Kinematics of the SIRGAS Reference Frame

Laura Sánchez
Deutsches Geodätisches Forschungsinstitut
der Technischen Universität München (DGFI-TUM), Germany

IGS Regional Network Associate Analysis Centre for SIRGAS
IGS RNAAC SIRGAS

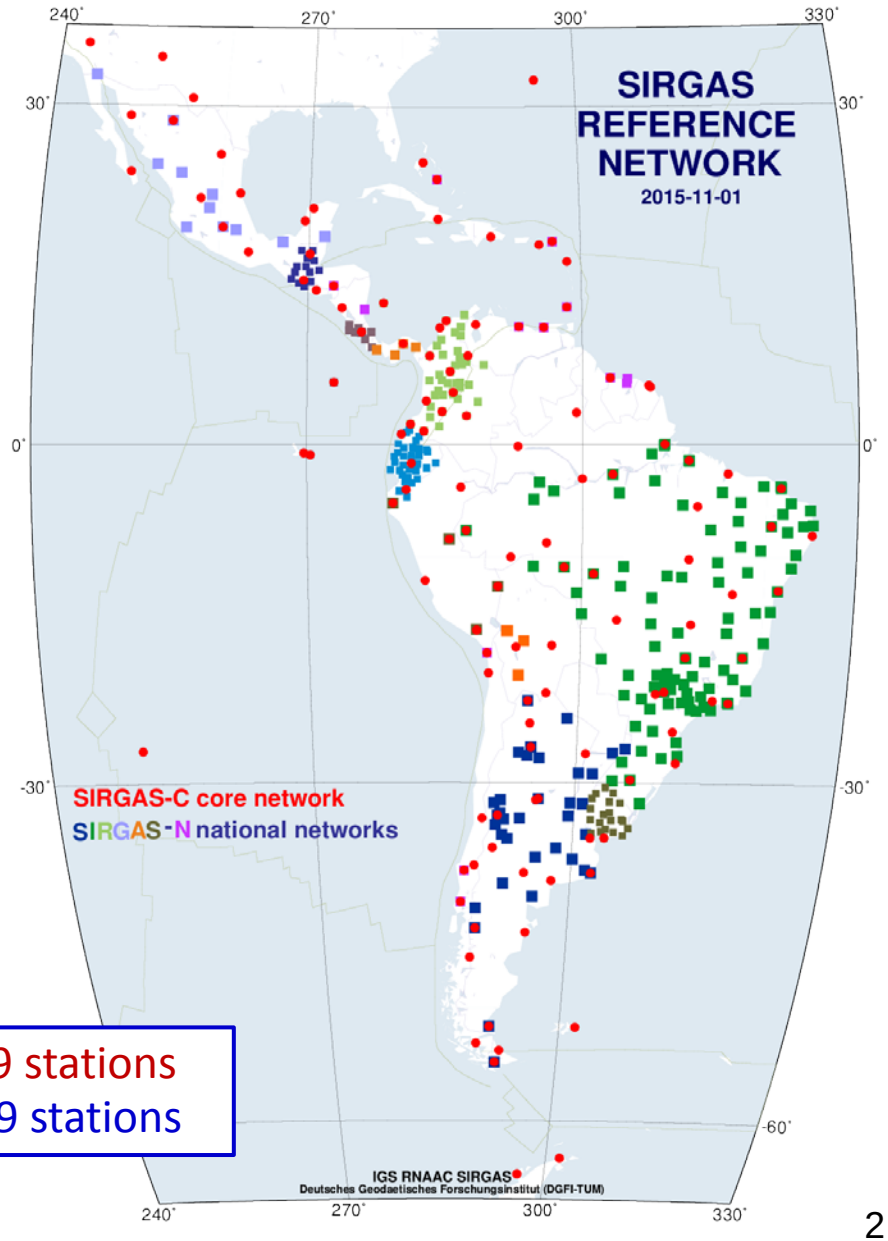
The SIRGAS Reference Frame

The SIRGAS Reference Frame comprises

- a continental reference network (SIRGAS-C) as the primary densification of the ITRF in the region; and
- national densifications (SIRGAS-N) of the continental reference frame.

It guarantees

- accessibility to the global reference system at regional, national, and local levels and
- full consistency with the reference system of the (GNSS) satellite orbits.

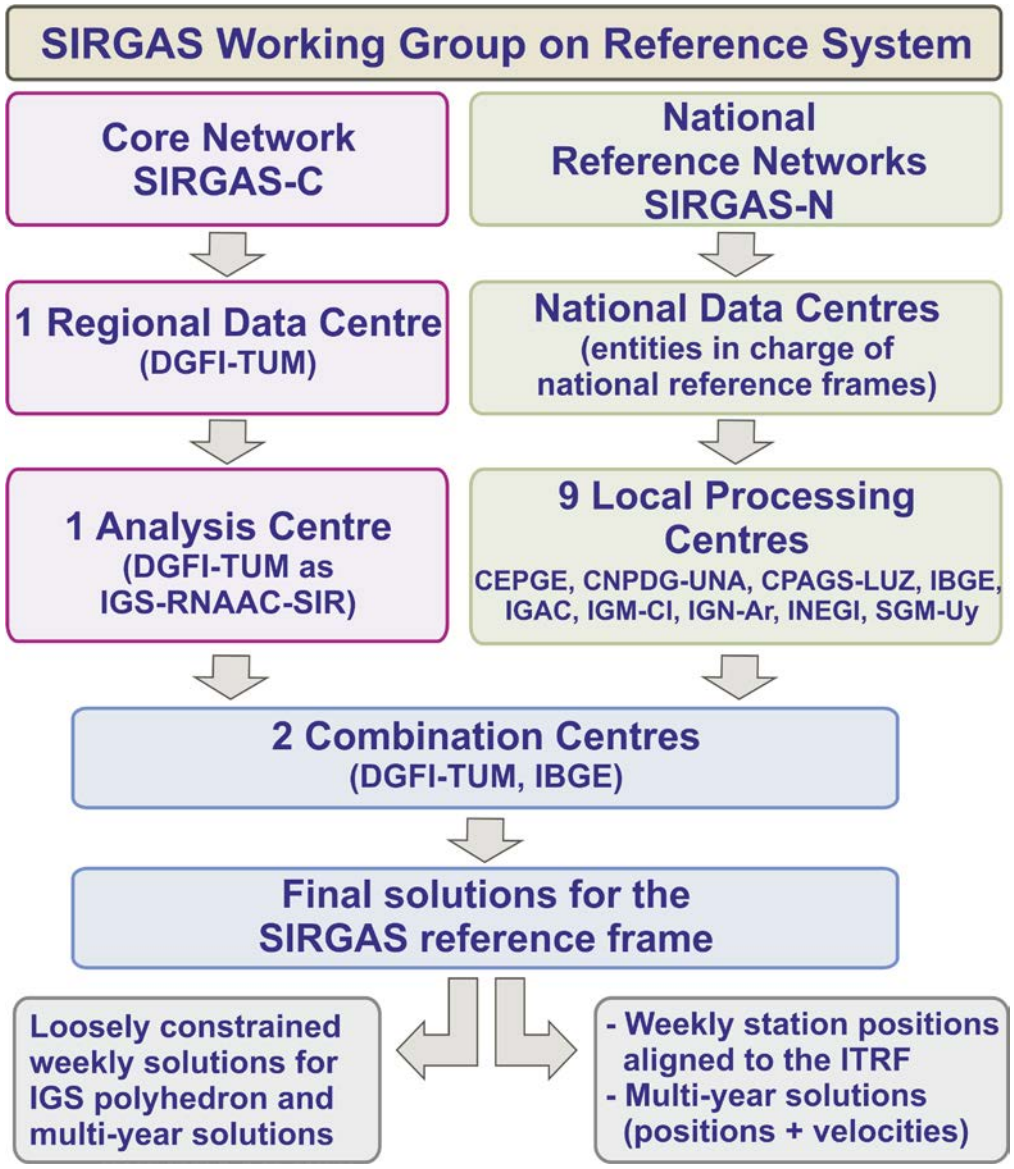


SIRGAS-C: 139 stations
SIRGAS-N: 249 stations

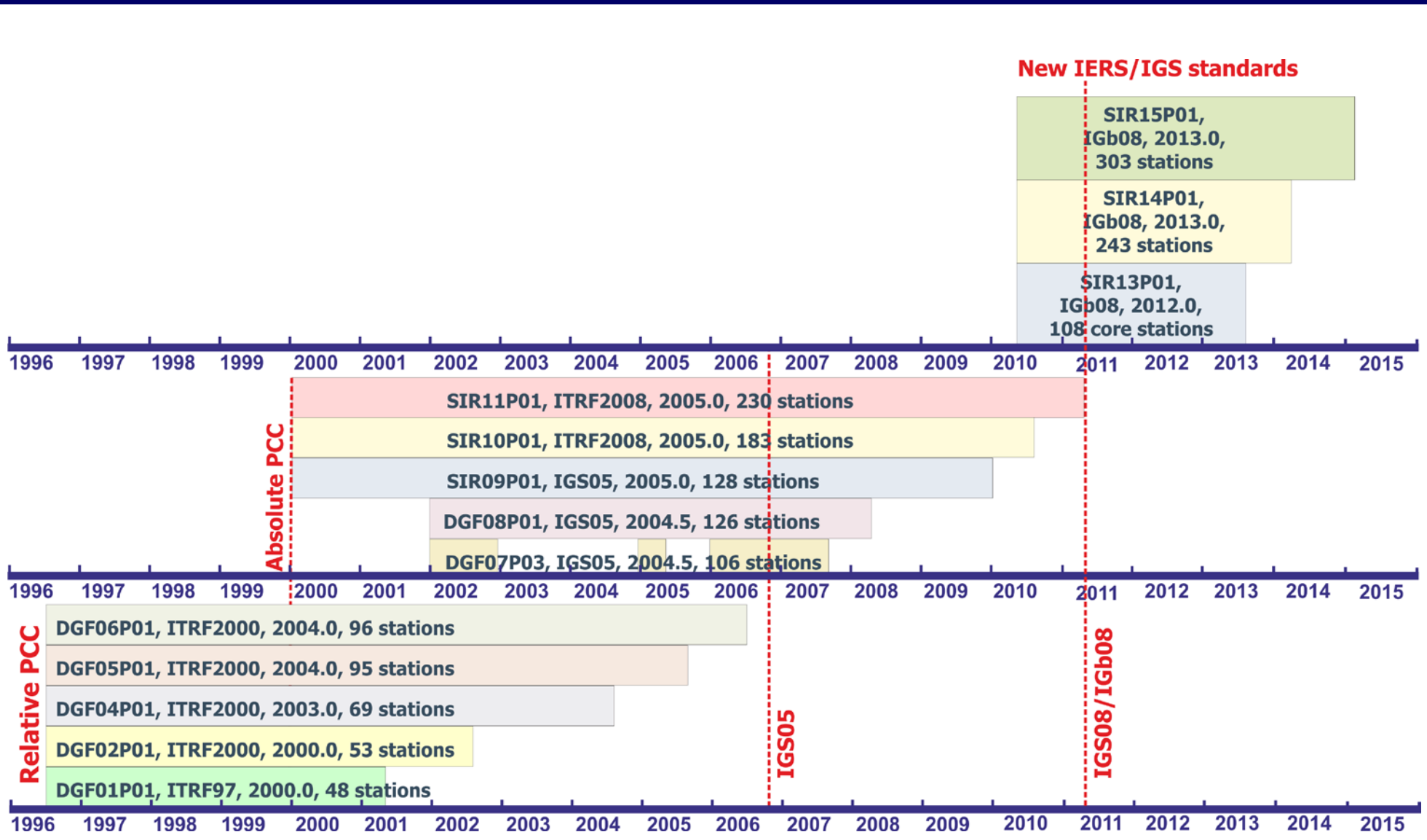
SIRGAS
www.sirgas.org

The SIRGAS Reference Frame

- Each SIRGAS station is computed by three processing centres;
- The individual solutions are combined by the SIRGAS Combination Centres: IBGE (Brazil) and DGFI-TUM (Germany);
- Software:
  Argentina and Mexico
  → GAMIT/GlobK 10.5
  Brazil, Chile, Colombia, Costa Rica, Ecuador, Uruguay, Venezuela
  → Bernese GNSS Software 5.2



SIRGAS multi-year solutions



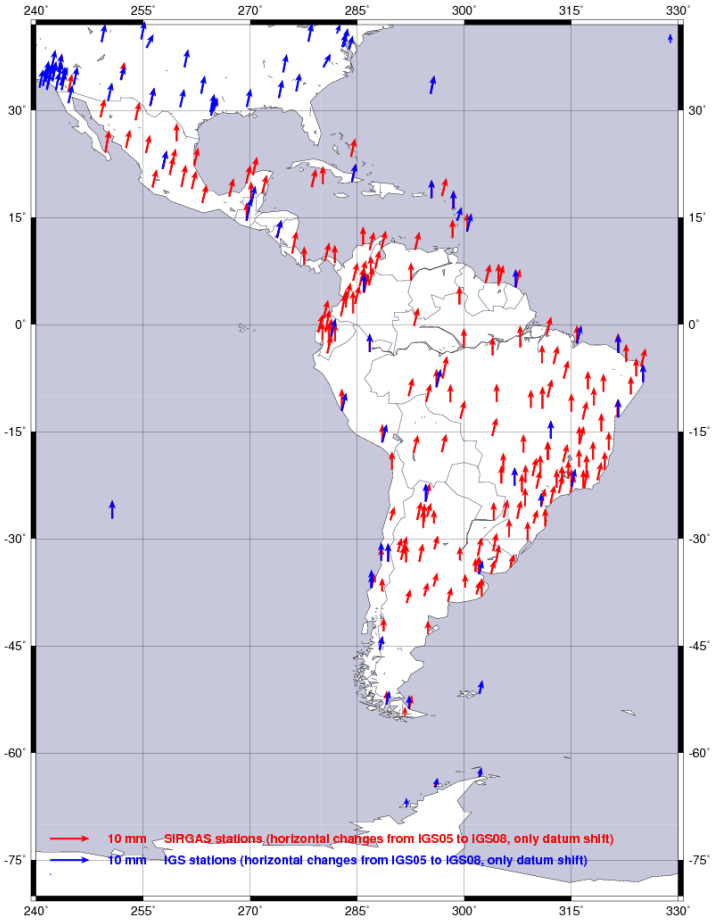
SIRGAS
www.sirgas.org

New IERS/IGS standards

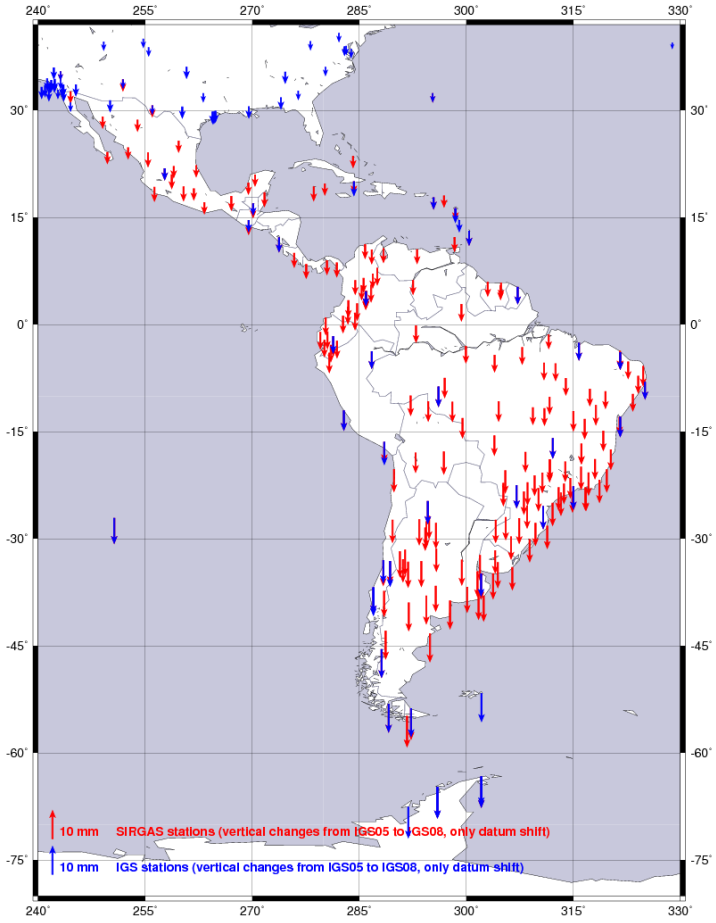
According to the [IGSMAIL-6354], the switch to the ITRF2008 has two main consequences on the station positions:

- Systematic effects due to the ITRF2005 and ITRF2008 datum changes;
- Station-dependent effects due to antenna calibration updates.

Horizontal



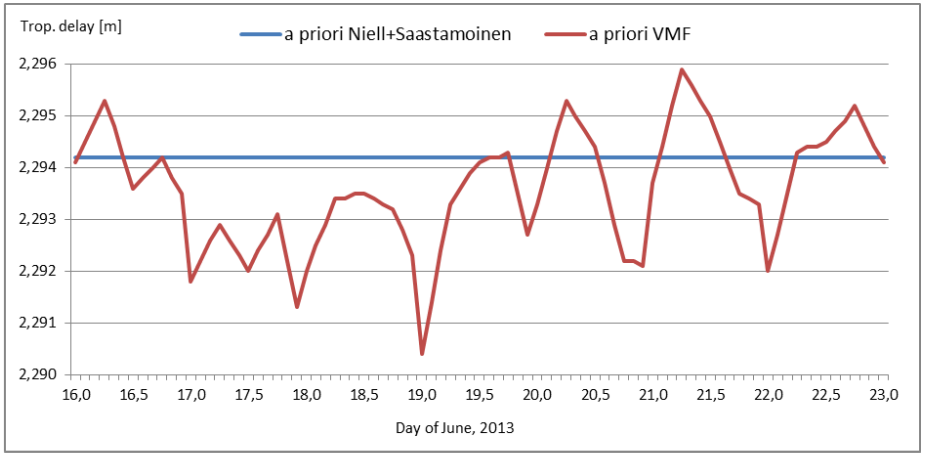
Vertical

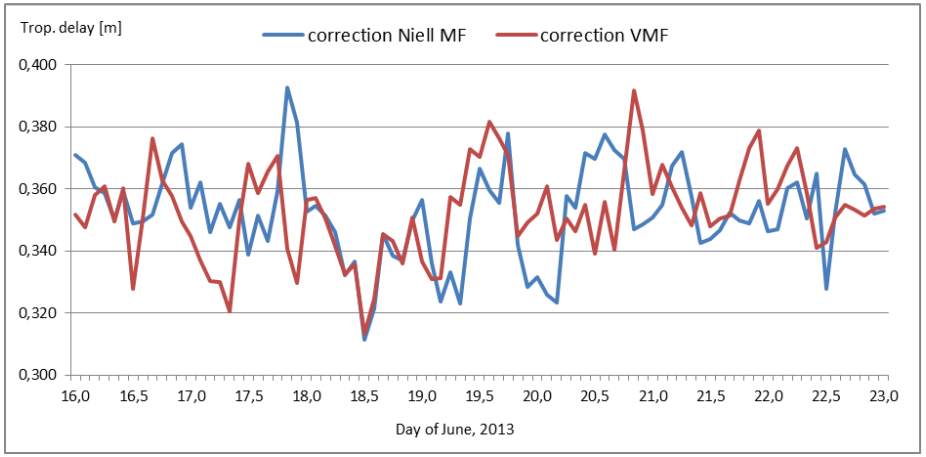


New IERS/IGS standards

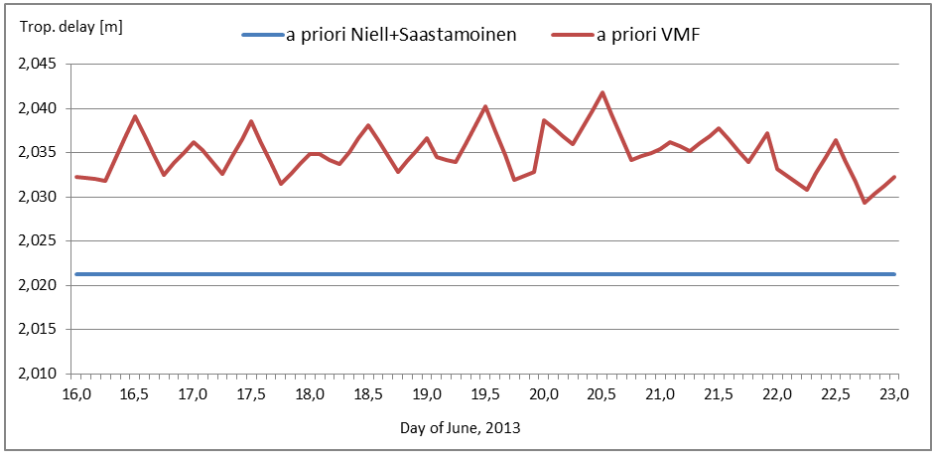
Comparison between previous and new model for the troposphere delay estimation

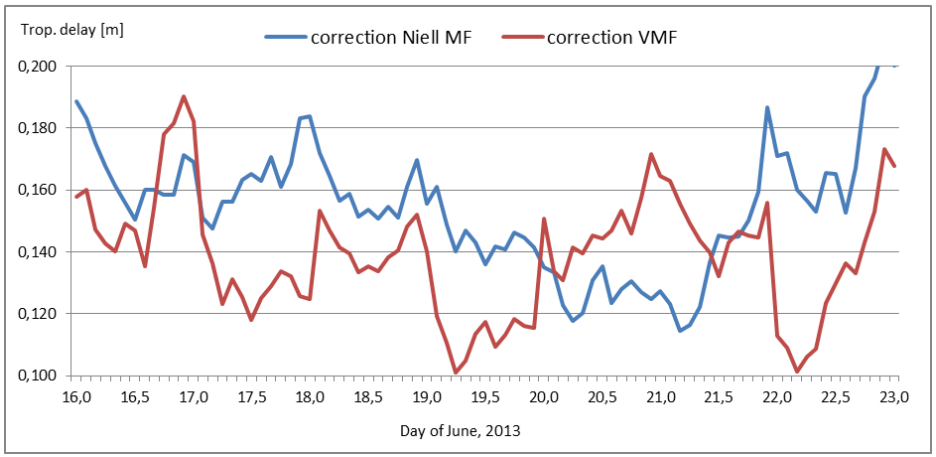
Station IGN1 (Panama City)





Station BRAZ (Brasilia)



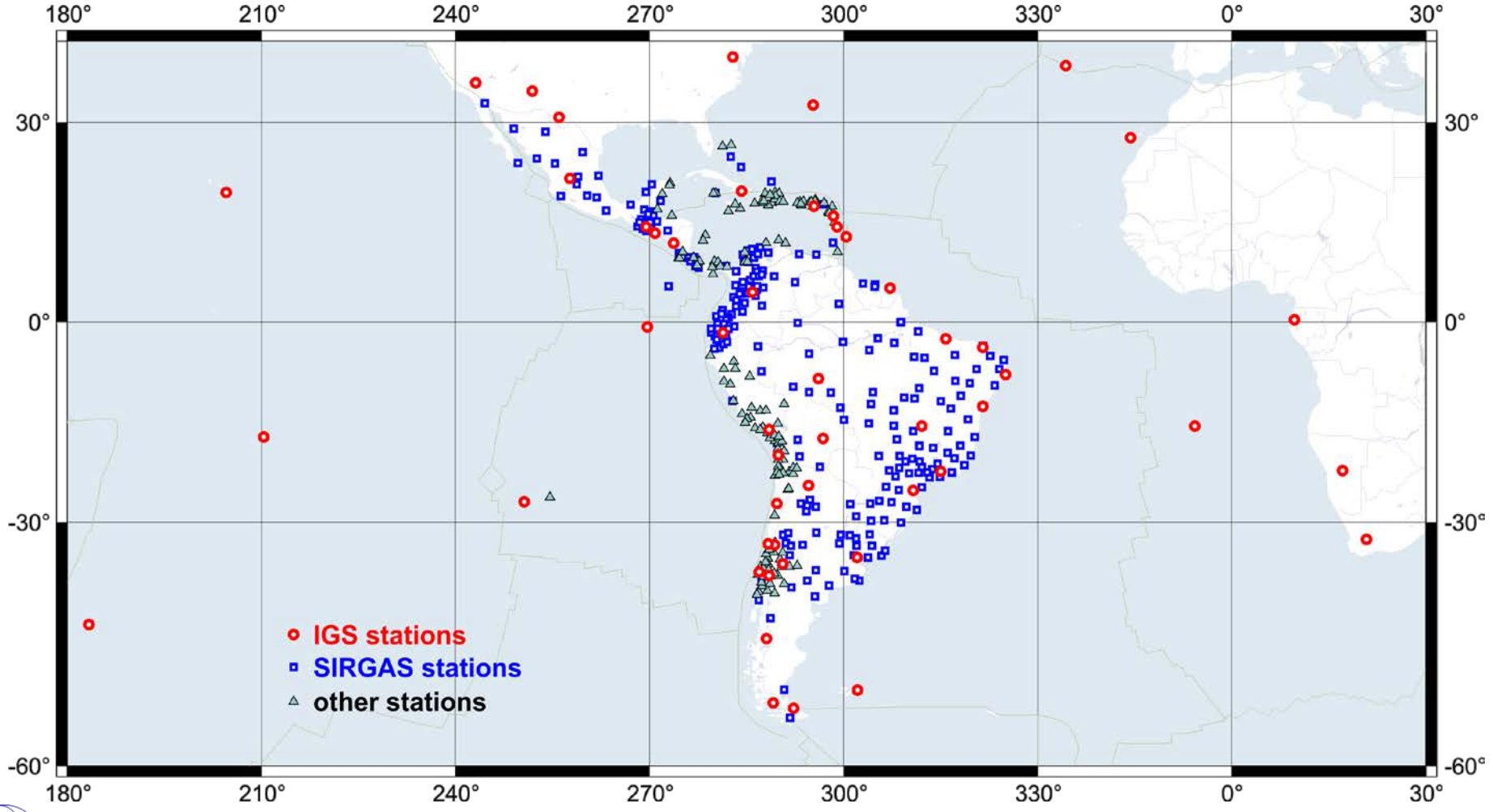


New fiducial stations

- As most of the ITRF stations in South America are affected by the earthquake in Chile in February 2010, stations located in Europe, Africa, Oceania and North America are now included in the routine SIRGAS computations to increase the availability of fiducial points.

SIR15P01: Input stations

- 303 SIRGAS stations
- 135 additional stations to improve VEMOS (data provided by UNAVCO and NGS)

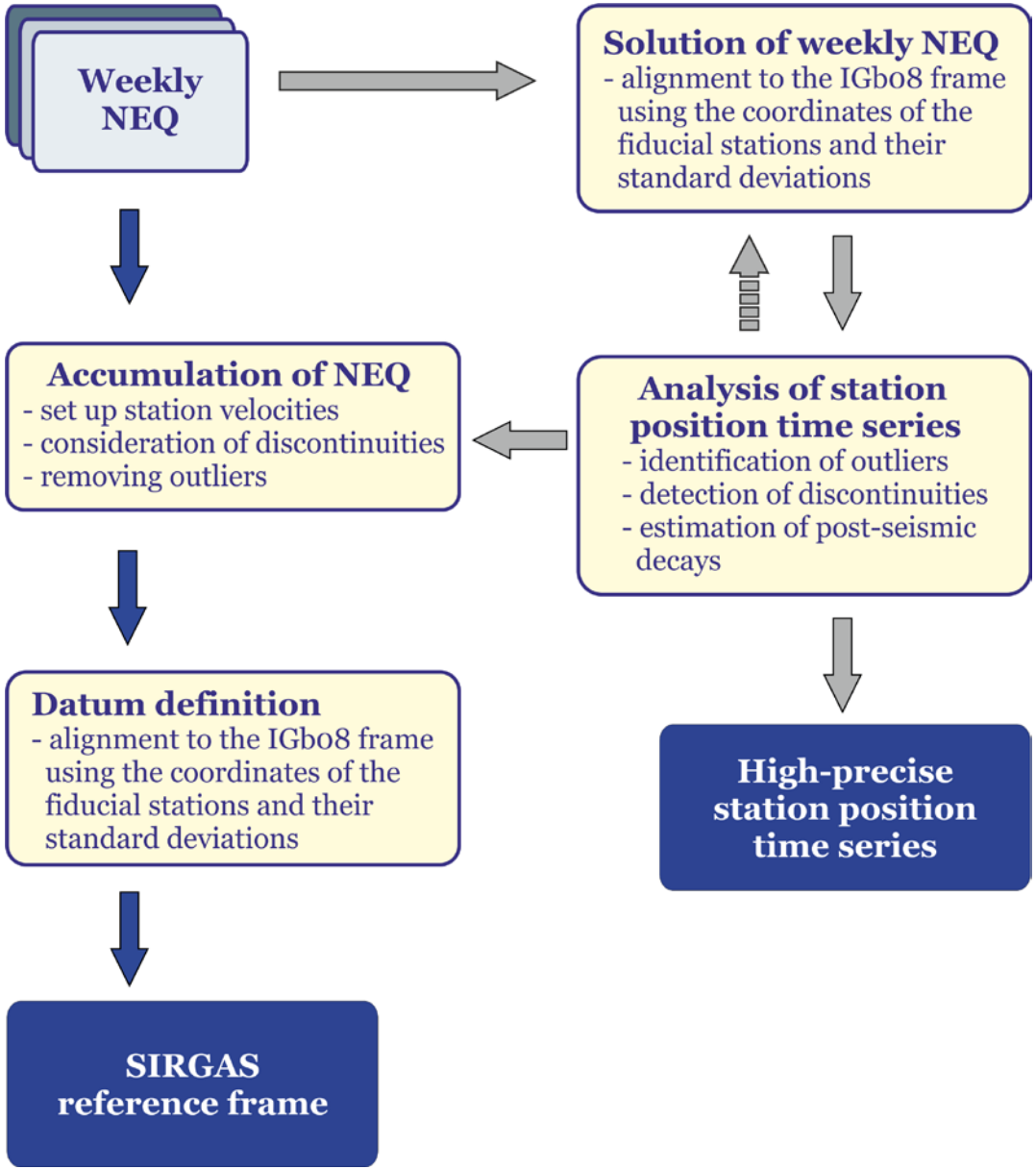


SIRGAS
www.sirgas.org

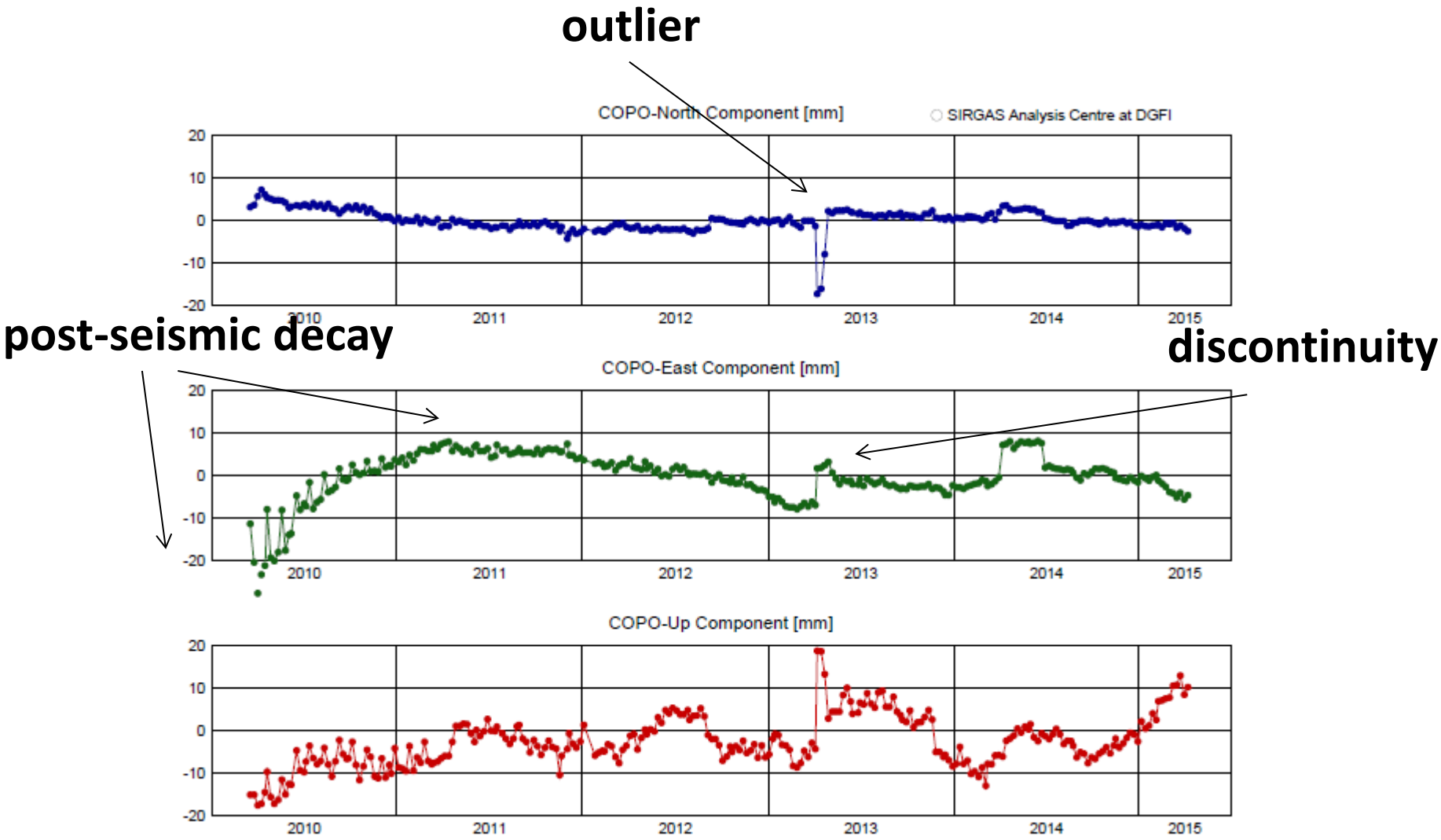
SIR15P01: Processing strategy

Input data:

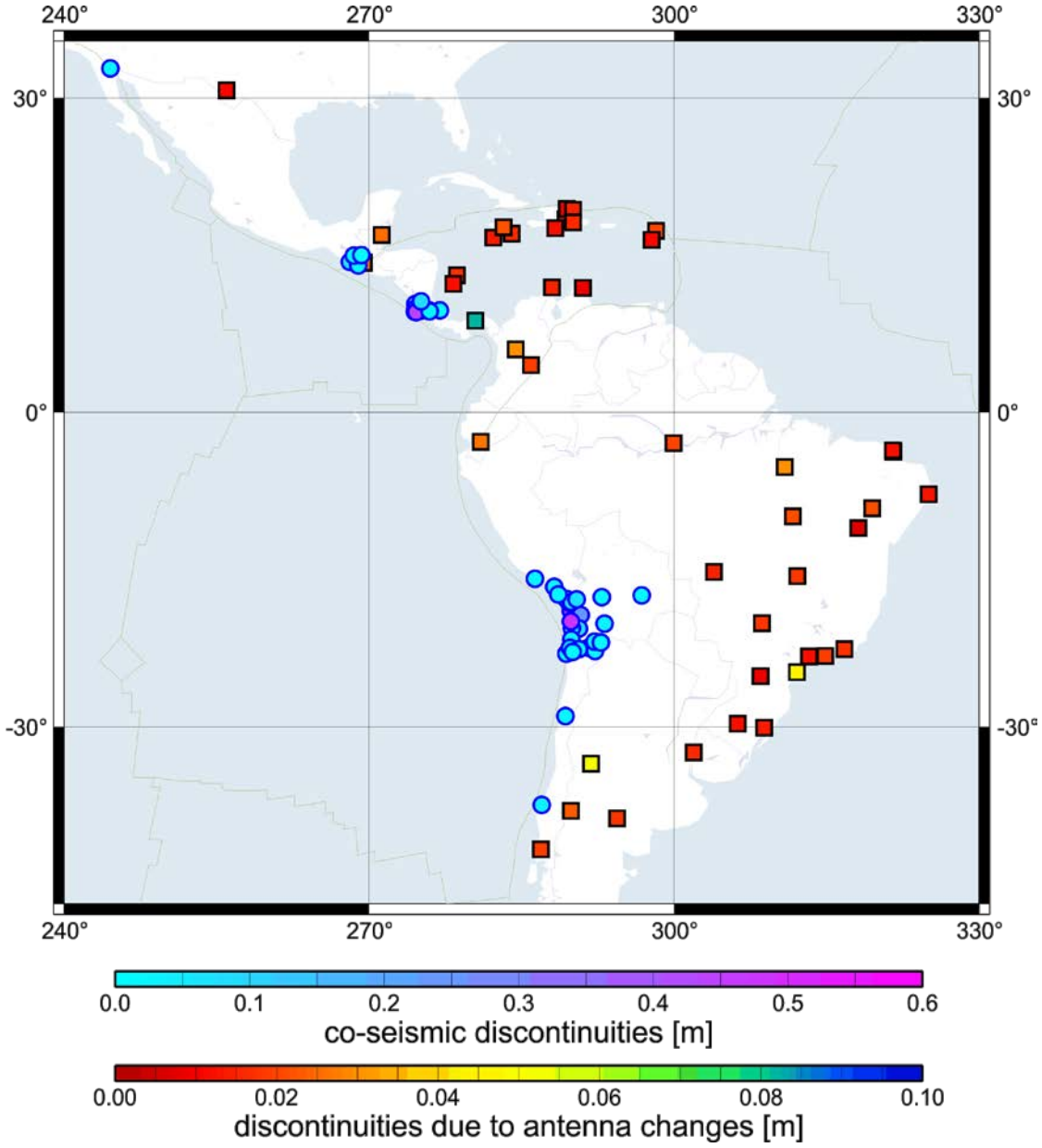
- for the SIRGAS stations: weekly combinations from January 2015 to April 2015 and recomputed weekly NEQ (by DGFI-TUM) from March 2010 to December 2014,
- for the other stations (NGS + UNAVCO): NEQ computed by DGFI-TUM for the same time span;
- only stations with more than two years of measurements.



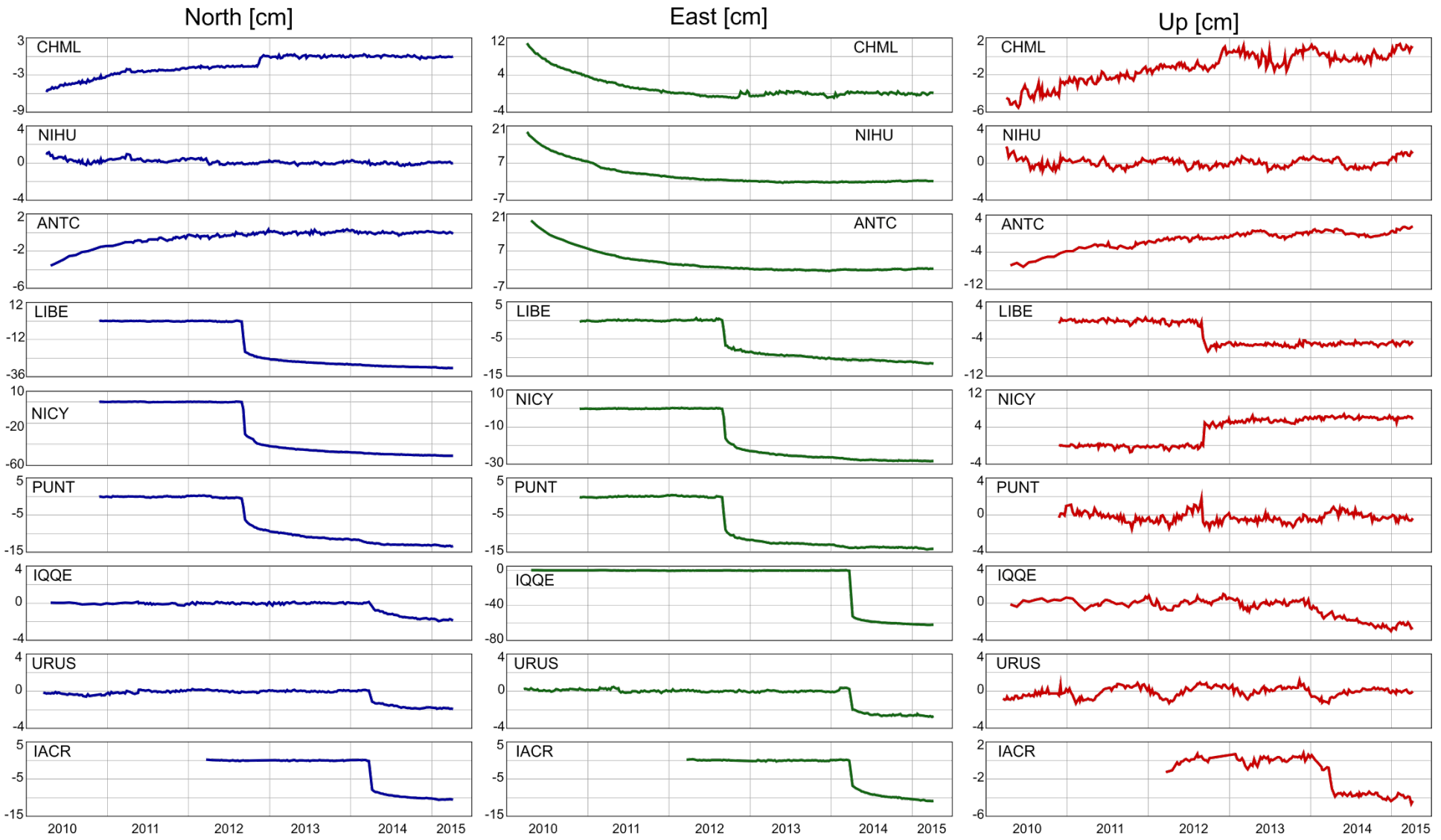
SIR15P01: Processing strategy



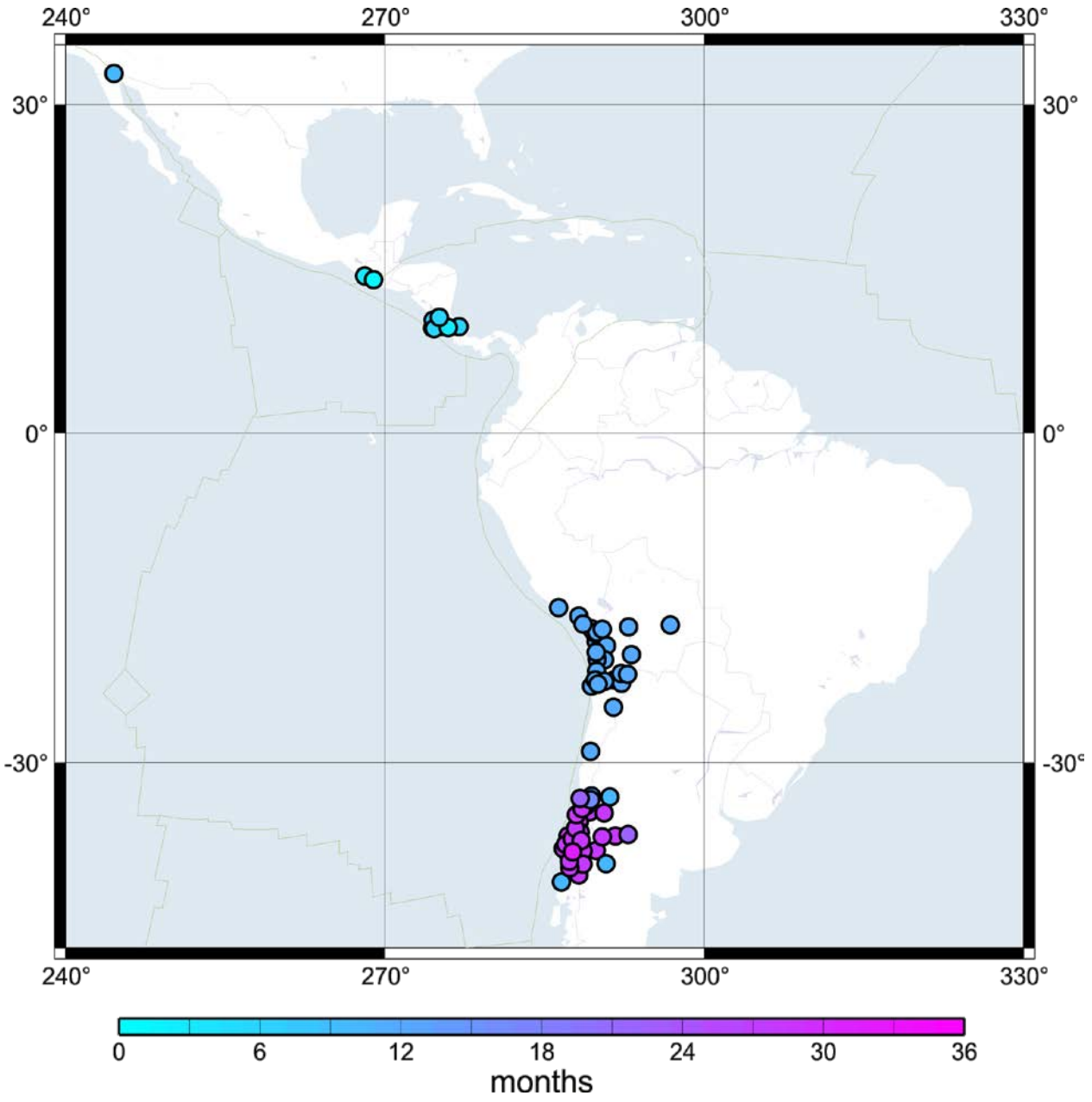
SIR15P01: Discontinuities



SIR15P01: Post-seismic decays

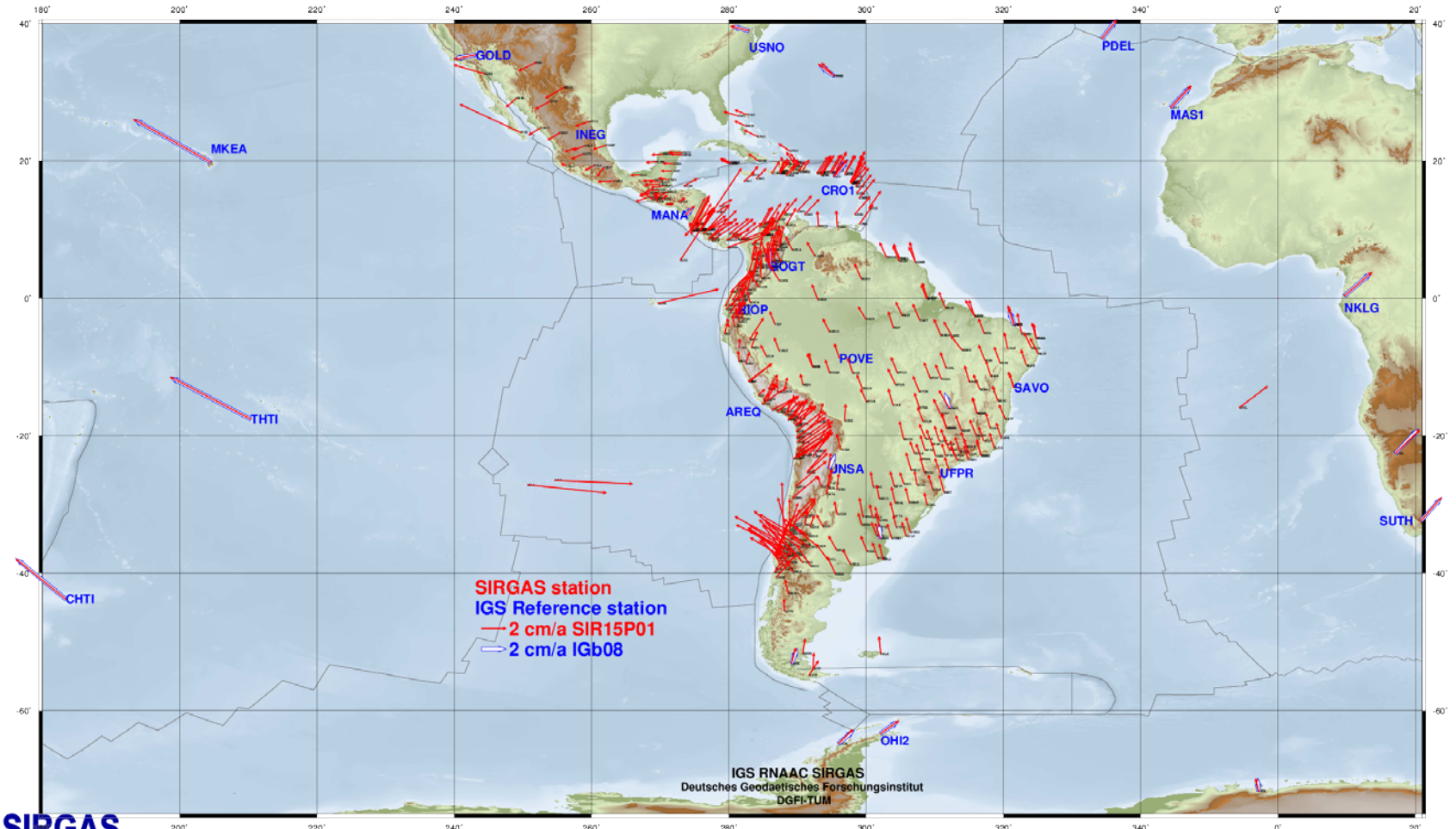


SIR15P01: Post-seismic decays



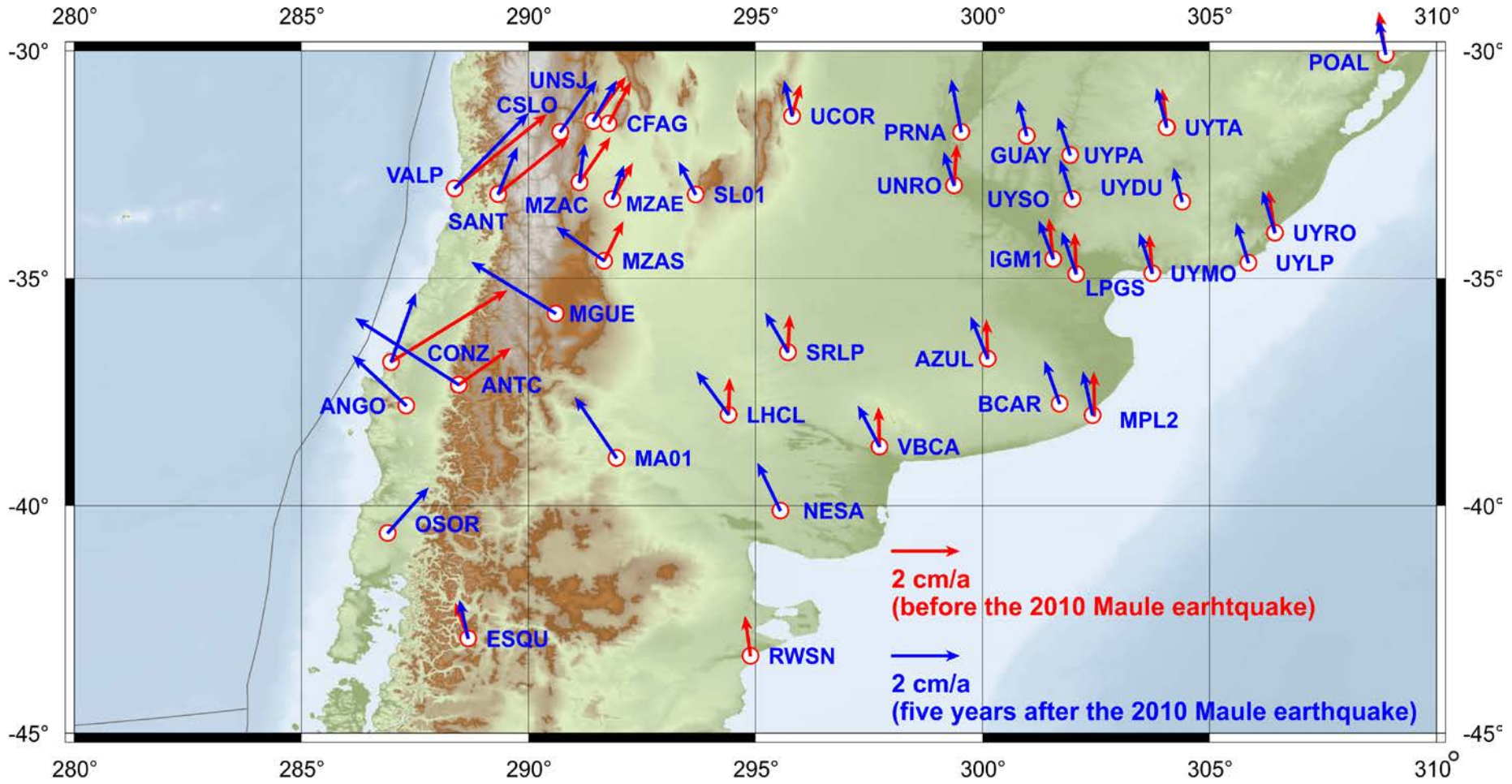
SIR15P01: Horizontal velocities

- Time span: 2010.2 - 2015.2;
- Frame: IGb08, 2013.0
- Accuracy: Pos.: N - E = ±1,8 mm, h = ±3,5 mm
  Vel.: N - E = ±1,0 mm/a, h = ±1,2 mm/a



SIRGAS
www.sirgas.org

SIR15P01: Comparison with previous solutions



On-going activities

- Second reprocessing of the entire SIRGAS reference frame:
  - ✓ New computation of daily normal equations from January 1, 1997 until December 31, 2013
  - ✓ Following the new geodetic standards outlined by the IERS and the IGS
  - ✓ Including GLONASS measurements;
- Computation of co-seismic deformation models derived from discrete (weekly) station positions to incorporate seismic discontinuities in the computation of the reference frame;
- These models shall be the basis for the transformation of geospatial information referring to the pre-seismic coordinates (specially in official maters like legal borders, cadastre, land management, etc.).
- Modelling of seasonal movements at the combination level of the weekly solutions.