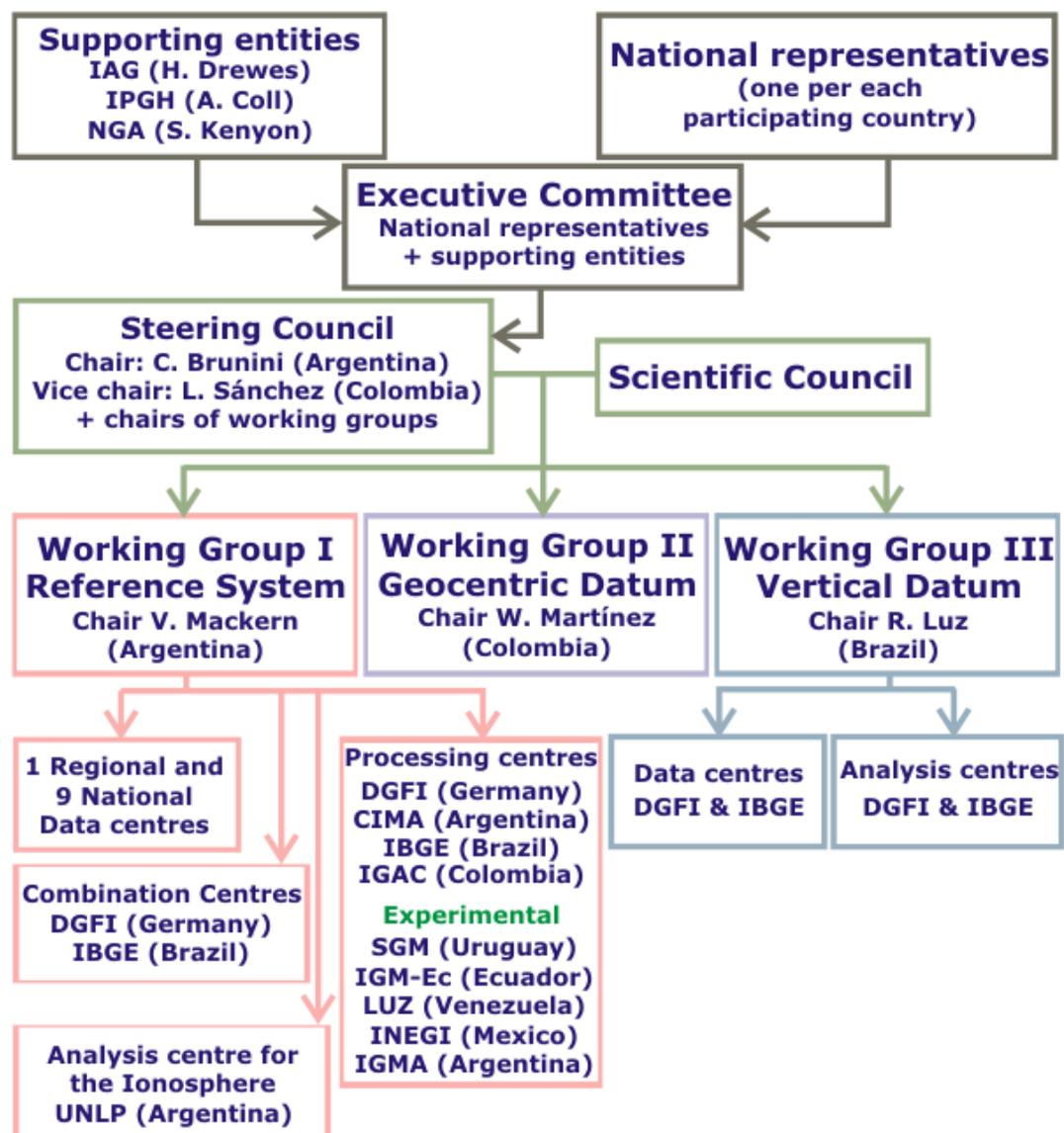
SIRGAS was established in 1993 under the sponsorship of:

- ✓ *International Association of Geodesy (IAG) - SIRGAS is the IAG Sub-commission 1.3b, "Regional Reference Frame for South and Central America";*
- ✓ *Pan American Institute of Geography and History (PAIGH) – SIRGAS is a Working Group of the PAIGH Commission of Cartography;*
- ✓ *USA Defence Mapping Agency (today National Geospatial-Intelligence Agency).*

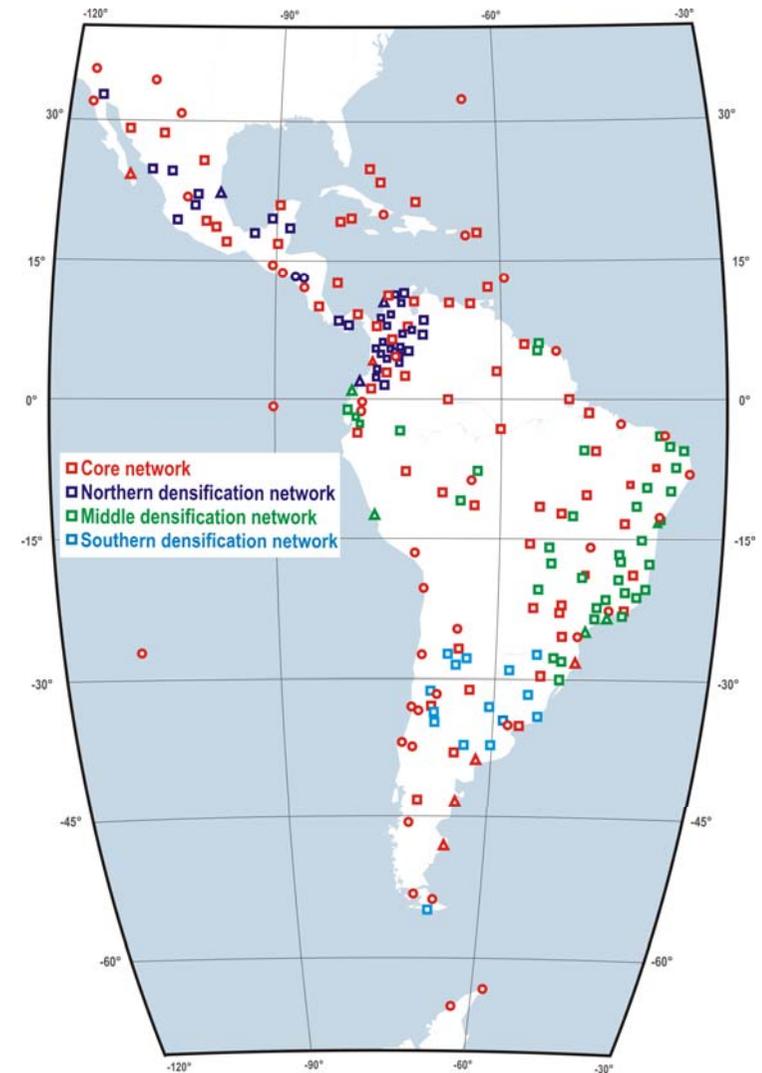
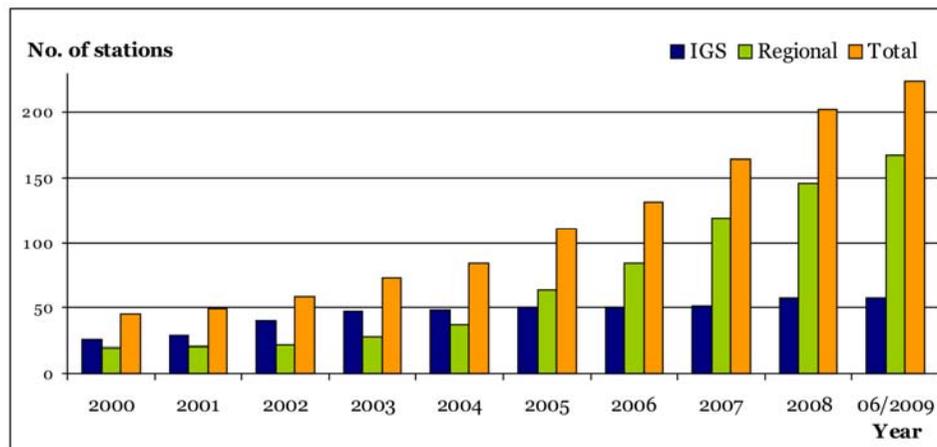
SIRGAS objectives are:

- ✓ *Define, realize, and maintain a geocentric reference system in Latin America and the Caribbean;*
- ✓ *Promote the use of SIRGAS as the unique reference frame in the region;*
- ✓ *Define, realize, and maintain a vertical reference system supporting physical and geometrical heights.*





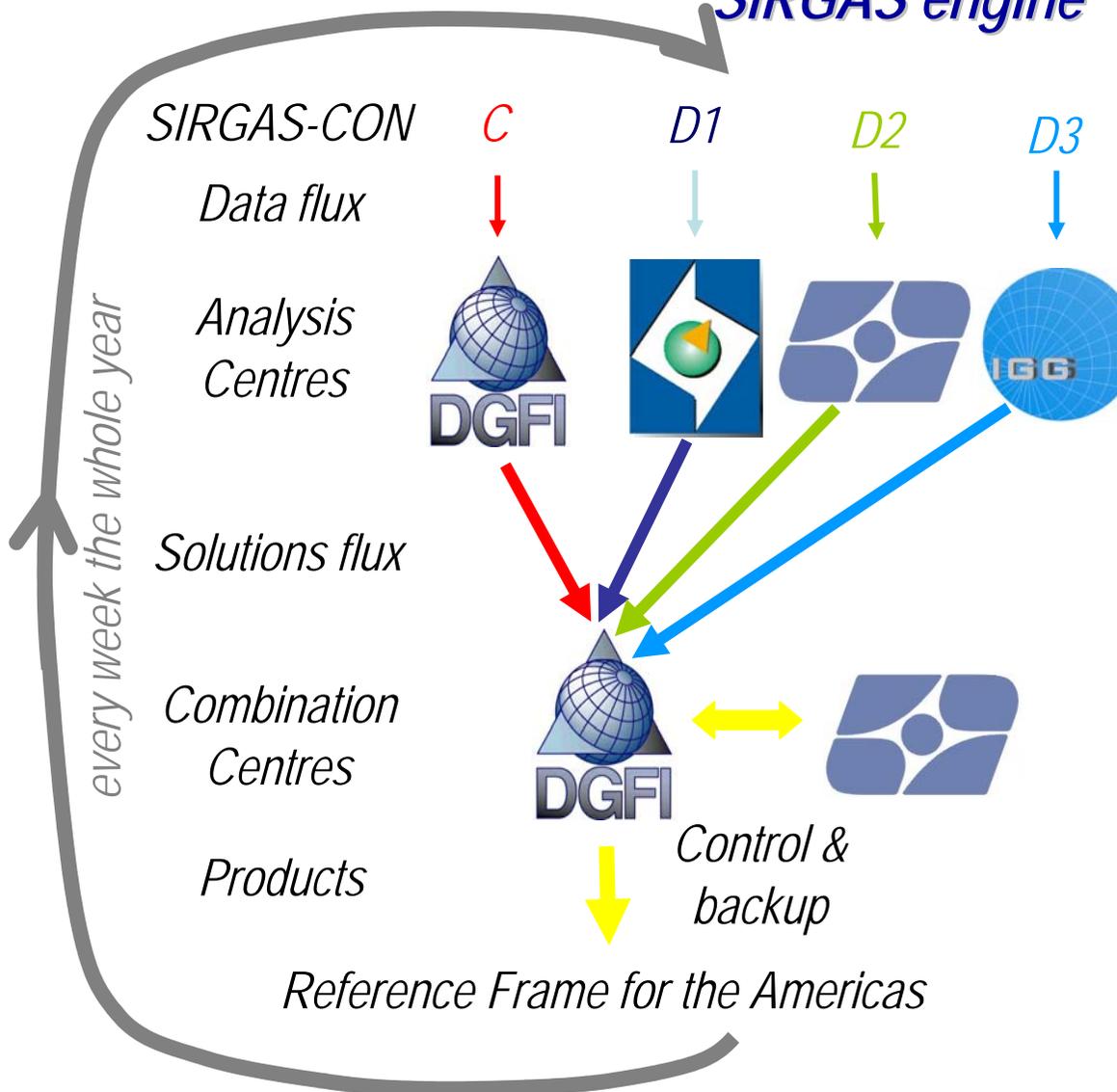
- ✓ *SIRGAS operates a continental-size / continuously-observing GNSS network shortly named SIRGAS-CON.*
- ✓ *Presently it encompasses more 200 receivers, data links, and 10 data centres.*
- ✓ *Receivers are operated by many institutions in an international voluntary cooperation framework.*
- ✓ *In August 2008 SIRGAS-CON was spited in different blocks that are separately processed and then combined in a unified solution for the entire region (before, the entire network was processed by DGFI).*





SIRGAS

The continuously moving SIRGAS engine



Official Analysis Centres

Instituto Brasileiro de Geografia e Estatística, Brasil



Instituto Geográfico Agustín Codazzi, Colombia



Universidad Nacional de Cuyo, Argentina



Deutsches Geodätisches Forschungsinstitut, Germany



Experimental Analysis Centres

Instituto Nacional de Estadística y Geografía, México



Instituto Geográfico Nacional, Argentina



Instituto Geográfico Militar, Ecuador

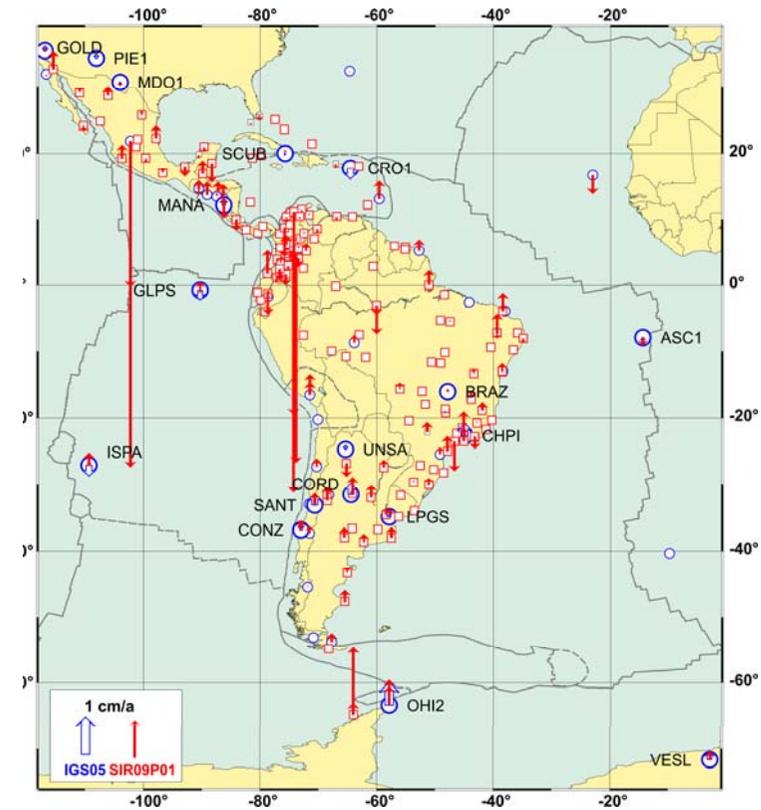
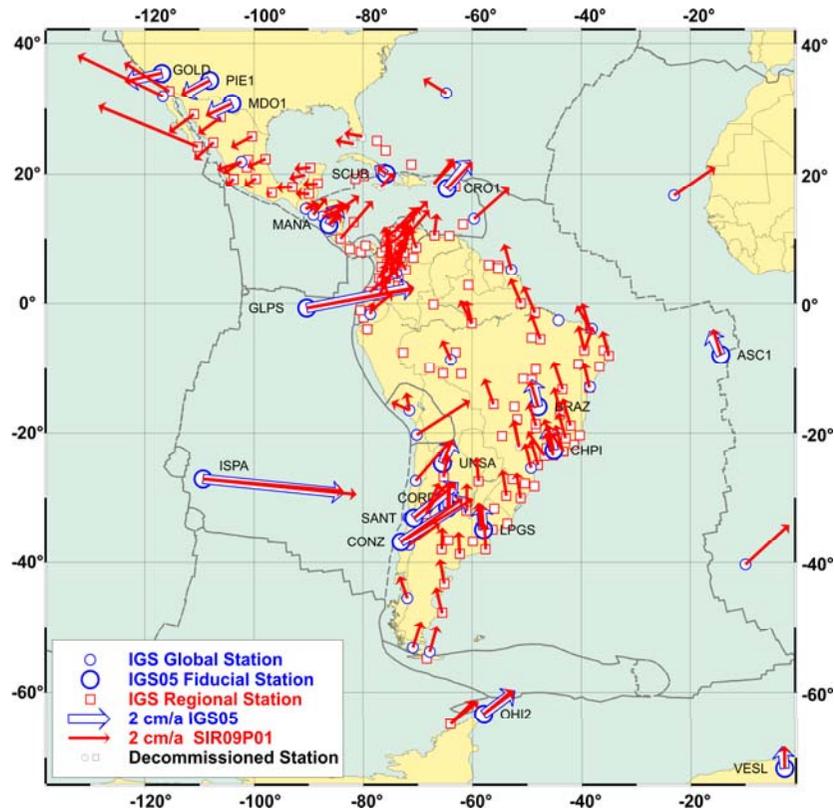


Universidad del Zulia, Venezuela



Servicio Geográfico Nacional, Uruguay

- ✓ Multi-annual solutions (i.e.: coordinates for a conventional epoch plus station velocities) are periodically computed by DGFI as IGS-RNAAC-SIR.
- ✓ The last one (SIR09P01) comprises from January 2000 to December 2008.
- ✓ It was constrained in the NNT-NNR sense to IGS05 for the epoch 2005.0.
- ✓ Precision at reference epoch: $\pm 0,5 / 0,9$ mm for hor. and ver. coordinates, and $\pm 0,8$ mm/a for vel.



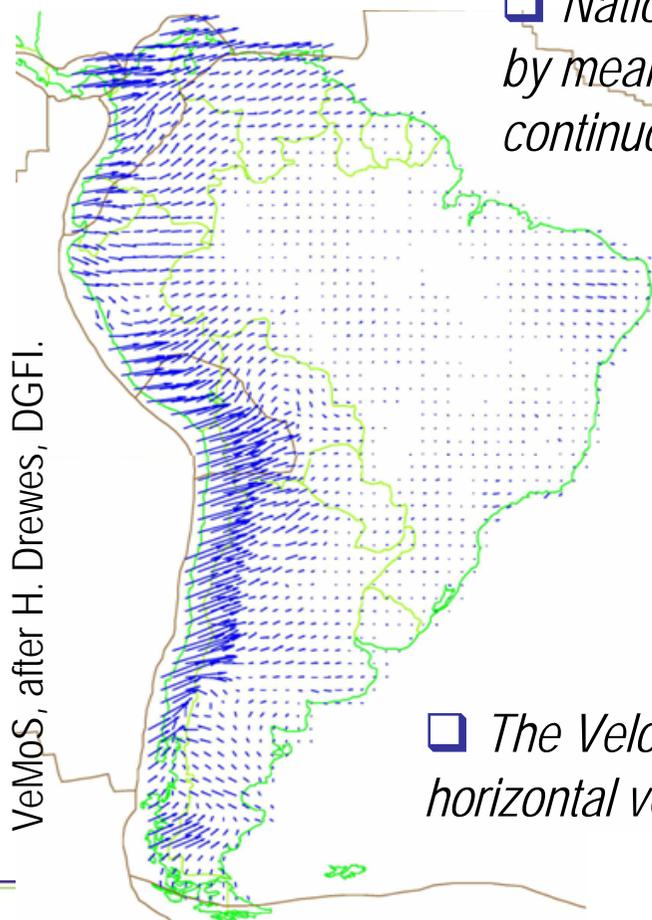
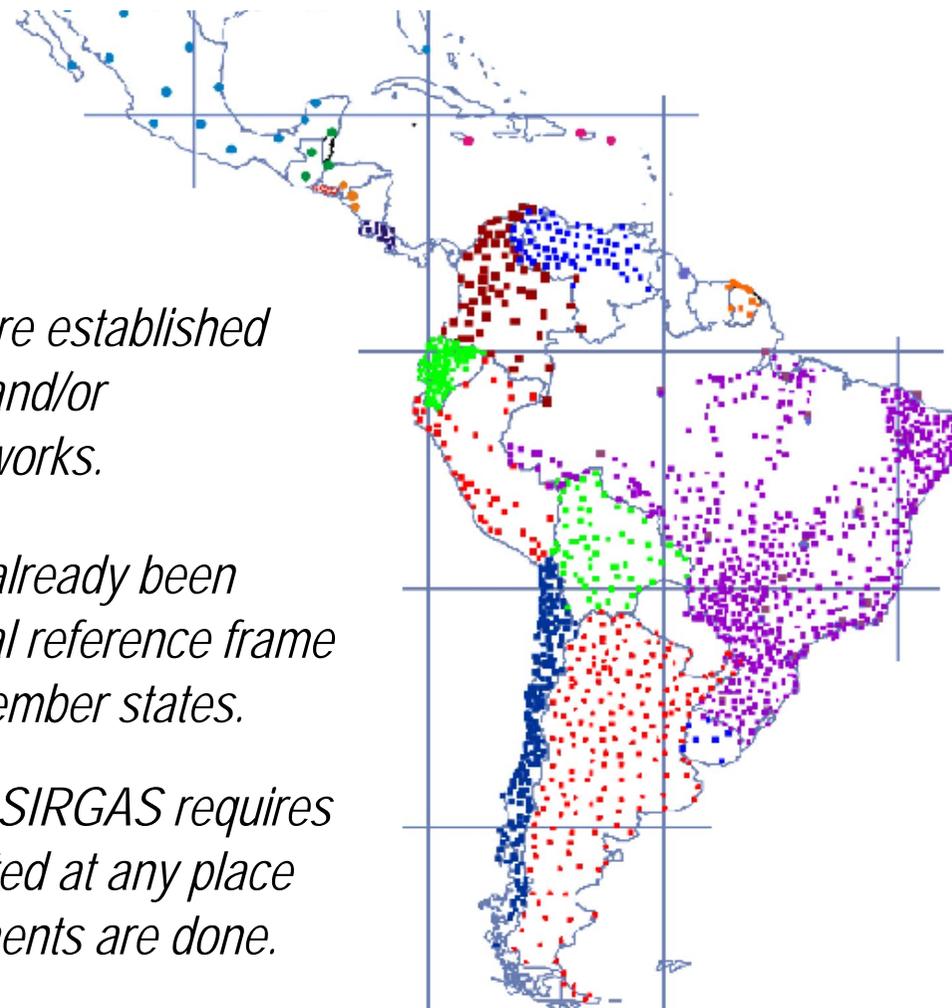
❑ Practical uses of SIRGAS are supported by the countries by deploying national densifications under the responsibility of the geographic institutes.

❑ National densifications are established by means of both, passive and/or continuously observing networks.

❑ SIRGAS has already been adopted as official reference frame by 13 of its 18 member states.

❑ Proper use of SIRGAS requires velocities computed at any place where measurements are done.

❑ The Velocity Model for SIRGAS (VeMoS) allows interpolating the horizontal velocities at any given location in South America.



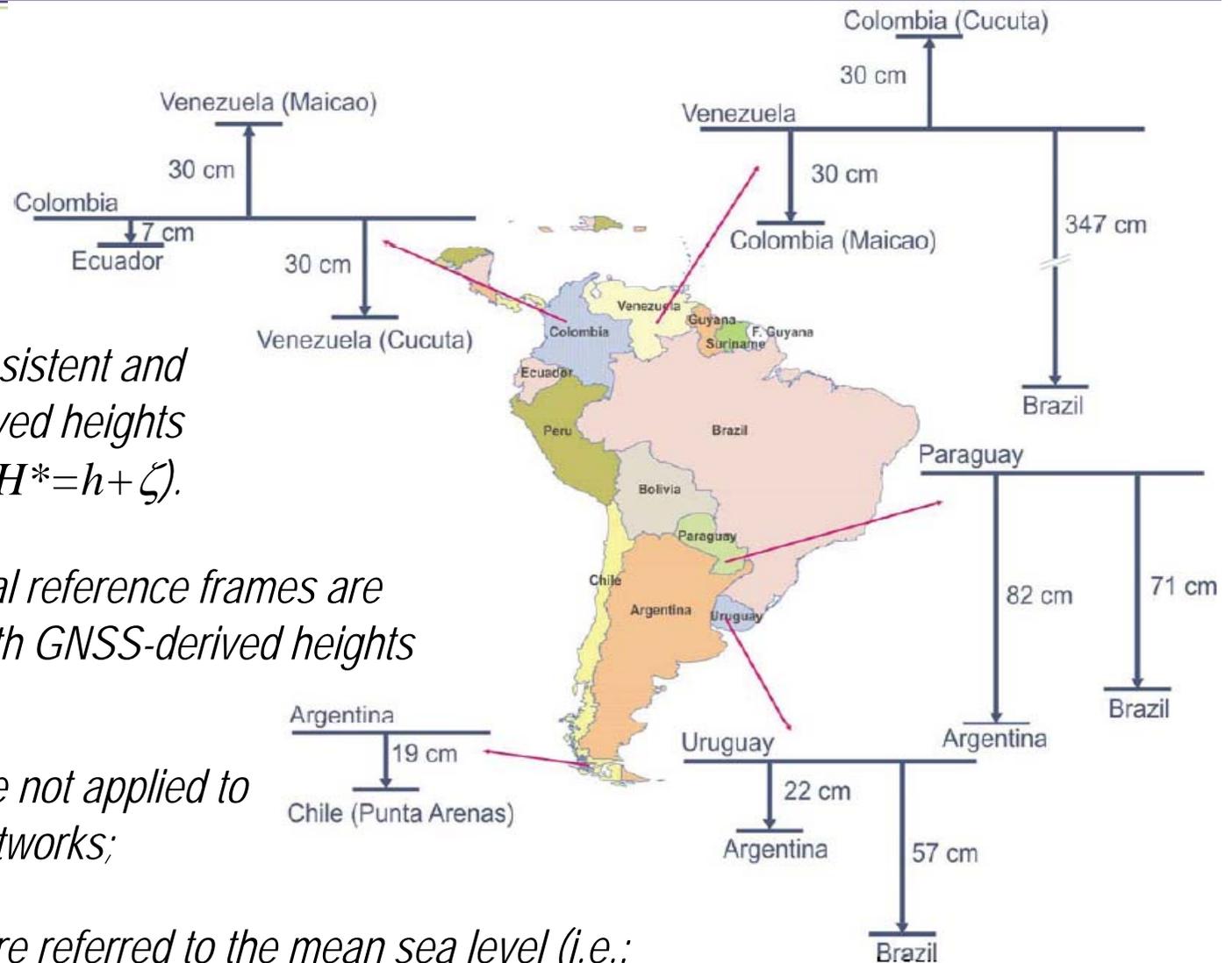
VeMoS, after H. Drewes, DGFI.

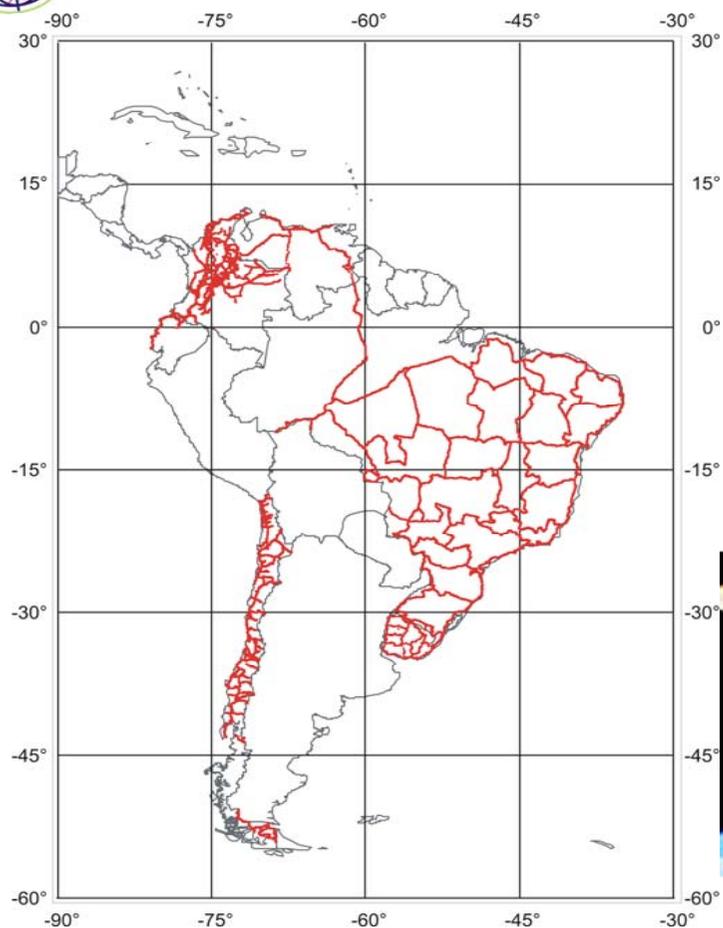
❑ *SIRGAS objectives include the realization of a gravity-related vertical reference frame based on normal heights.*

❑ *It must be globally consistent and compatible with GNSS-derived heights (i.e.: fulfill the relation $H^* = h + \zeta$).*

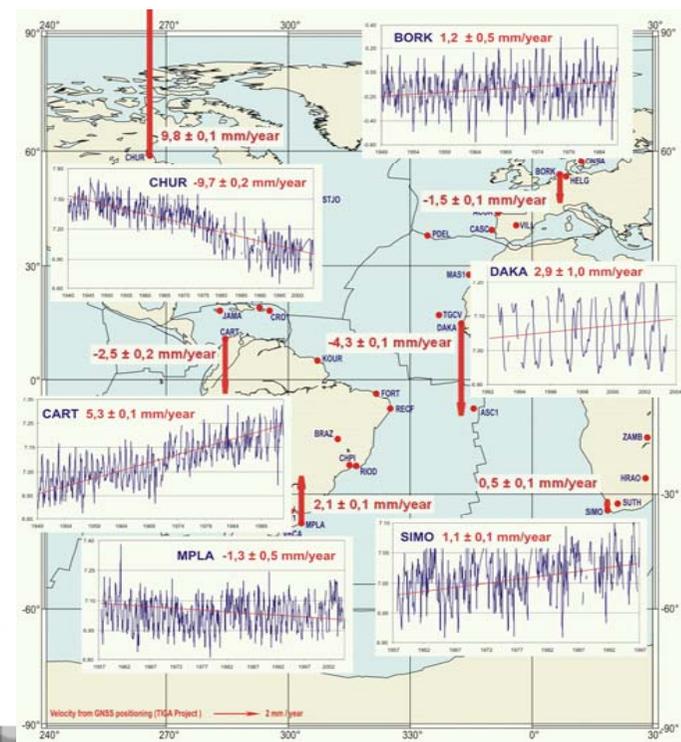
❑ *Existing gravity-related vertical reference frames are inconsistent among them and with GNSS-derived heights because:*

- ✓ *gravitational corrections were not applied to the existing national leveling networks;*
- ✓ *national leveling networks were referred to the mean sea level (i.e.: they are affected by sea surface topography irregularities);*

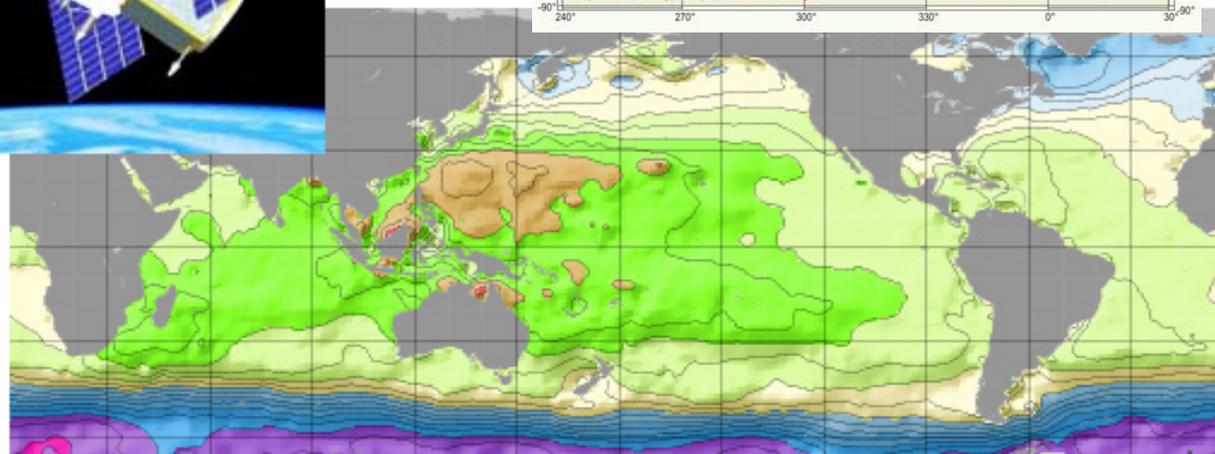




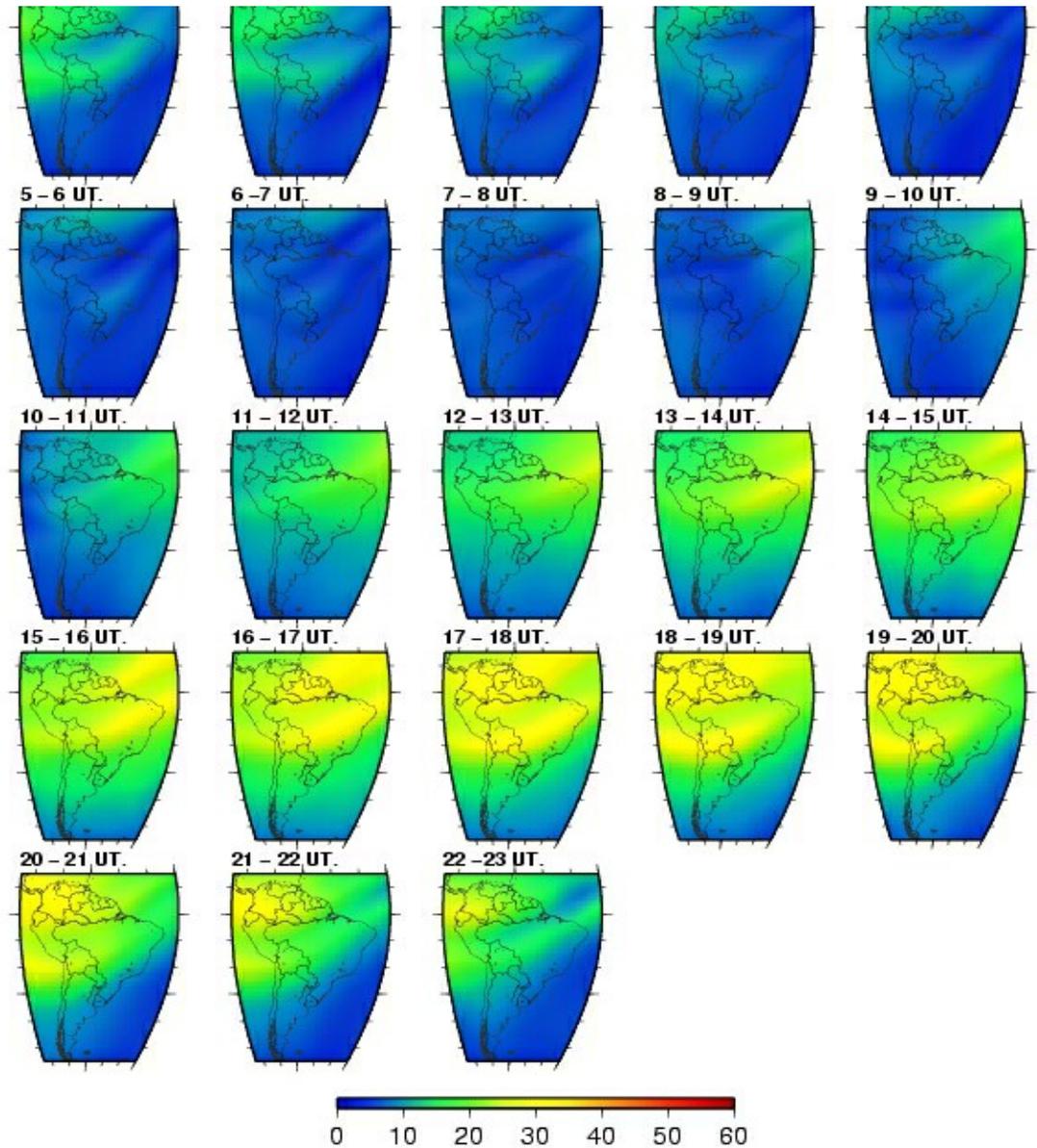
Define and realize a global-consistent reference level by means of tide-gauges controlled with GNSS, and satellite altimetry.



Compute geopotential numbers for the first-order national leveling networks and refer them to a global-consistent reference level.



- ❑ Central and South American ionosphere presents challenging problems for aeronomers.
- ❑ Since July 2006, SIRGAS operates an Ionospheric Analysis Center under the responsibility of La Plata National University, Argentina.
- ❑ Hourly regional maps of $vTEC$ are computed and delivered to the community.
 - ❑ They have been used for:
 - ✓ validation of the International Reference Ionosphere (IRI);
 - ✓ improvement positioning with single-frequency GNSS receivers;
 - ✓ feasibility studies for a SBAS in the region (supported by the International Civil Aviation Organization - ICAO).



- ✓ *SIRGAS is driving a powerful capacity building process in the Americas.*
- ✓ *Eight Analysis Centres were installed during the last four years in Latin American institutions; two more are in preparation in Peru and Costa Rica.*
- ✓ *Three of them have successfully passed the experimental phase and are fully operational, while the others are close to be validated.*
- ✓ *Capacity building activities are performed by the "IAG-PIGH-SIRGAS School on Reference Systems", intended to provide the theoretical background; and "Training Courses for Analysis Centres", intended to provide the practical training (already thought in Peru, Uruguay, Chile and Argentina).*

*First IAG-PIGH-SIRGAS School,
Julio 13 -17, 2009. Bogotá,
Colombia (120 participants; 12
countries represented.*

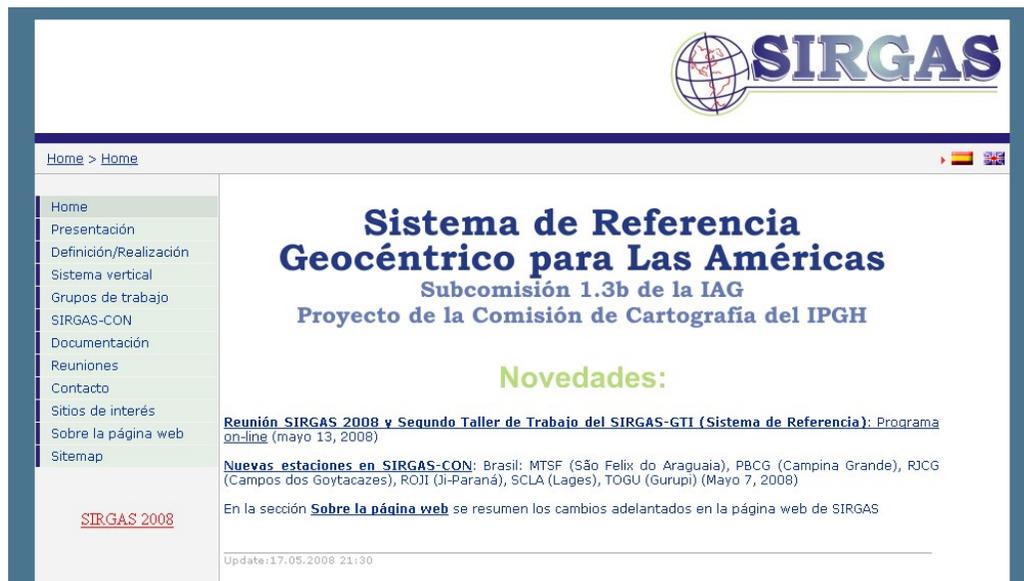


- ✓ *SIRGAS has been recommended as the Americas' official reference frame by the 7th United Nations Regional Cartographic Conference for the Americas (New York, January 2001)*
- ✓ *It is the basis for many practical applications, e.g.: cadastre, digital cartography, geo information systems, spatial data infrastructures, navigation, augmentation systems, geophysical exploration, engineering projects, etc.*
- ✓ *It is also the platform for a wide range of scientific studies, e.g.: monitoring of cortical deformations, vertical movements, sea level variations, atmospheric studies, etc.*
- ✓ *Besides, it is a crucial tool for capacity building in the region; many SIRGAS scientists are today involved in international competitive scientific projects.*
- ✓ *SIRGAS represents one of the most successfully initiatives in international (voluntary) cooperation.*

Many thanks for your attention

See more in ...

www.sirgas.org



The screenshot shows the SIRGAS website interface. At the top right is the SIRGAS logo. Below it is a navigation menu with the following items: Home, Presentación, Definición/Realización, Sistema vertical, Grupos de trabajo, SIRGAS-CON, Documentación, Reuniones, Contacto, Sitios de interés, Sobre la página web, and Sitemap. The main content area features the title "Sistema de Referencia Geocéntrico para Las Américas" and "Subcomisión 1.3b de la IAG Proyecto de la Comisión de Cartografía del IPGH". Below this is a "Novedades:" section with two news items: "Reunión SIRGAS 2008 y Segundo Taller de Trabajo del SIRGAS-GTI (Sistema de Referencia): Programa on-line (mayo 13, 2008)" and "Nuevas estaciones en SIRGAS-CON: Brasil: MTSF (São Felix do Araguaia), PBCG (Campina Grande), RCG (Campos dos Goytacazes), ROJI (Ji-Paraná), SCLA (Lages), TOGU (Gurupi) (Mayo 7, 2008)". A footer note states: "En la sección [Sobre la página web](#) se resumen los cambios adelantados en la página web de SIRGAS". The page is dated "Update: 17.05.2008 21:30".