UN GGIM Sub Committee on Geodesy
Side event

Danger in degradation of the GGRF

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The Global Geodetic reference Frame (GGRF)

- **The GGRF includes various components….**
- **Focus here:**
  - **The geometric part of the GGRF that allows precise positioning on the Earth surface: The International Terrestrial Reference Frame (ITRF)**
  - **Access to the ITRF using GNSS technology**

The ITRF is built on observations of :

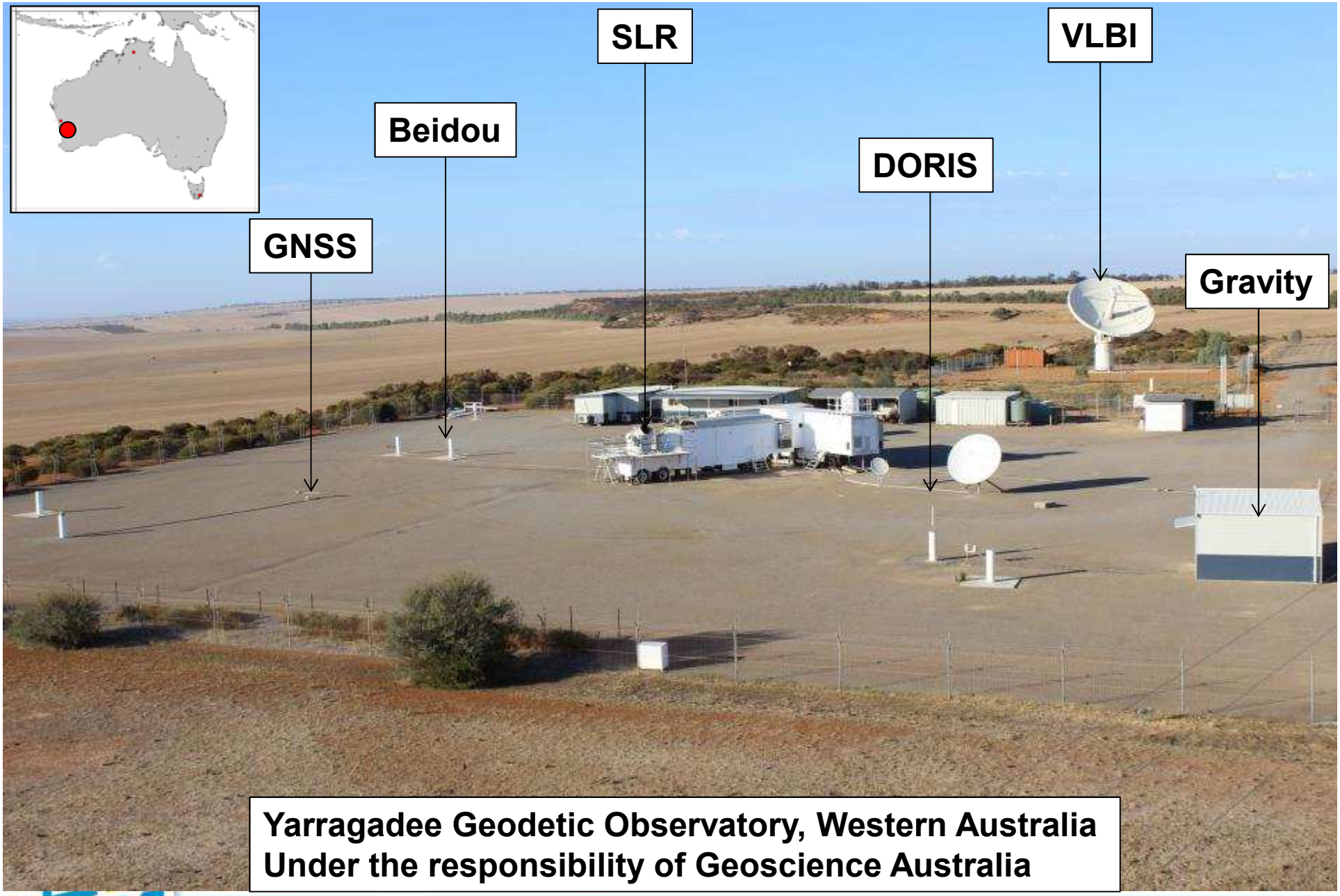
SLR

VLBI

GNSS/GPS

DORIS

and their co-locations…



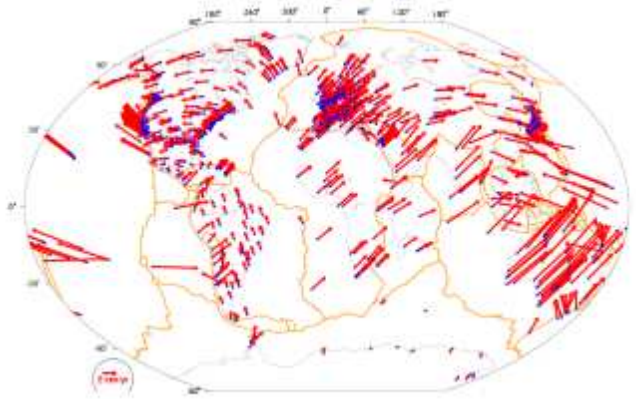
Yarragadee Geodetic Observatory, Western Australia
Under the responsibility of Geoscience Australia

Societal and Scientific Questions (1/2)

- **Where am I, and how to accurately navigate between places on Earth, Oceans & Space ?**
- **How to plan for territory & land management ?**
  - **Construction, mining, civil engineering, National boundaries,…**
- **How to locate areas and people at risk ?**
  - **Natural disasters: Earthquakes, Tsunamis & flooding, …**
- **How to ensure that geospatial data are inter-operable within a country, a region & globally ?**
- **How to measure self-consistent sea level rise over several decades?**
- **BUT… How to accurately determine point positions on the Earth surface that is constantly deforming?**

Societal and Scientific Questions (2/2)

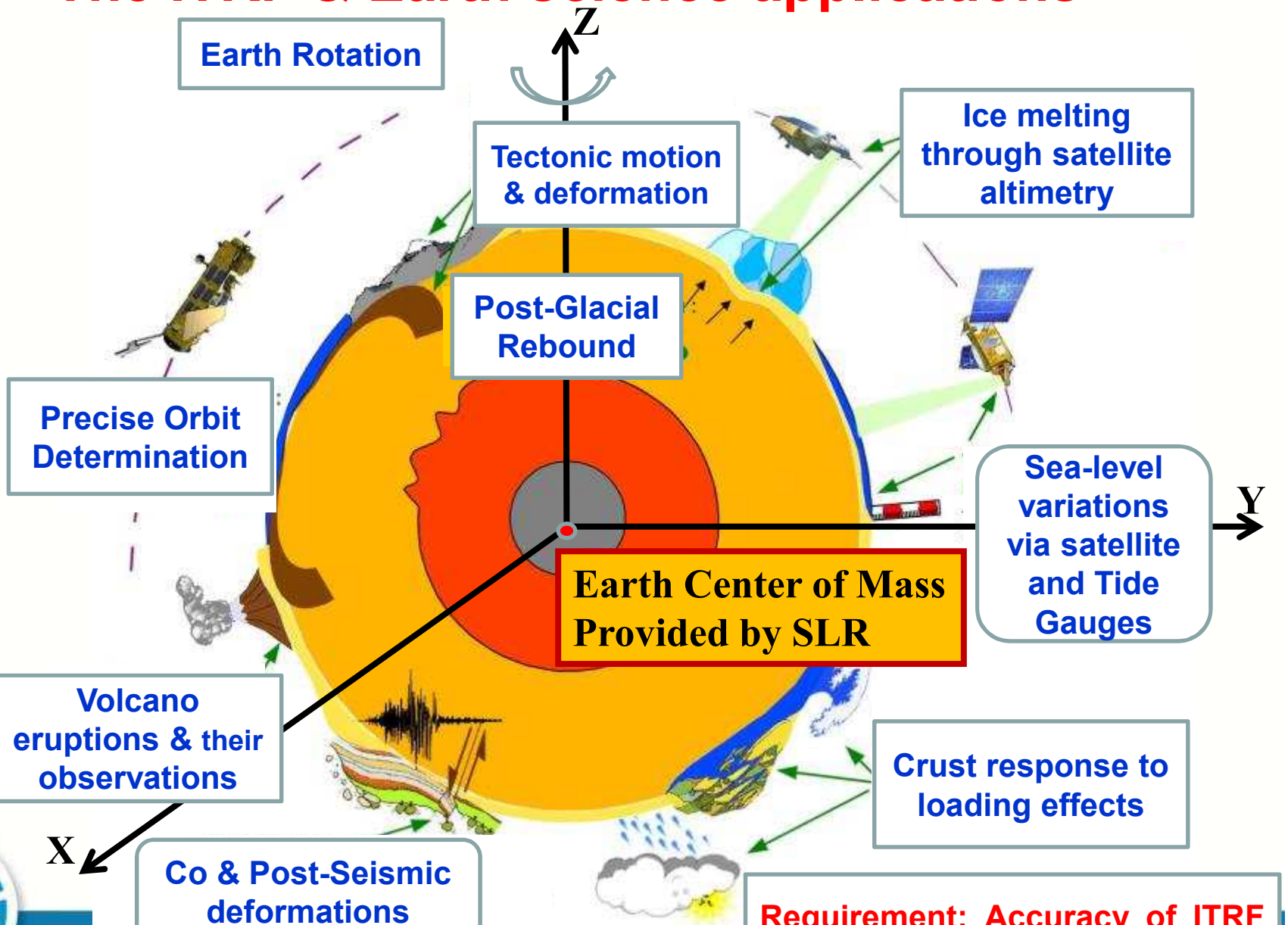
- **How the Earth is deforming ?**
  - Tectonic plate motion
  - Land uplift & subsidence
  - Natural Hazard:
    - Earthquake dislocations
    - Post-seismic deformations,
    - Volcano eruptions…



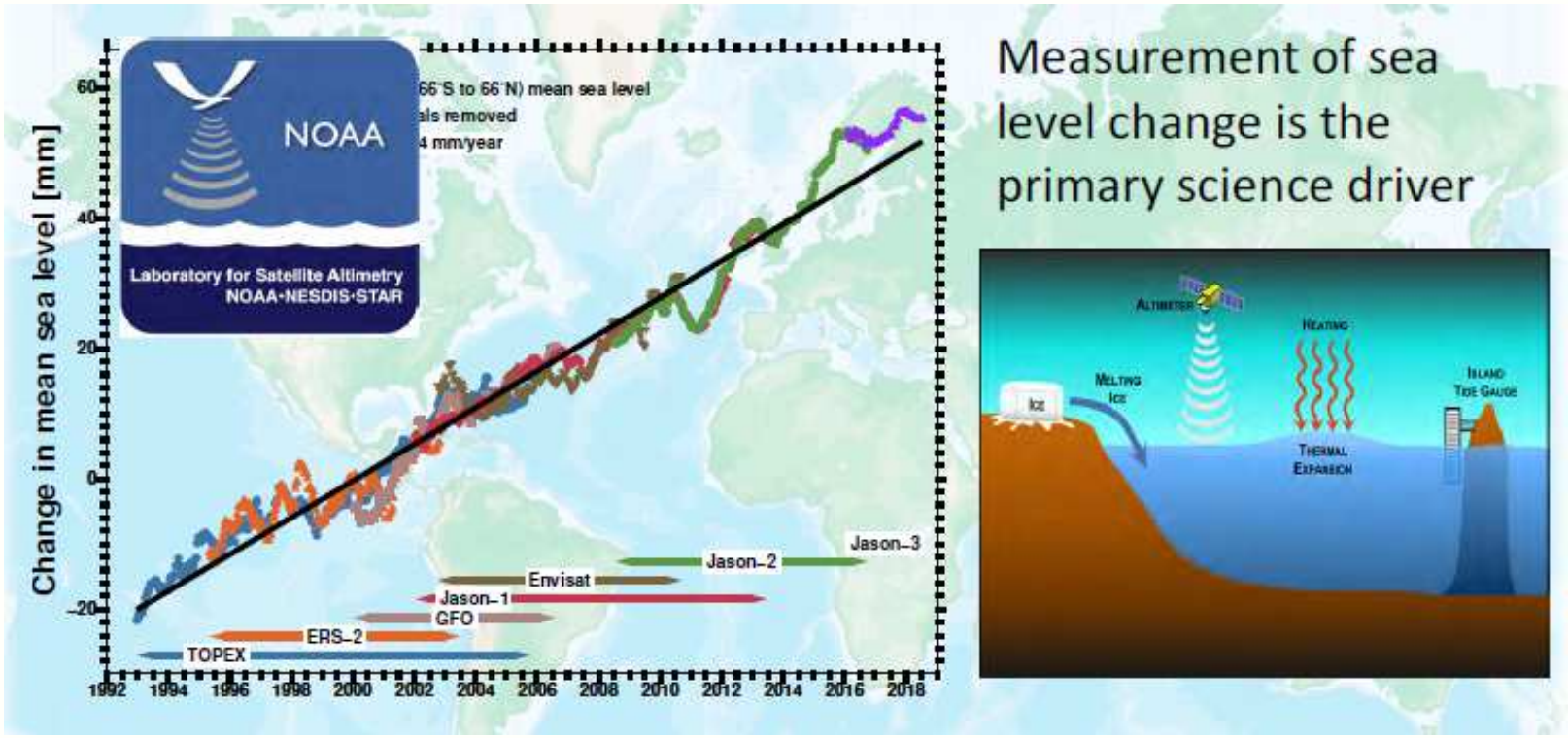
  - Ice cap melting
  - Sea level variations

→ climate change & global warming

The ITRF & Earth science applications



Mean sea level change



A small drift of 1 mm/yr in the ITRF origin, translates into apparent 0.9 mm/yr in sea level rise at high latitudes

Why Multiple Techniques for the ITRF ?

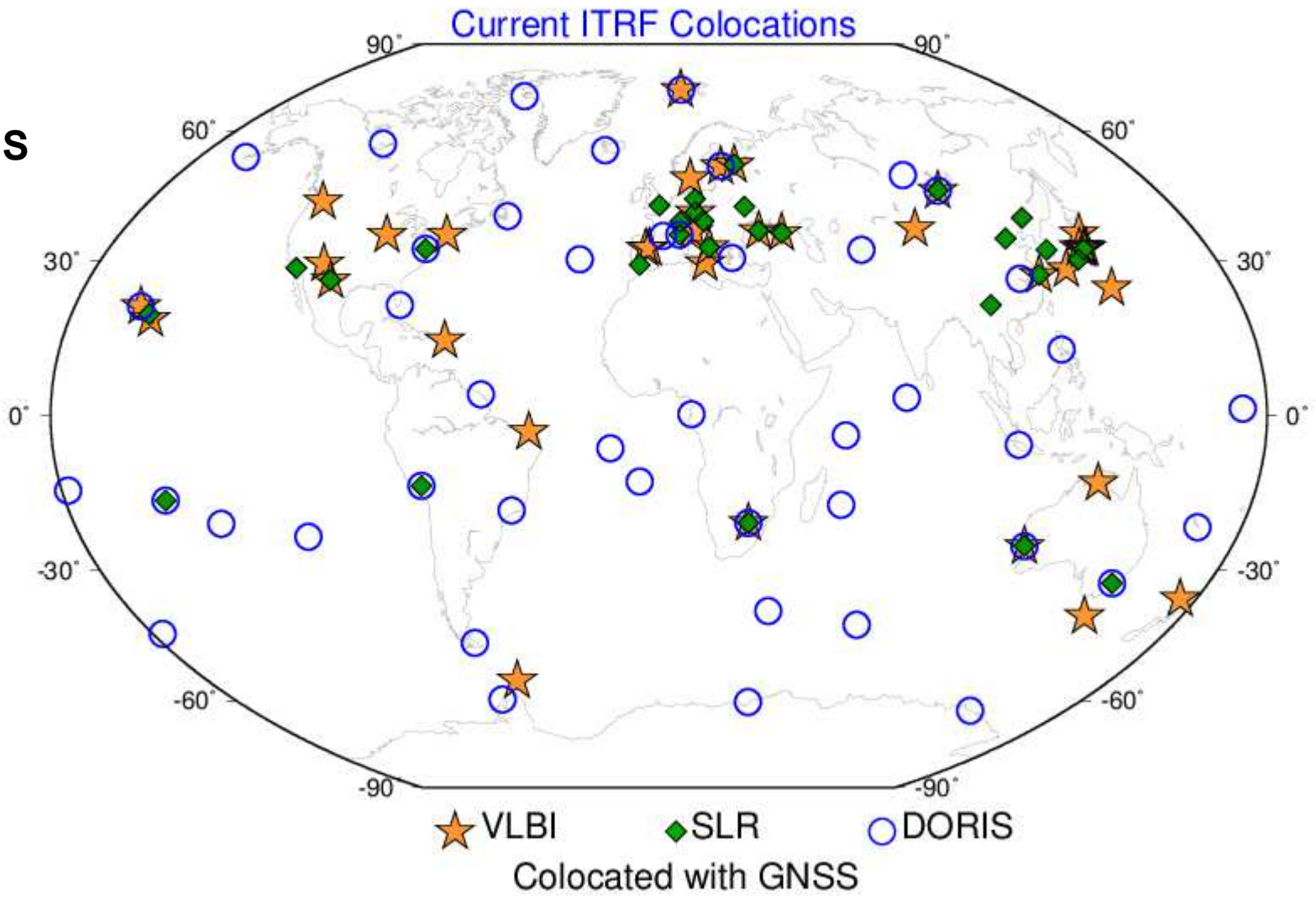
- **VLBI & SLR:**
  - **Fundamental for an accurate definition of the ITRF physical parameters/ properties**
  - **SLR determines Earth Center of Mass ==> ITRF origin**
  - **VLBI places the Earth in space ==> ITRF orientation**
  - **But their ground networks are poorly distributed and in danger of degradation**

- **DORIS: disseminates ITRF in satellite orbit determination**

- **GNSS:**
  - **Ensures the link between VLBI & SLR networks**
  - **Is the tool today to access the global ITRF by the regions and nations**

Current colocations

~ 44 VLBI
~ 30 SLR
~ 45 DORIS



Current colocations

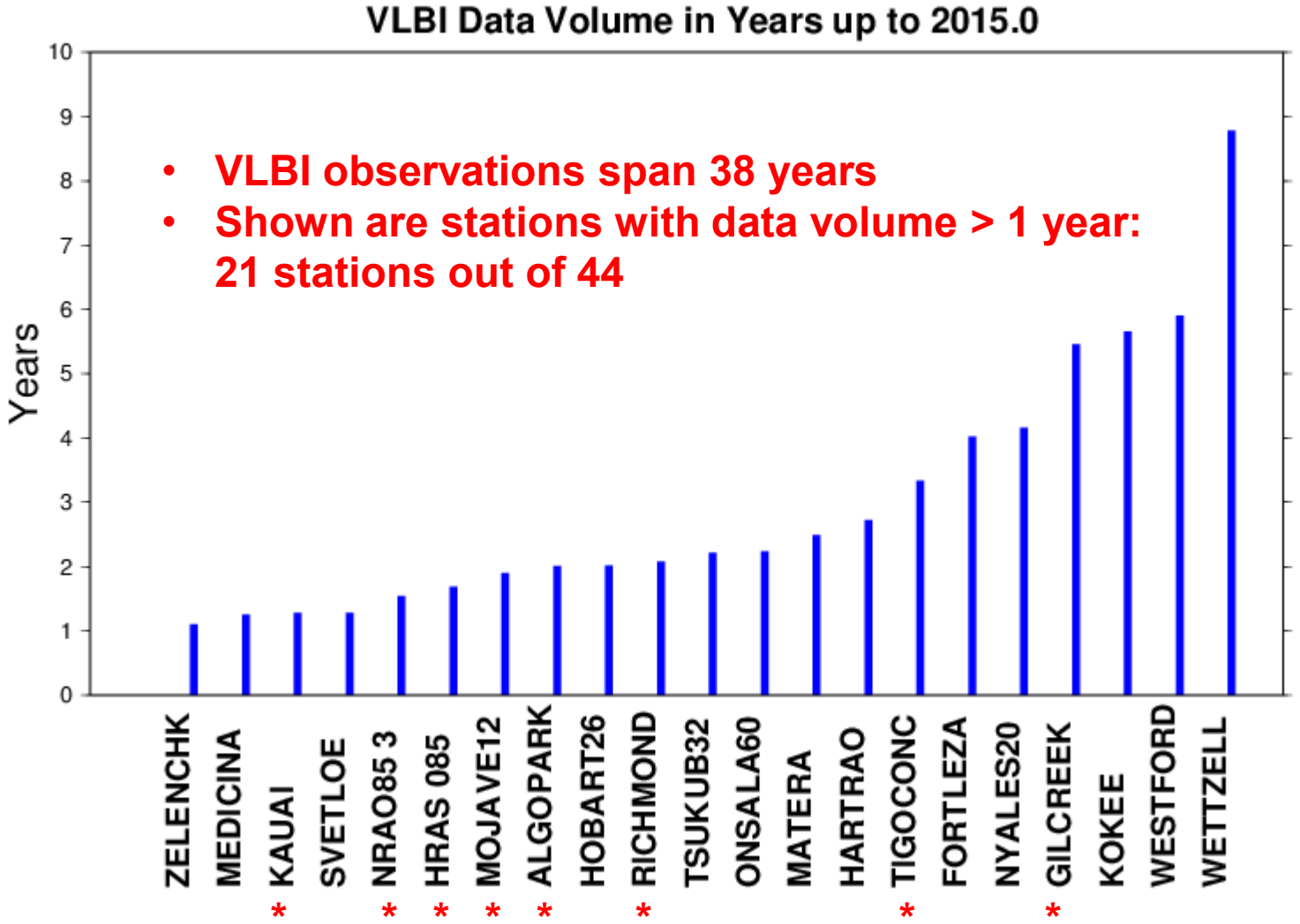
~ 44 VLBI
~ 30 SLR

New geodetic Observatory at Ny-Ålesund

Poor geometry between north and south

"New generation" VLBI antennas

VLBI Data Volume in years up to 2015.0

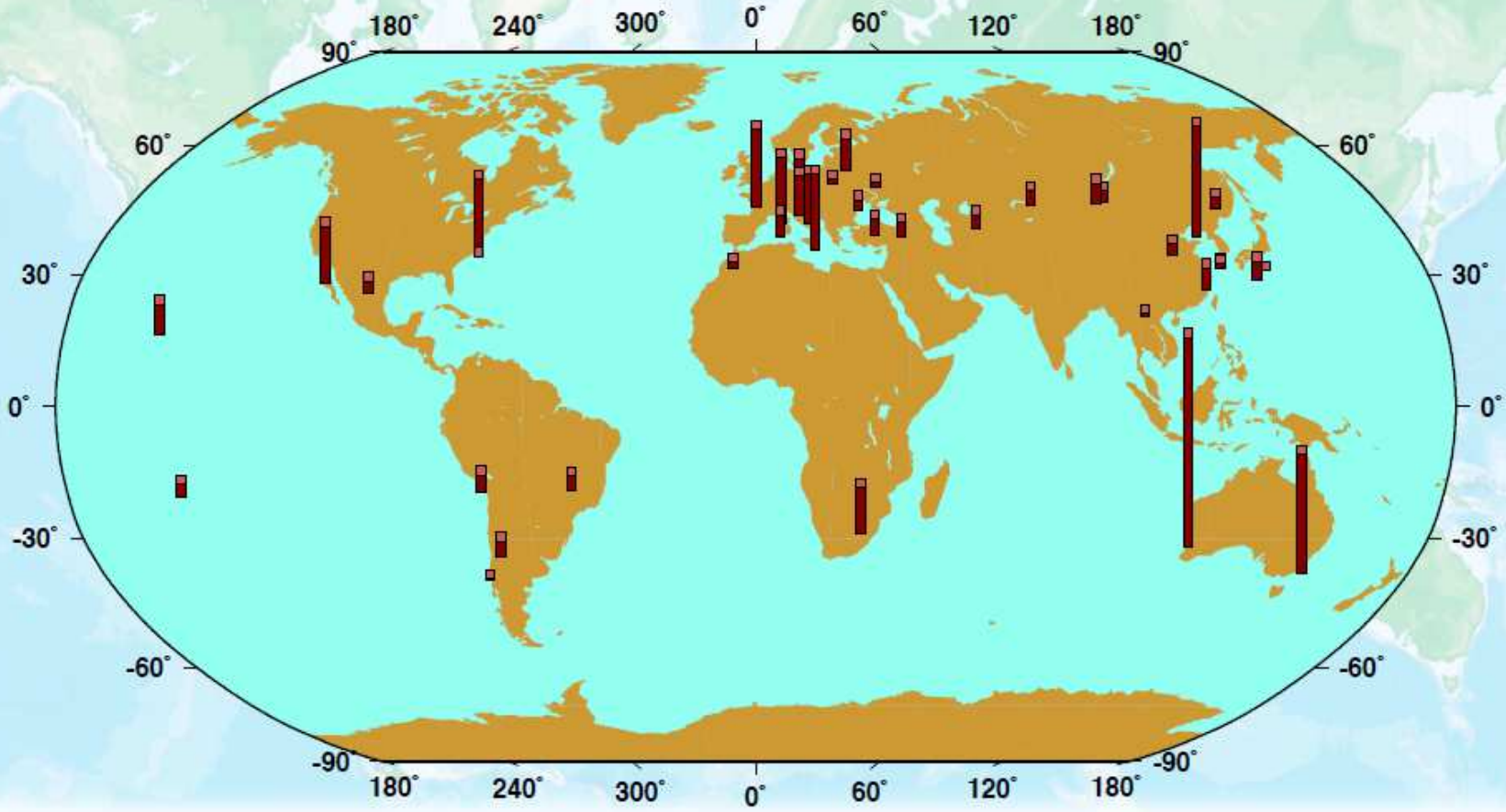


- **VLBI observations span 38 years**
- **Shown are stations with data volume > 1 year: 21 stations out of 44**

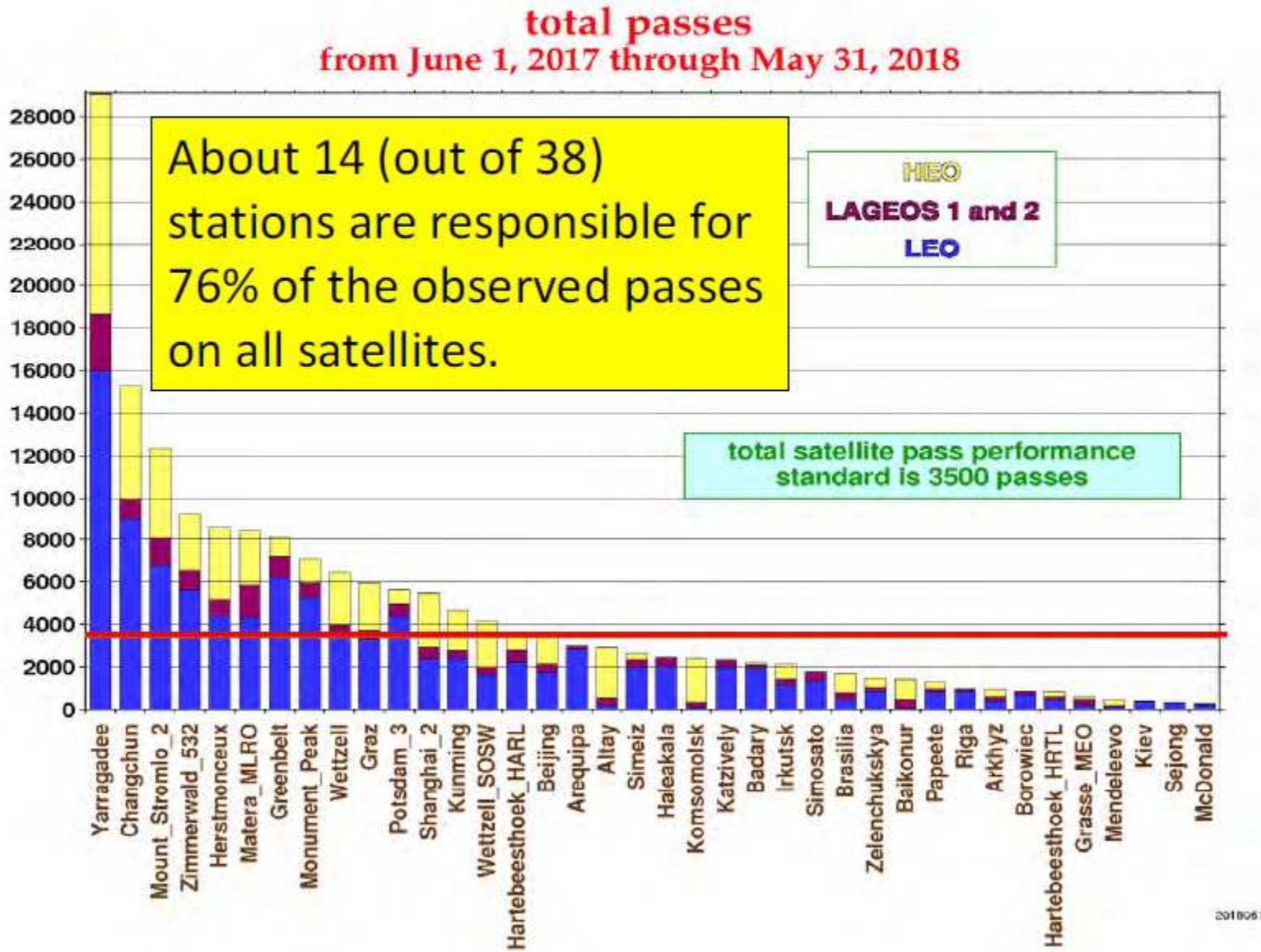
* **No longer in operation**

The network seen via its data yield

- The global SLR data set on the two LAGEOS collected by the ILRS network over 2014-2016 were distributed as shown on this map:



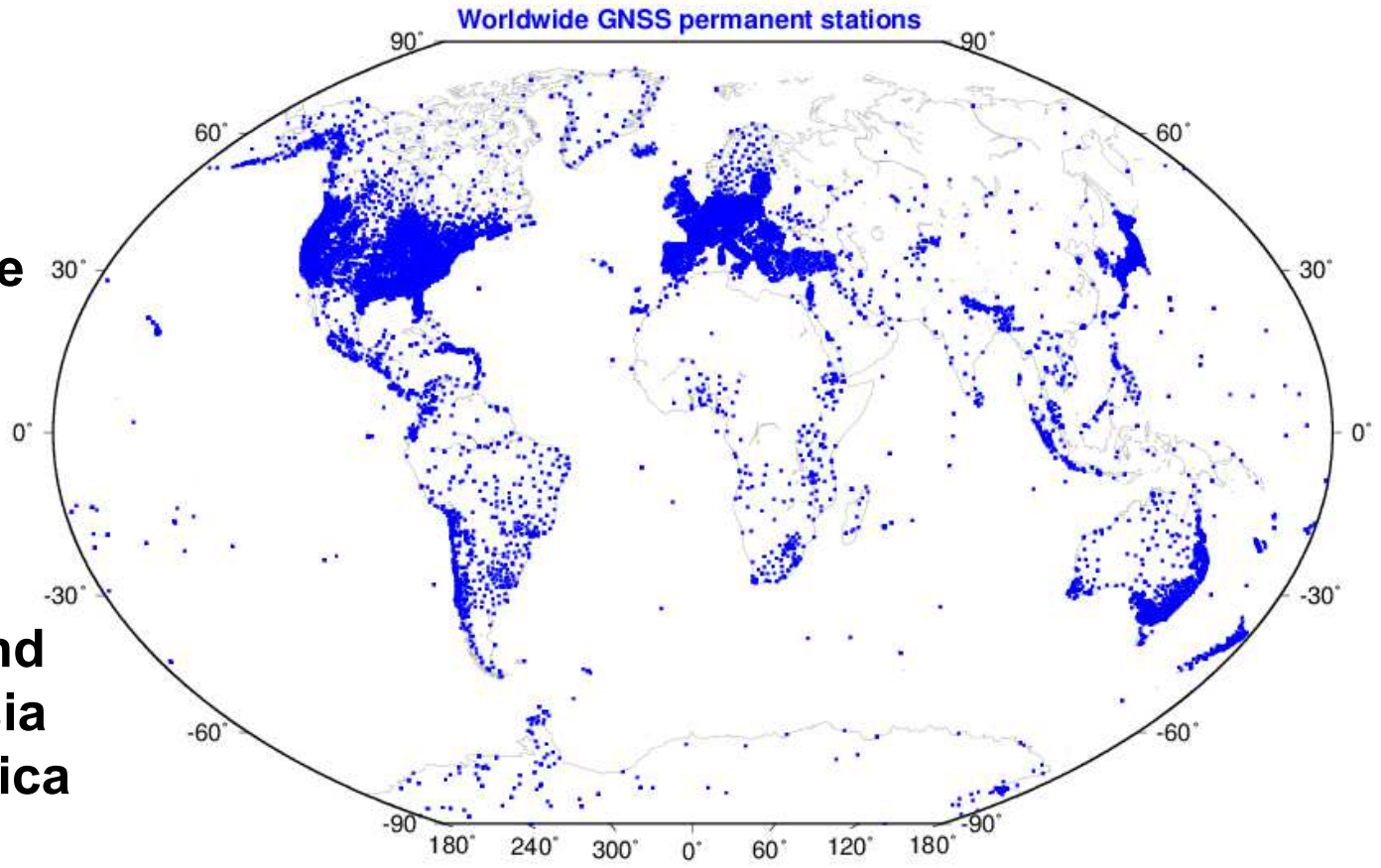
ILRS Network Productivity (All targets)



Access to the ITRF via GNSS

Key messages:

- **Data Sharing: GNSS data freely available to all users around the world**
- **Note Gaps in Africa, East and South East Asia & South America**



Summary

- The UN GA resolution on the GGRF calls for commitments by Member States to improving national geodetic infrastructure as a means to enhance the GGRF

- The current geodetic infrastructure is weak, esp. SLR and VLBI networks that are in danger of degradation over time
- The recent examples of Australia and Norway in enhancing their geodetic infrastructures are concrete examples to follow by other nations

- There are still gaps in GNSS network to provide effective access to the GGRF/ITRF