

## ***SIRGAS: an international collaborative enterprise of the geodetic community in Latin America and the Caribbean***



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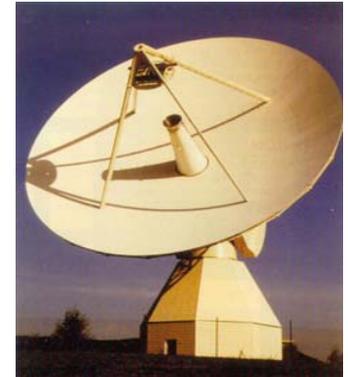
*Geodesy is the science of measuring and portraying the earth's surface (Helmert, 1880).*



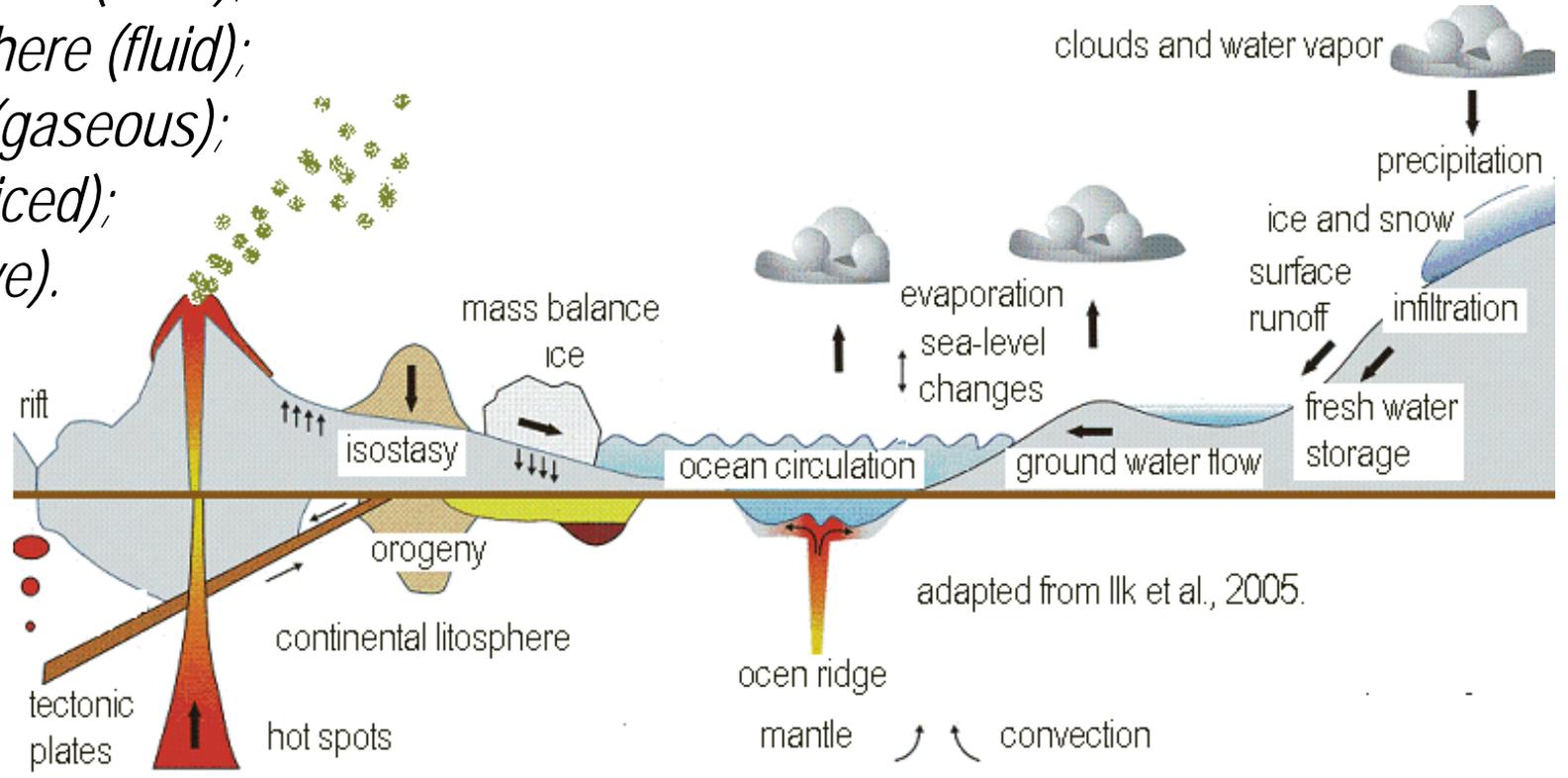
- Technological advances (artificial satellites, extragalactic observations, etc.);*
- Scientific advances (physical models, computational methods, etc.).*



*The science of measuring changes in the Earth System.*

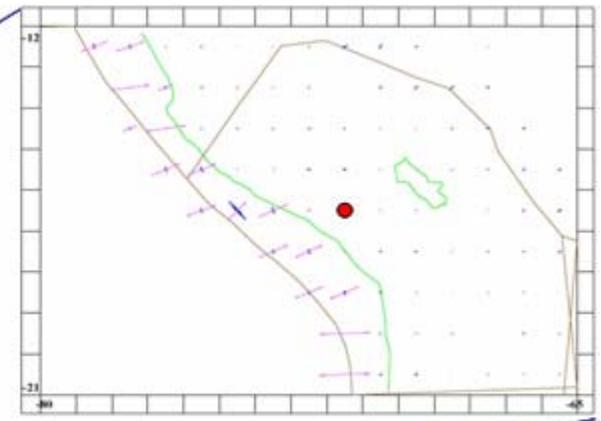
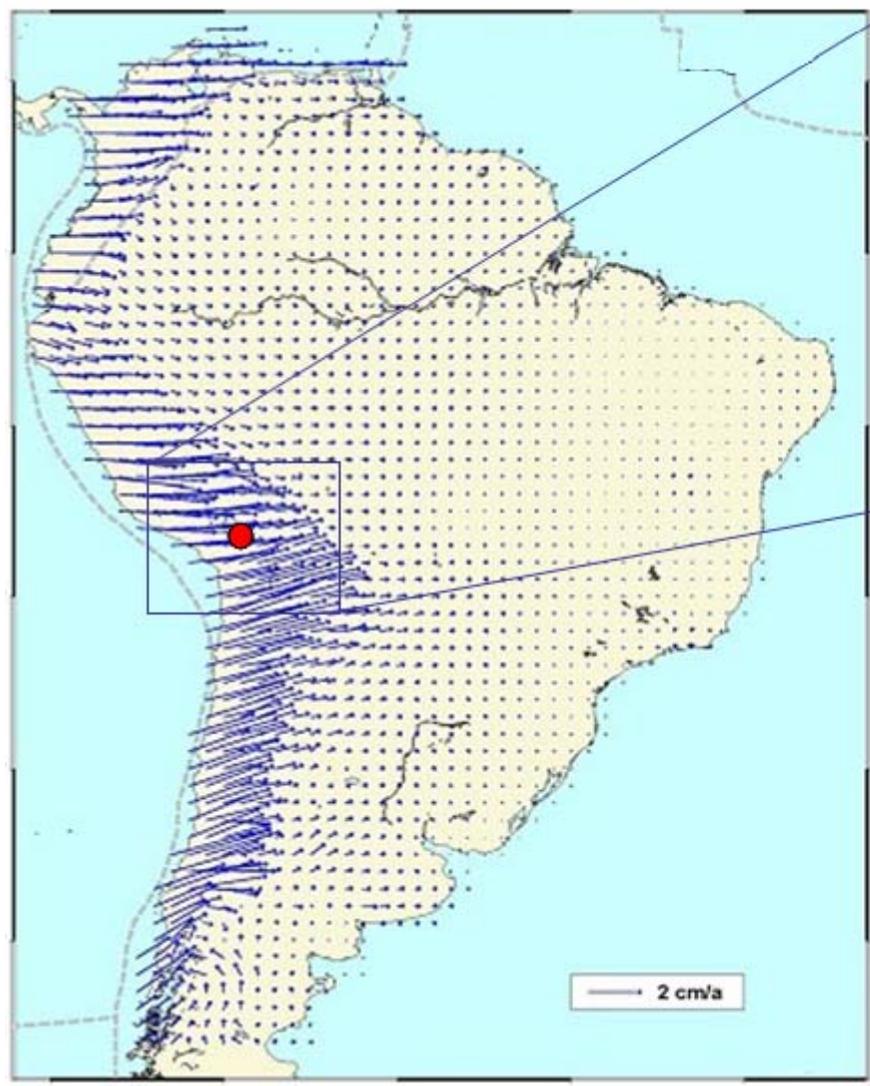


- Geosphere (solid);
- Hydrosphere (fluid);
- Atmosphere (gaseous);
- Cryosphere (iced);
- Biosphere (live).



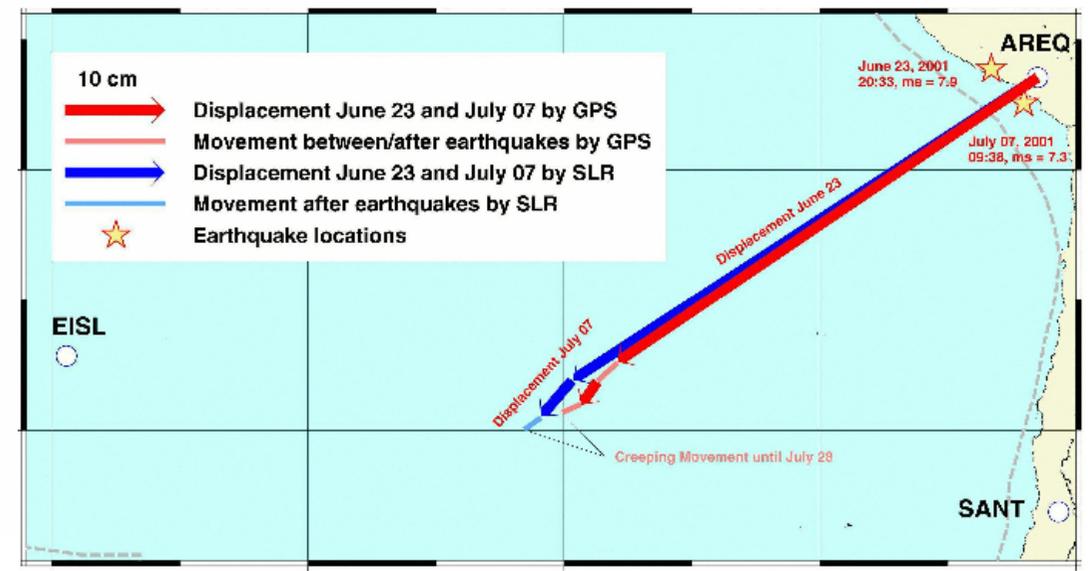
*Geodynamic and Global Change are processes inside and between the components of the Earth System.*

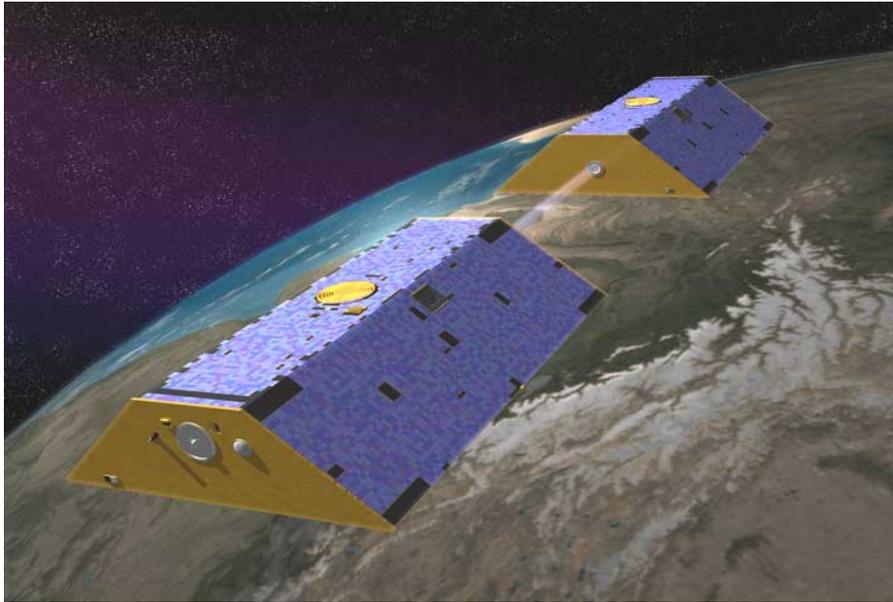
*Geodetic observations are sensitive to those processes. Just a couple of examples ...*



*Deformation in Arequipa (Peru) previous the 2001 earthquakes.*

*Co-seismic displacement from GPS and LASER.*





*GRACE continuously measures the range between two satellites with micron-level precision.*

*This range varies in response to the irregularities in the mass distribution of the Earth System.*

*Repetition of measurements at different times provides information about changes in the mass distribution.*

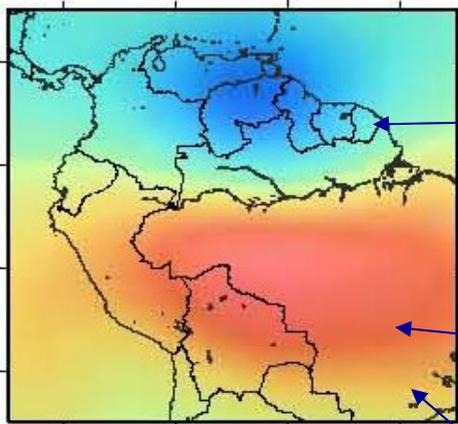
*The largest change is due to water mass exchange:*

*precipitation – evapotranspiration – water runoff = water storage in the soil*

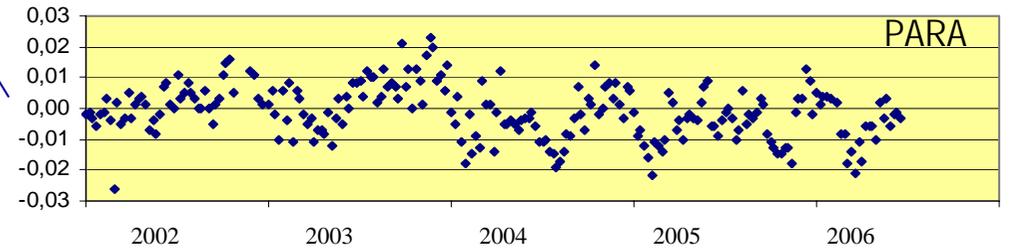
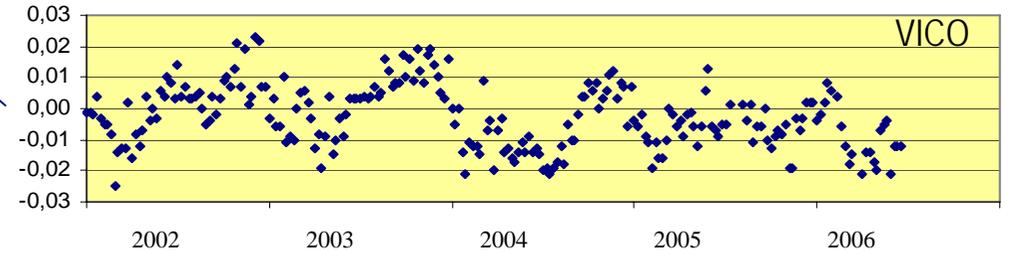
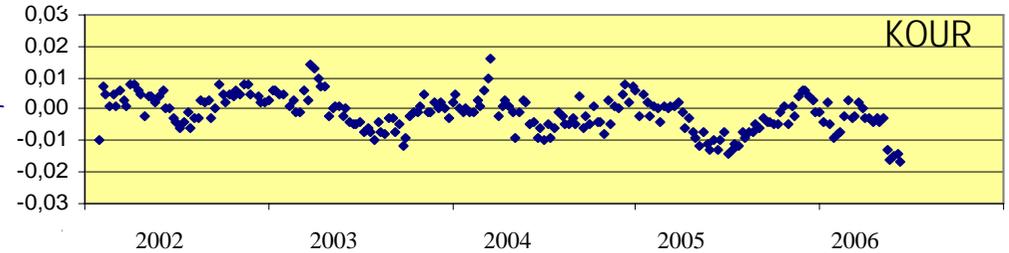
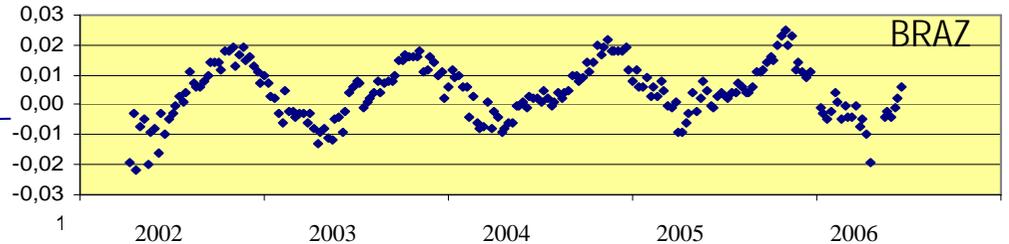
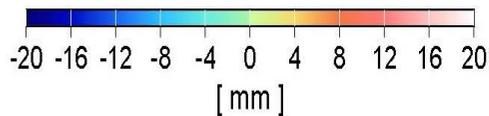
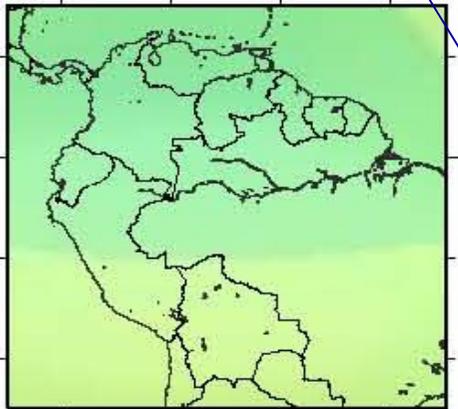
▣ Gravity measurements (GRACE):  
mass exchanges

▣ Geometrical measurements (GNNS):  
height variations

*Apr. 2003*



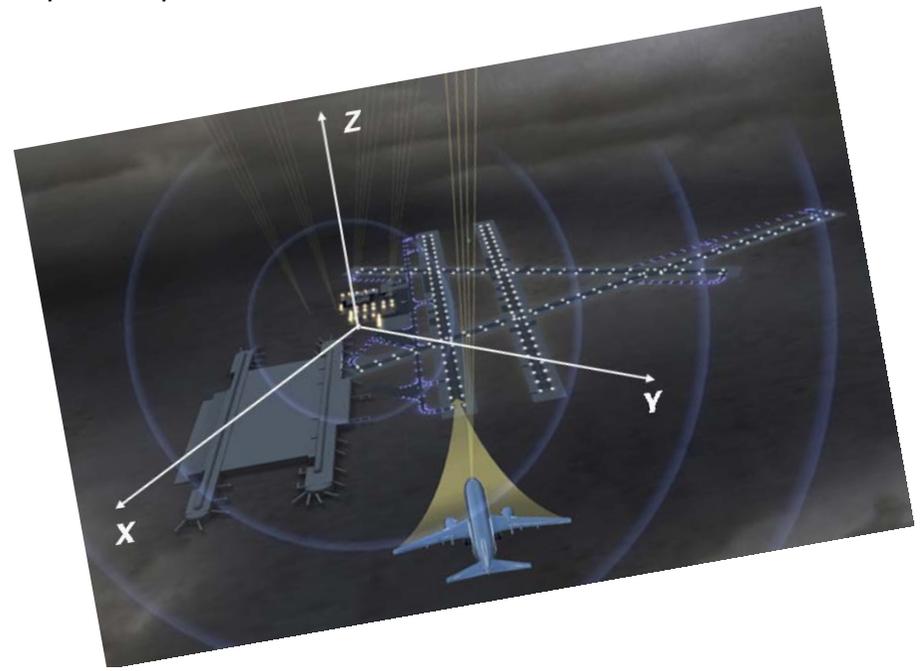
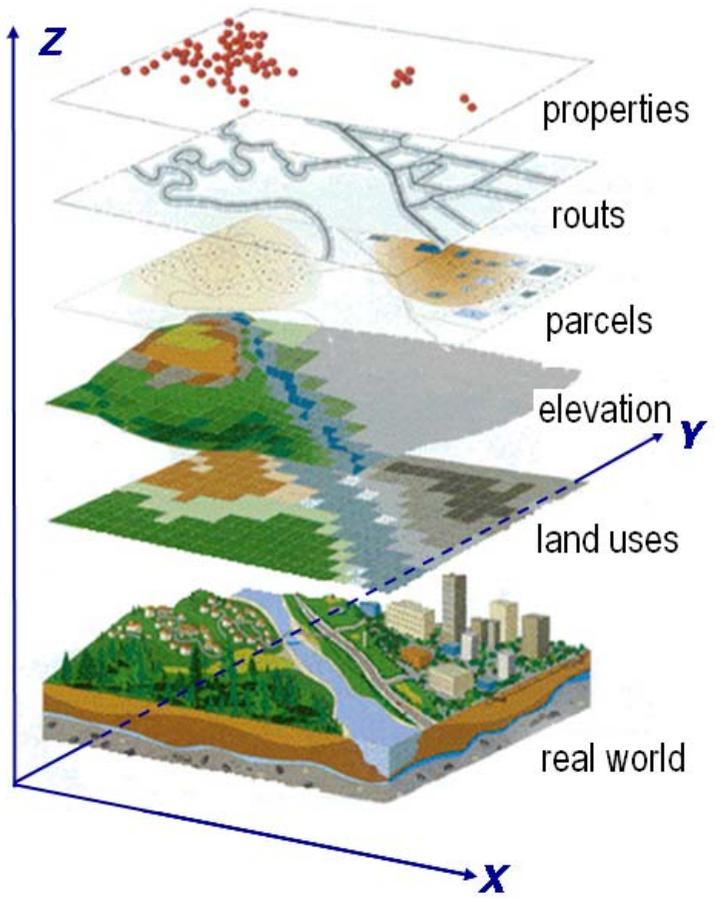
*Sep. 2003*



- Geodesy is able to measure several effects of geodynamic and global change processes, including the whole cycle of the water.*
- A complete understanding of those processes will require very precise and stable time series of data acquired over many years.*
- Measurements and satellite orbits must be tied to a Terrestrial Reference Frame (TRF) that supports millimeter-level accuracy and ensures stability over decades.*
- Changes must be continuously monitored with mm/year-level accuracy.*

□ *TRF provides the backbone of the global geospatial data infrastructure, which encompasses cadastre, natural resources, and much other information needed for ensuring the sustainable development of humanity.*

□ *TRF is crucial for accurate and safe navigation over air, sea, and land.*



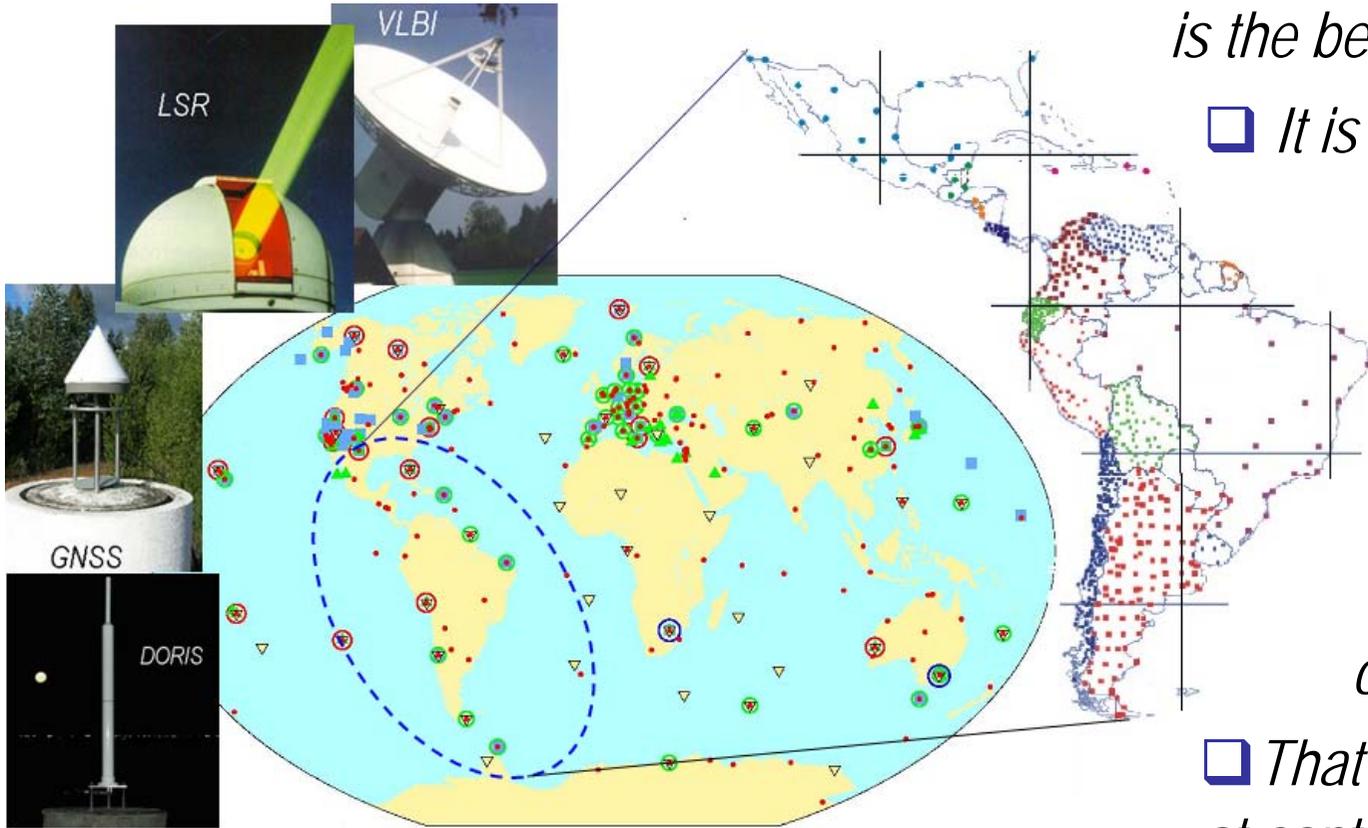
□ *ITRF (International Terrestrial Reference Frame) is the best TRF available worldwide.*

□ *It is established and maintained by an IAG Service (the International Earth Rotation and Reference Systems Service – IERS)*

□ *It is realized by a global network of continuously observing geodetic stations.*

□ *That network is further extended at continental and national levels in order to provide detailed reference to all users of geospatial data.*

□ *SIRGAS is the ITRF densification in Latin America and the Caribbean.*



# *Sistema de Referencia Geocéntrico para Las Américas*

## *Geocentric Reference System for the Americas*

*Established in 1993 under the sponsorship of:*

- ✓ *International Association of Geodesy;*
- ✓ *Pan-American Institute of Geography and History;*
- ✓ *USA National Geoinformation Agency.*



*Executive Committee*  
*Member Countries (18) + Supporting Entities*



*Steering Council*  
*President + Vice-president + WG Presidents*



*Working Groups 1, 2 and 3*



*Scientific Council*

❑ *SIRGAS operates a continental-size distributed observatory, the SIRGAS-CON (Continuously Observing Network).*

❑ *It encompasses ~200 GNSS receivers, data links, 10 data centers, 4 analysis centers and 2 combination centers.*

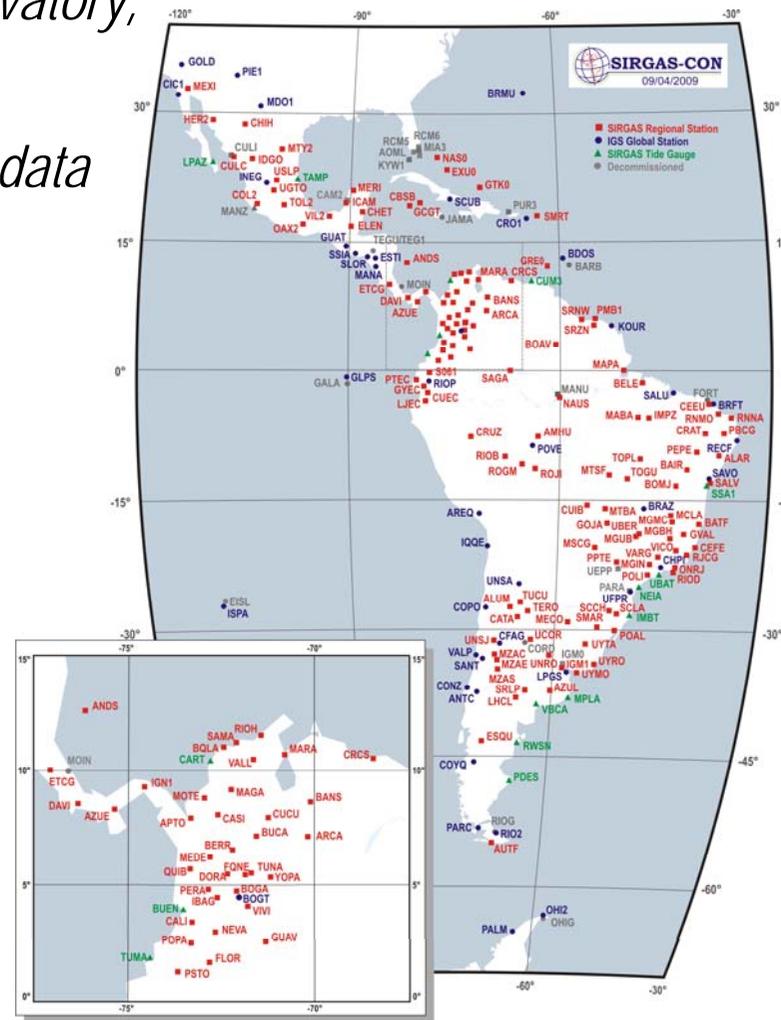
❑ *Receivers are operated by many institutions in an international voluntary cooperation framework.*

❑ *SIRGAS-CON comprises two hierarchical levels:*

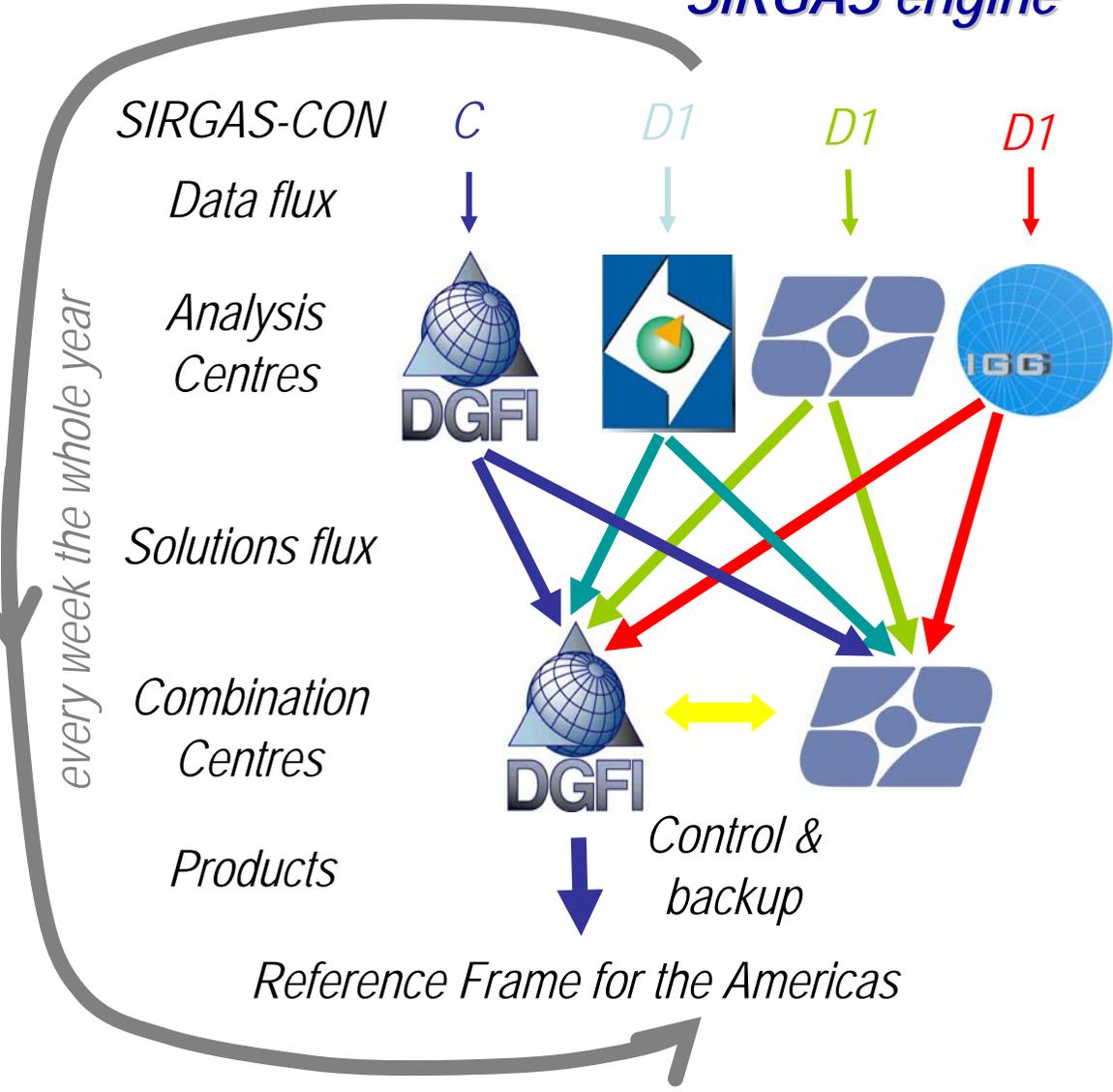
- ✓ *a continental (C) network, with ~100 stations all over the continent;*

- ✓ *several densification (D) networks comprising the fundamental points of the national networks of all SIRGAS countries.*

❑ *At present, there are 3 D-networks but it is expected to have one per country.*



# The continuously moving SIRGAS engine



- ✓ 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, Geografía e Informática, México
- ✓ Instituto Geográfico Militar, Argentina
- ✓ Instituto Geográfico Militar, Ecuador
- ✓ Universidad del Zulia, Venezuela
- ✓ Servicio Geográfico Nacional, Uruguay

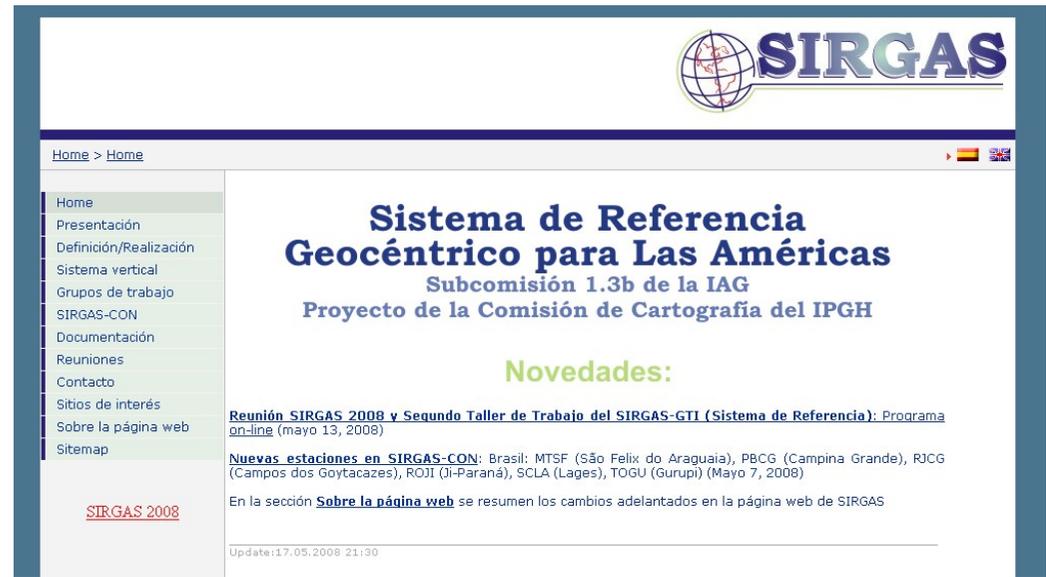
- ❑ *SIRGAS is driving a powerful capacity building process in the Americas.*
- ❑ *Eight Analysis Centres were installed during the last four years in Latin American institutions.*
- ❑ *Three of them have successfully suppurated the experimental phase and are fully operational, while the others are in process of validation.*
- ❑ *Capacity building activities are performed by:*
  - ✓ *The “SIRGAS School in Reference Systems”, intended to provide the theoretical background; and*
  - ✓ *The “Training Courses for Analysis Centers”, intended to provide the practical training.*
- ❑ *The next SIRGAS School will take place from July 13 to 17, 2009, at the Instituto Geográfico Agustín Codazzi (Colombia).*

- ❑ *SIRGAS was recommended as official reference frame for the American countries by the 7<sup>th</sup> United Nations Regional Cartographic Conference for the Americas (New York, January 2001).*
- ❑ *It is the basis for all practical applications that require reliability and accuracy such as cadastre and land information, oil prospecting, GNSS navigation, etc.*
- ❑ *It provides the best reference frame for scientific studies such as cortical deformation, mass transport, sea-level height variations, atmospheric sounding, etc.*
- ❑ *It is one of the most successful initiatives of Geodesy regarding international, voluntary collaboration.*

*Many thanks for your attention*

*See more in ...*

*[www.sirgas.org](http://www.sirgas.org)*



The screenshot shows the SIRGAS website interface. At the top right is the SIRGAS logo. Below it, there is a navigation bar with "Home > Home" and flags for Spain and the UK. A left sidebar contains a menu with 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, a "Novedades:" section lists two 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), RJCG (Campos dos Goytacazes), ROJI (It-Paraná), SCLA (Lages), TOGU (Gurupi) (Mayo 7, 2008)". A note mentions that the "Sobre la página web" section summarizes changes. At the bottom, it says "Update:17.05.2008 21:30".