The Contribution of the Regional Reference Frames

to the

Global Geodetic Reference Frame Implementation

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Global Geodetic Reference Frame and CORS
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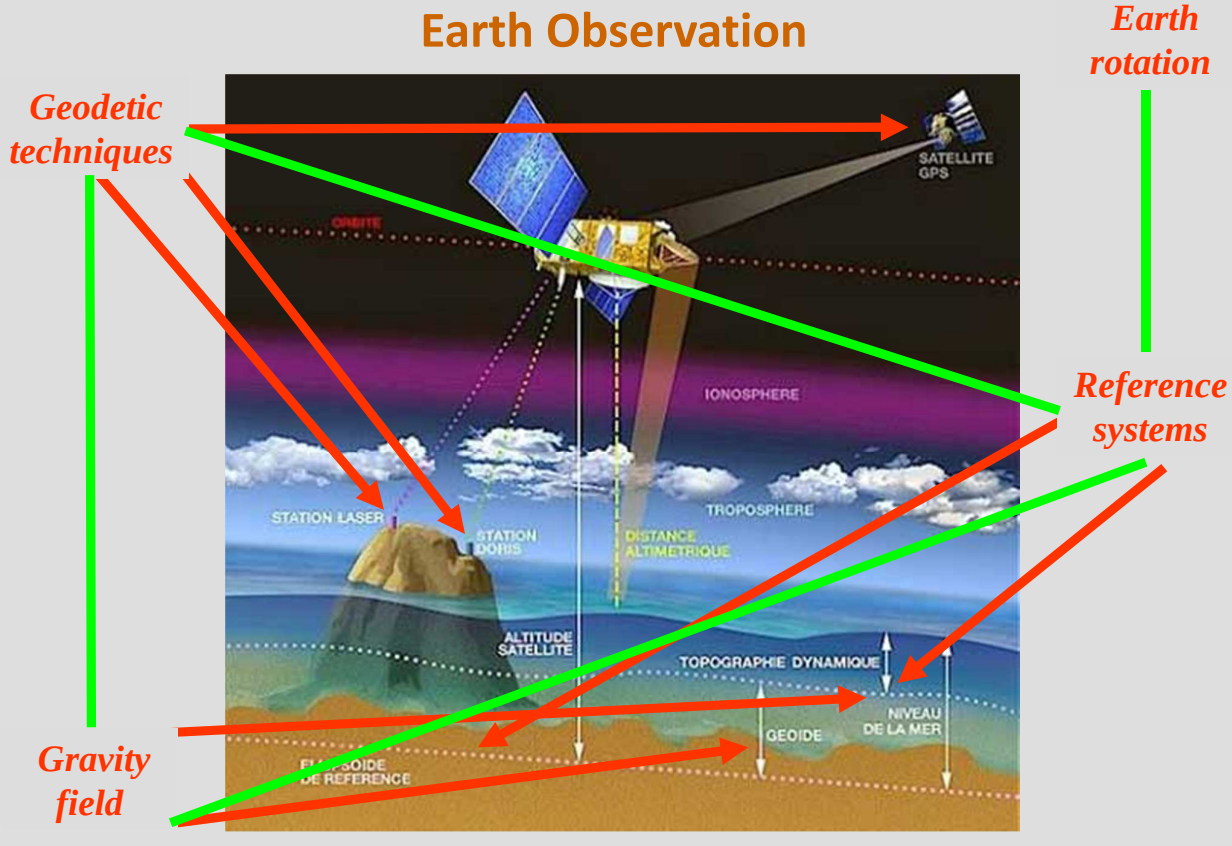
... the chairpersons of the IAG Regional RF sub-commissions

The Contribution of the Regional Reference Frames to the Global Geodetic Reference Frame Implementation

SUMMARY

- Introduction / GGRF
- SC Regional Reference Frames
- Regional activities
- Transition to the GGRF
- Impact on user's community

1 – Introduction / GGRF

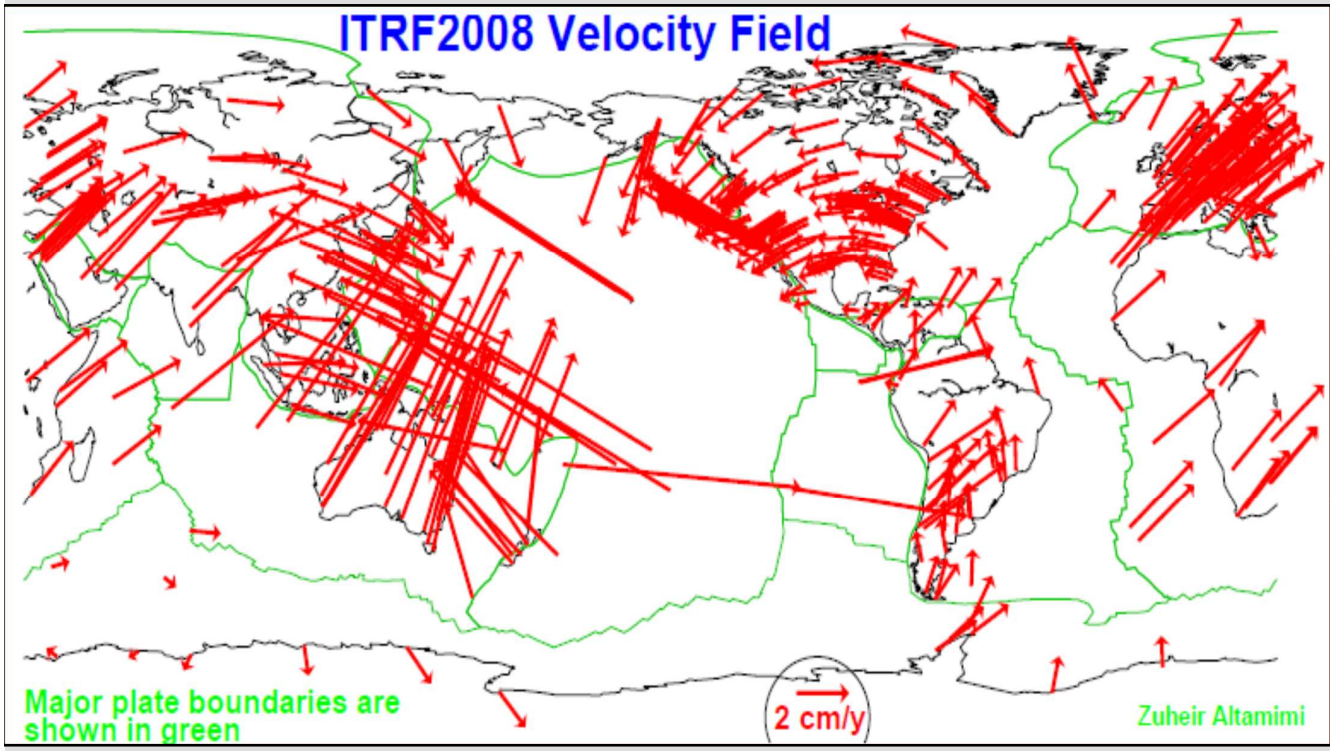


(CNES/NASA)

ITRF
INTERNATIONAL TERRESTRIAL REFERENCE FRAME

- *Set of geodetic references*
- *Coordinates and velocities estimation based on space geodetic techniques*
  - VLBI *(Very Long Baseline Interferometry)*
  - SLR *(Satellite Laser Ranging)*
  - GPS *(Global Positioning System)*
  - DORIS *(Doppler Orbitography Radiopositioning Integrated by Satellite)*

MAJORITY OF CONTRIBUTION COMES FROM GNSS



(Zuheir Altamimi, 2010)

IAG SUB-COMMISSION 1.3

GENERAL PURPOSE

SC1.3 Regional Reference Frames deals with the definitions and realizations of regional reference frames and their connection to the global International Terrestrial Reference Frame (ITRF)

Moreover, it offers a home for service-like activities addressing theoretical and technical key common issues of interest to regional organisations

IAG SUB-COMMISSION 1.3

MAIN OBJECTIVES

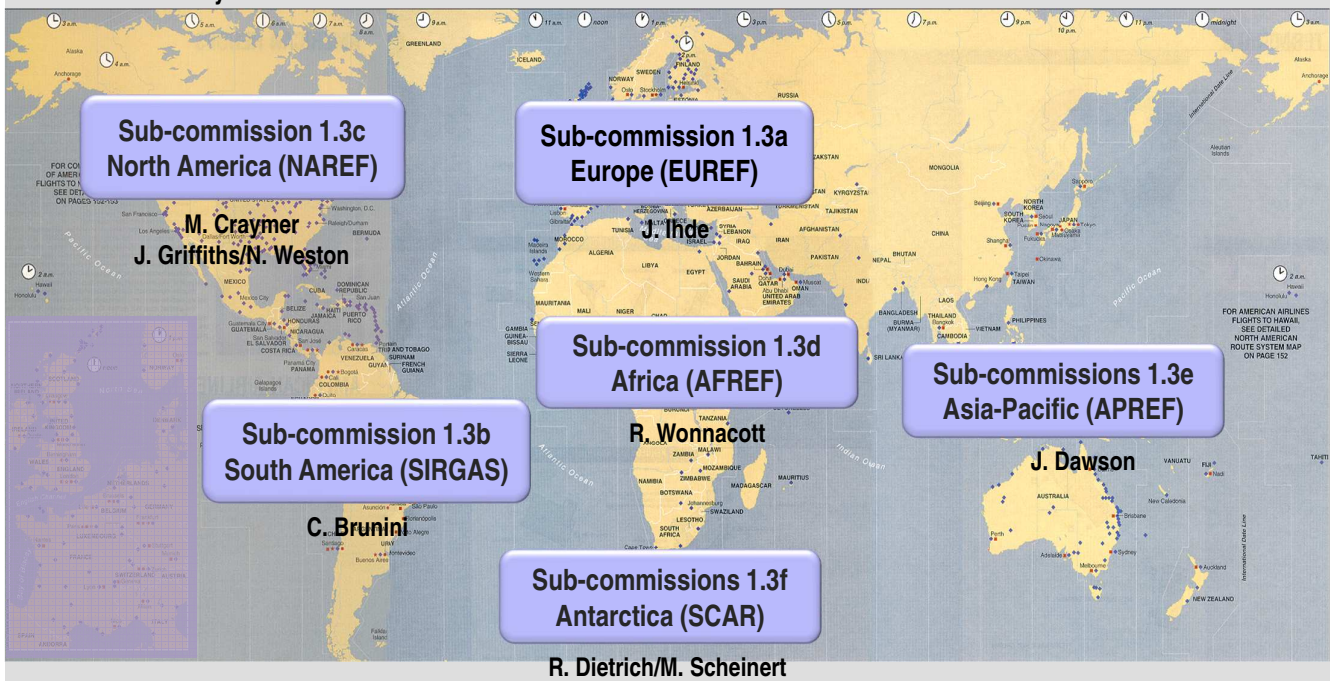
- **Develop specifications for the definition and realization of regional reference frames, including the vertical component with special consideration of gravity data and other data.**
- **Coordinate activities of the regional sub-commissions focusing on exchange and share of competences and results.**
- **Develop and promote operation of GNSS permanent stations, in connection with IGS whenever appropriate, to be the basis for the long-term maintenance of regional reference frames.**
- **Promote the actions for the densification of regional velocity fields.**
- **Encourage and assist, within each regional sub-commission, countries to re-define and modernize their national geodetic systems, compatible with the ITRF.**

2 - SC Regional Reference Frames

Working Group
Integration of Dense Velocity Fields into the ITRF
C. Bruyninx

Sub-commission 1.3
Regional Reference Frames
J. Torres

Working Group
Deformation Models for Reference Frames
R. Stanaway



Sub-commission 1.3c
North America (NAREF)
M. Craymer
J. Griffiths/N. Weston

Sub-commission 1.3a
Europe (EUREF)
J. Ihde

Sub-commission 1.3d
Africa (AFREF)
R. Wonnacott

Sub-commissions 1.3e
Asia-Pacific (APREF)
J. Dawson

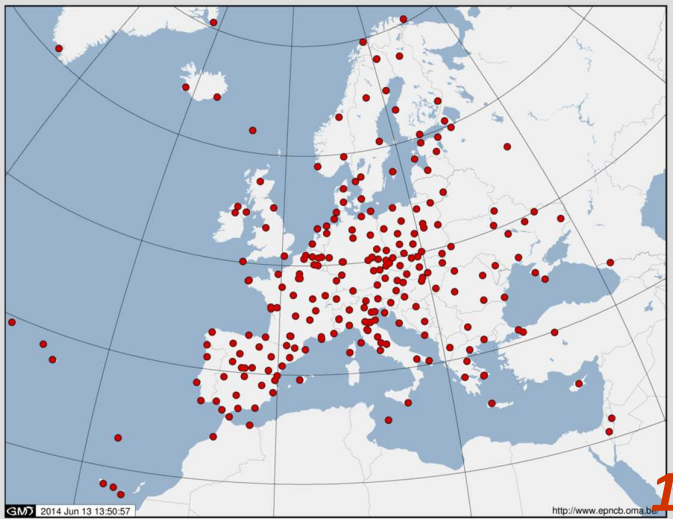
Sub-commission 1.3b
South America (SIRGAS)
C. Brunini

Sub-commissions 1.3f
Antarctica (SCAR)
R. Dietrich/M. Scheinert

3 - Regional activities

EUREF

- *Promotion of the ETRS89 (European Terrestrial Reference System) and the EVRS (European Vertical Reference System)*
- *250 GNSS stations of EPN (European Permanent Network) operating by mid-2013 (70% GLONASS)*
- *Preparation for Galileo and multi-GNSS*
- *Follow-up on the adoption of the INSPIRE Directive*



EUREF Permanent Tracking Network

3 - Regional activities

SIRGAS

- *Almost all Central and South America countries adopted the reference system defined by SIRGAS*
- *The SIRGAS-CON (SIRGAS Continuously Operating Network) is composed by 300 stations (45% GLONASS)*
- *Regional velocity model (horizontal) for coordinate update*
- *Epoch station positions to detect deformations of the reference frame (earthquakes)*

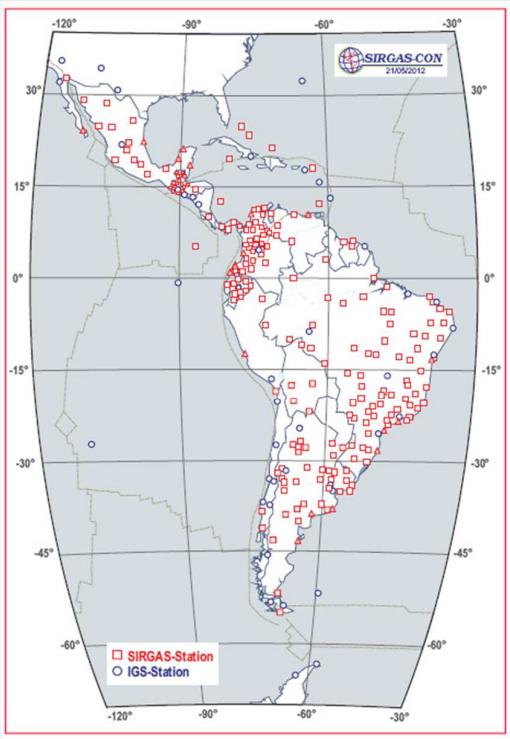


Figure 2: SIRGAS Continuously Operating Network (SIRGAS.CON), status May, 2012.

3 - Regional activities

NAREF

- *New realization of the NAD (North America Datum) expected to occur in 2022*
- *Definition and maintenance of the relationships between the national and international reference systems*
- *The densification of the ITRF and IGS network is made by weekly combinations of 5 regional weekly solutions*

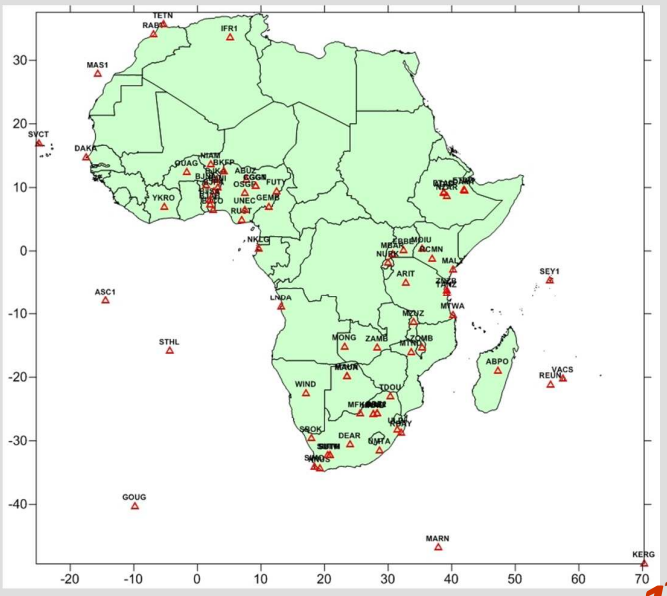
3 - Regional activities

AFREF

- *Not much progress in the instalation of GNSS permanent stations*

- *Operational Data Center (since 2010) with an open policy: data from 70 GNSS permanent stations*

- *The data of 50 stations plus 50 global stations (two week period in Dec 2012) was processed by 5 processing centres and combined to provide a set of static coordinates based on ITRF to be used for everyday surveying and mapping operations*



3 - Regional activities

APREF

- *Processing of GNSS observations of 480 stations from 28 countries in 3 analysis centers*

- *Publication of the weekly ITRF coordinate estimates, time series and velocity solutions for the APREF stations*

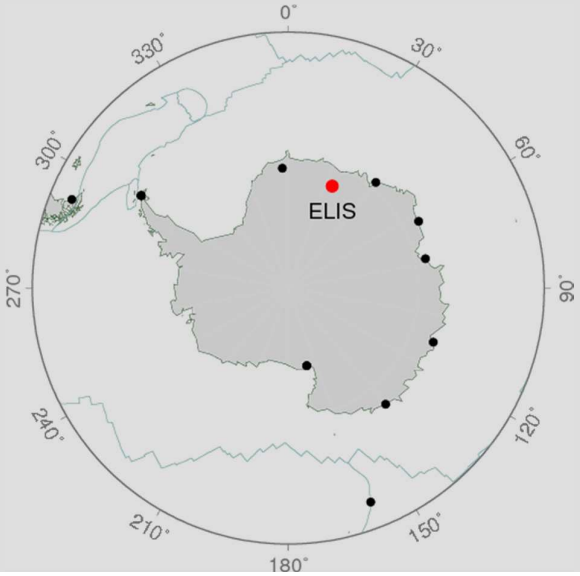
- *Coordination of observation campaigns to densify the ITRF in the Asia-Pacific Region in countries without CORS*

3 - Regional activities

SCAR

- *Regular analysis of 40 GNSS stations data collected since 1995 (non permanent)*

- *Members of SCAR constitute the Group of Experts on Geodetic Infrastructure in Antarctica (GIANT)*



4 – Transition to the GGFR

HOW IS THIS GOAL BEING ACHIEVED IN

- *Europe*
  - *the ETRS89 was defined 25 years ago*
  - *only now it is being adopted officially (INSPIRE)*
  - *some countries are still using the classical datums*
- *South and Central America*
  - *SIRGAS uses a ITRF realization of the ITRS*
  - *it is being adopted progressively*
  - *some countries are still using the classical datums*
- *North America*
  - *NAD 83 is un use*
  - *Transition is expected by 2022*

4 – Transition to the GGFR

HOW IS THIS GOAL BEING ACHIEVED IN

- Africa
  - there is no global knowledge on the situation
  - some countries use WGS84 (surveying)
  - the evolution is very slow
- Asia-Pacific
  - it is being adopted progressively
  - some countries use WGS84 (surveying)
  - evolution is very heterogeneous
- Antarctica
  - ITRF is used

5 – Impact in user's community

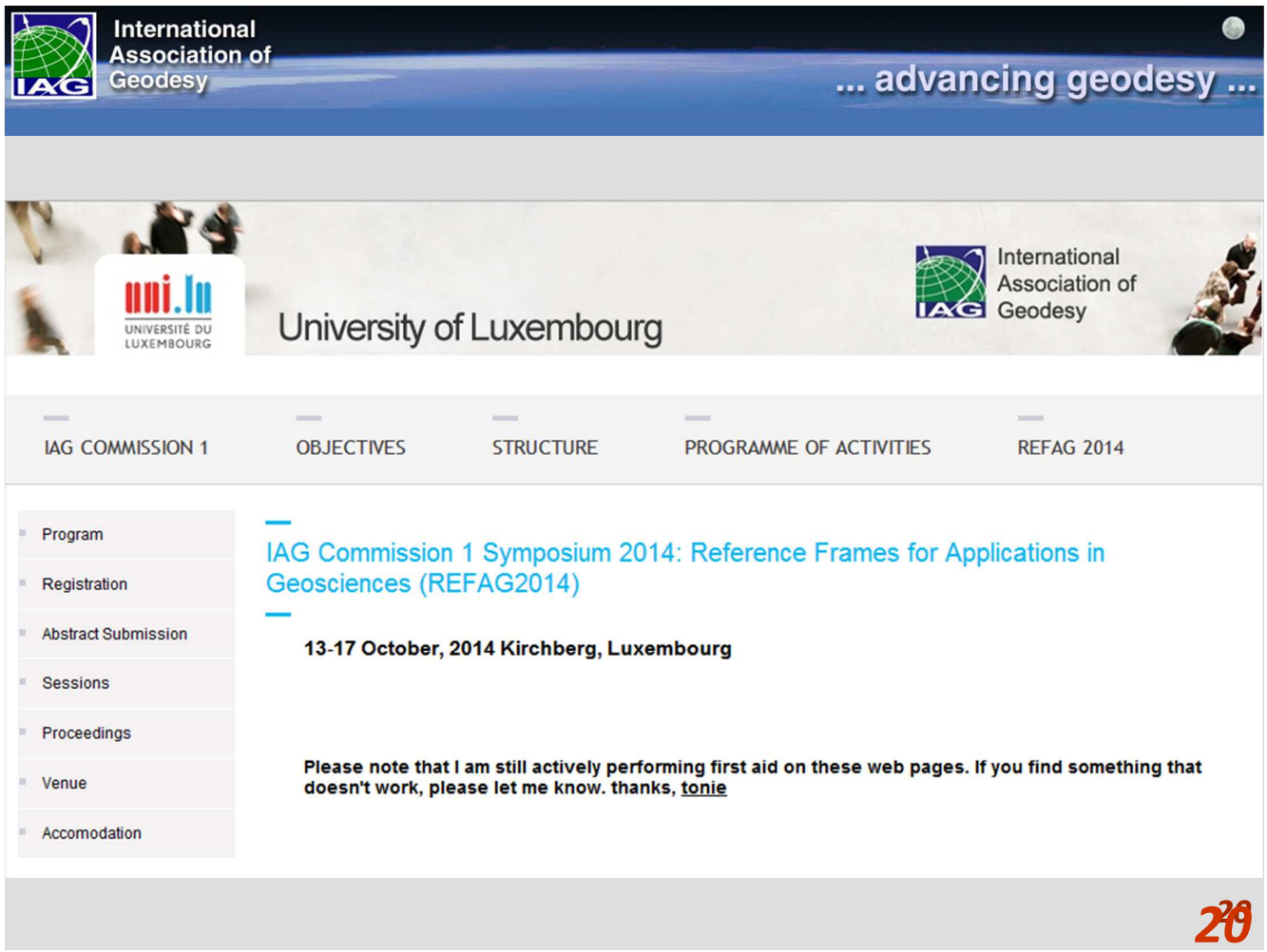
IMPACT

- How is ITRF used?
  - Epoch fixed coordinates?
  - Are velocities/discontinuities taken into account?
- How to adapt to a moving frame?
  - Time span (years/decades?)
  - Is present education/capacity building sufficient?

5 – Impact in user's community

SOME DISCUSSION

- ***Is there a future role for sub-global reference frames of high accuracy?***
- ***If the main justification for regional frames is to remove large- scale tectonic effects, how well can this really be done?***
- ***What about residual motions?***
- ***How should national and regional frame efforts be best coordinated?***



News of a new network
is not always good news

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2005

Carl Curet