# Review of the IGS (GNSS) Contribution to the ITRF

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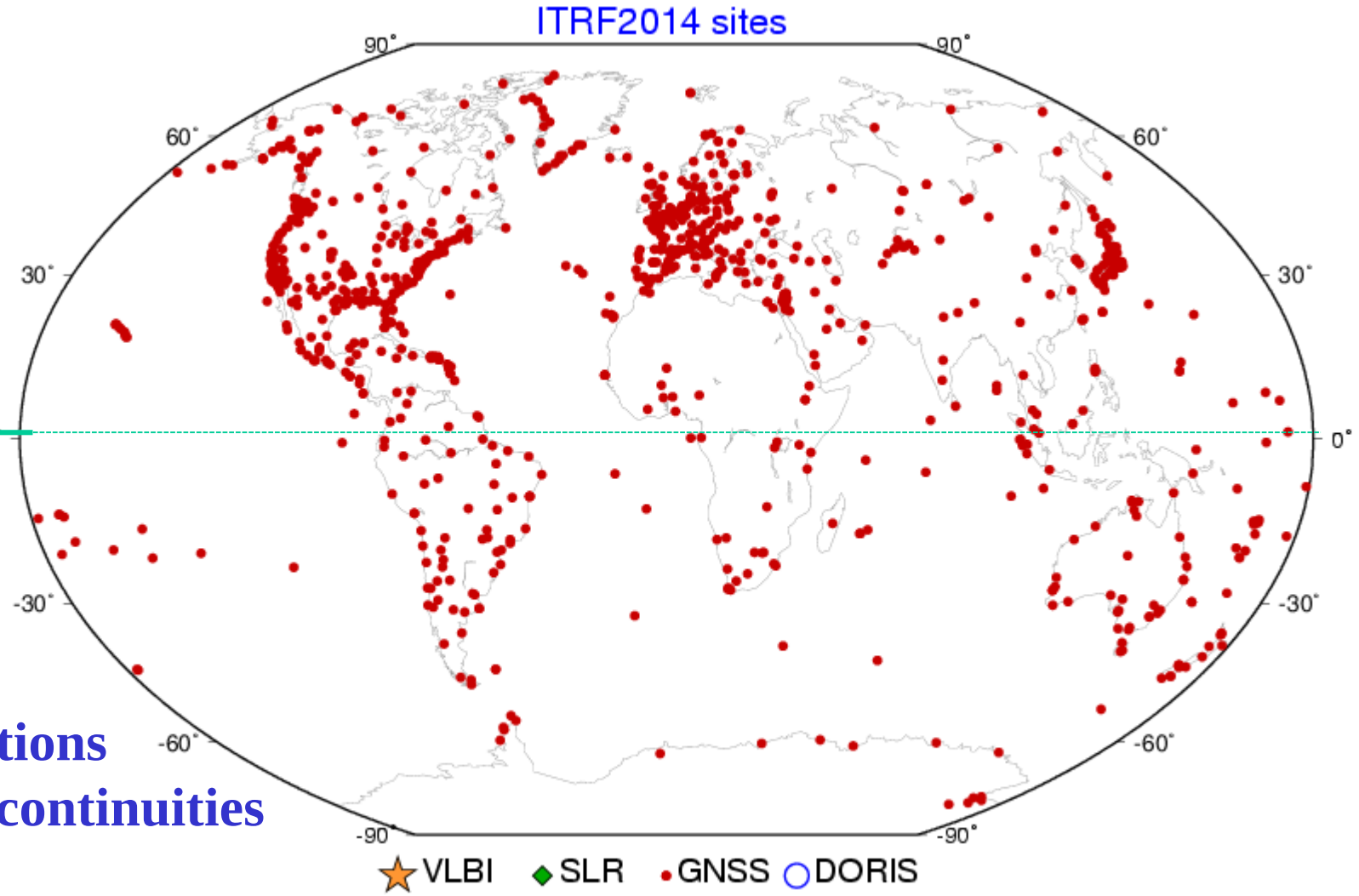
# ITRF2014: Input data

| Service/Technique | Number of Solutions | Time span | # of sites |
|---|---|---|---|
| IGS/GNSS/GPS | 7714 daily | 1994.0 – 2015.1 (21yrs) | 884 |
| IVS/VLBI | 5328 daily | 1980.0 – 2015.0 (35yrs) | 124 |
| ILRS/SLR | 244 fortnightly<br>1147 weekly | 1980.0 – 1993.0<br>1993.0 – 2015.0 (35yrs) | 96 |
| IDS/DORIS | 1140 weekly | 1993.0 – 2015.0 (22yrs) | 71 |

# ITRF2014: GNSS

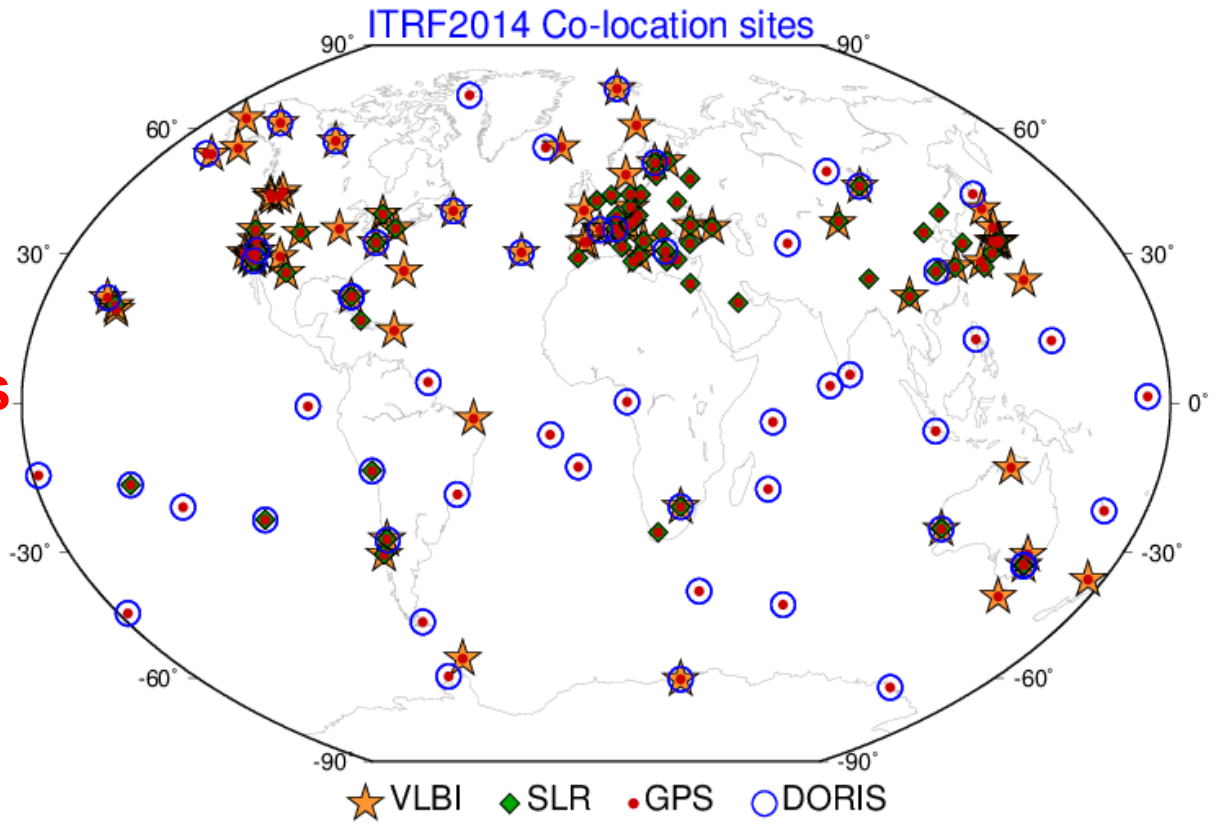



**Site #**
**696**
**188**

**884 sites**
**1054 stations**
**1882 discontinuities**

# ITRF2014 colocation sites

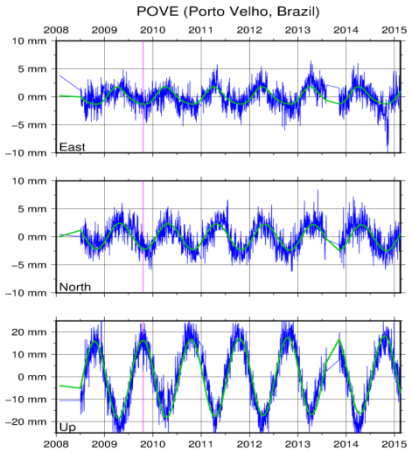
- SLR-VLBI : 11
- SLR-DORIS: 11
- VLBI-DORIS: 12




**# of local tie vectors between GNSS &:**

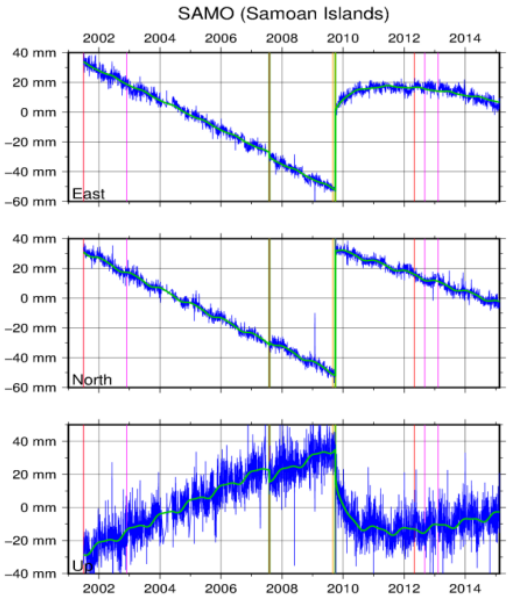
- **DORIS: 103**
- **SLR : 56**
- **VLBI: 62**
- **Total: 221**

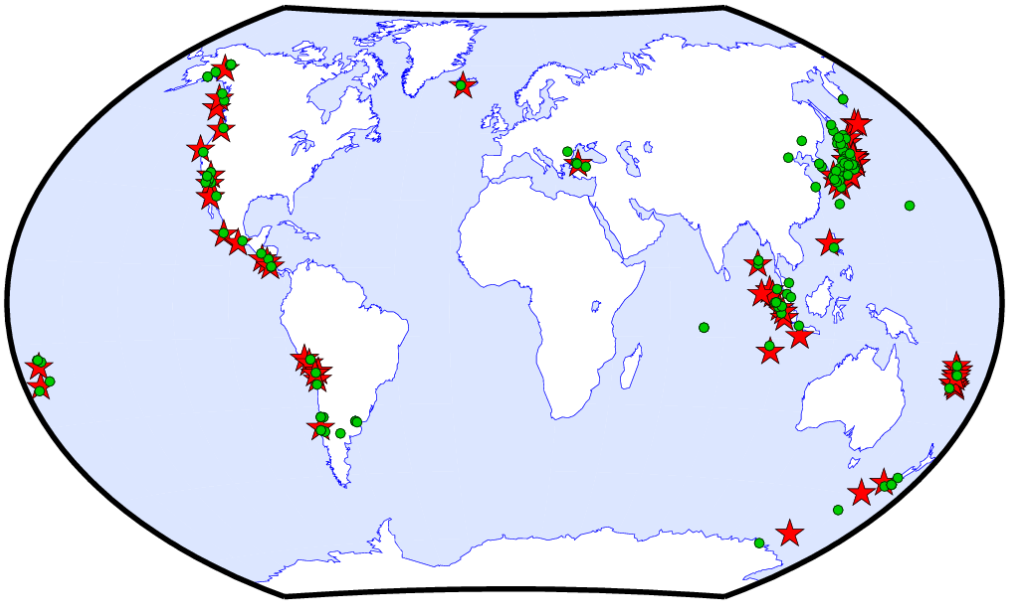
# Modelling nonlinear station motions




- **Position time series of all stations exhibit periodic signals**

- **More than 100 sites are subject to Post-Seismic Deformation due to major earthquakes**



**Red Stars: EQ Epicenters (58)**

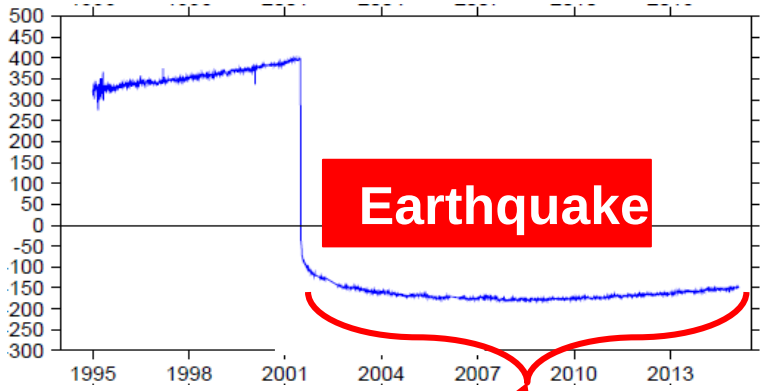
**Green circles: ITRF2014 sites (117)**

**Precisely modelling the above leads to more robust secular frame and site velocities.**

# Post-Seismic Deformations

- **Fitting parametric models using GNSS/GPS data**
  - **at major GNSS/GPS Earthquake sites**
  - **apply these models to the 3 other techniques at colocation EQ sites**

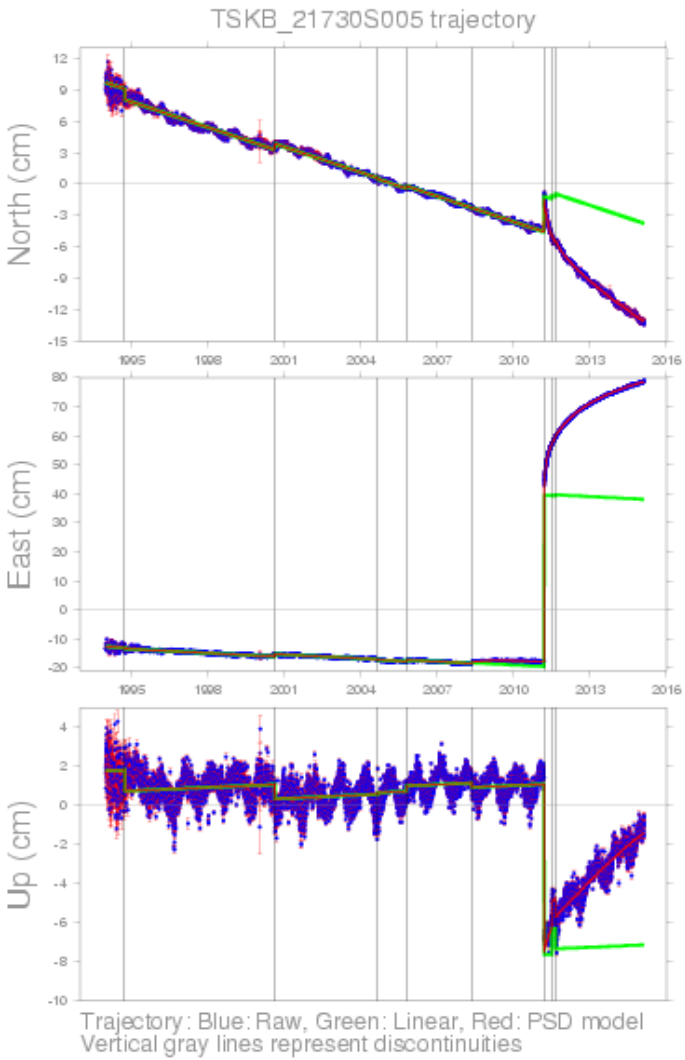
- **Parametric models:**
  - **Logarithmic**
  - **Exponential**
  - **Log + Exp**
  - **Two Exp**



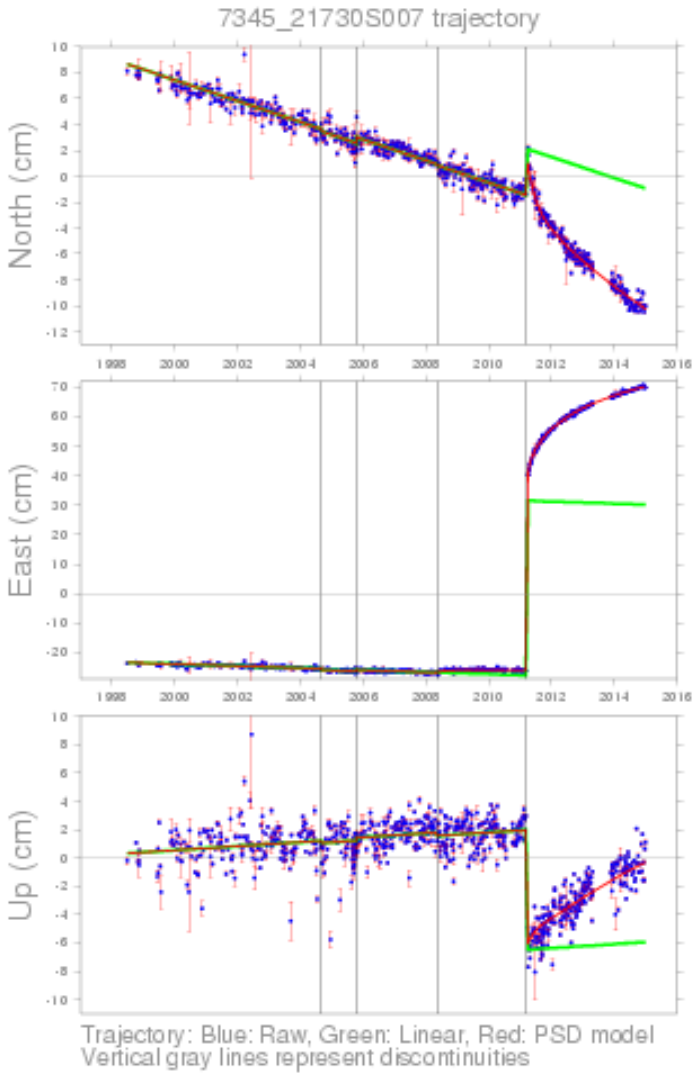

**Post-seismic deformation**

# Tsukuba Trajectory

**GNSS**

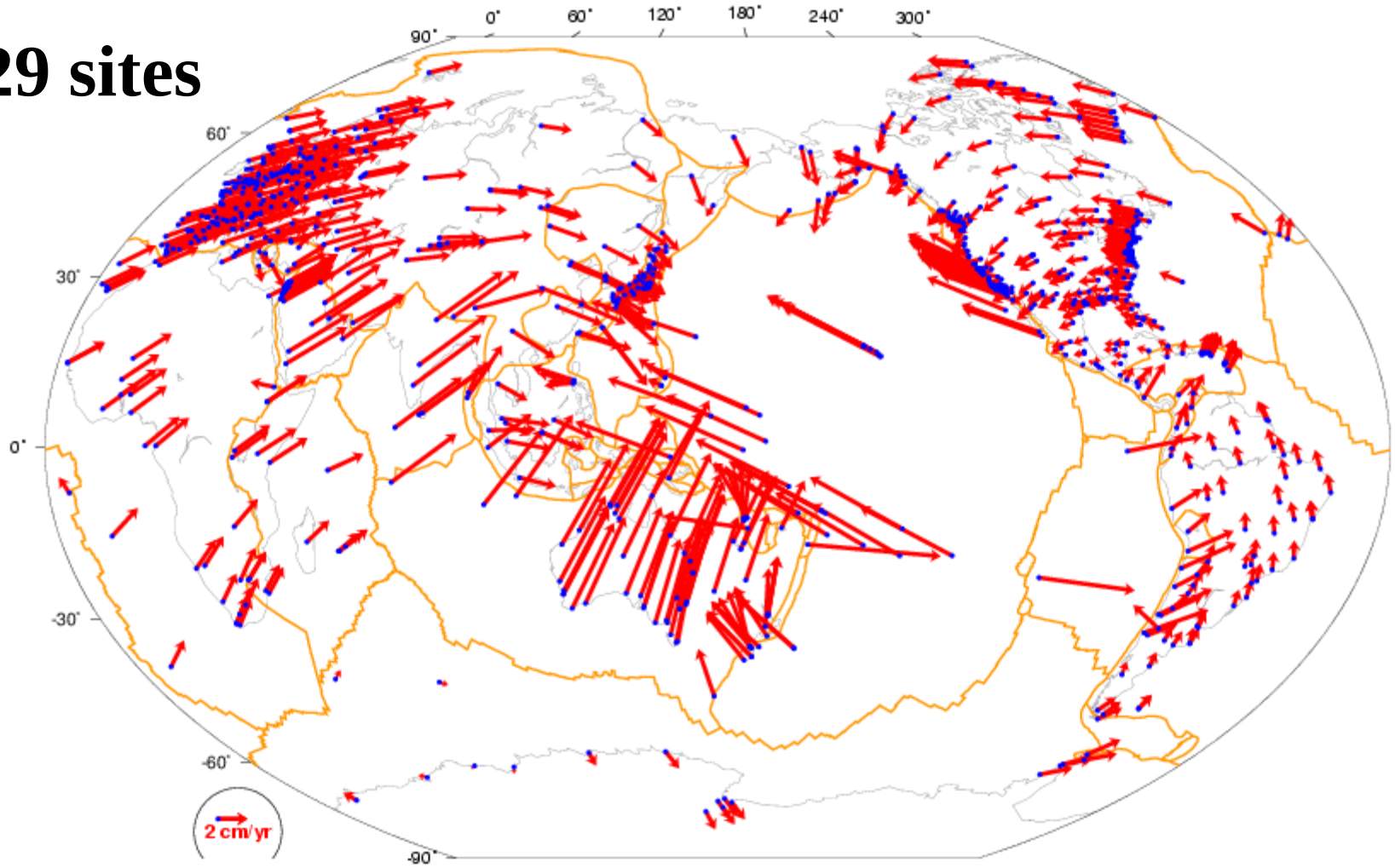



**VLBI**



# ITRF2014: Horizontal velocity field

**829 sites**

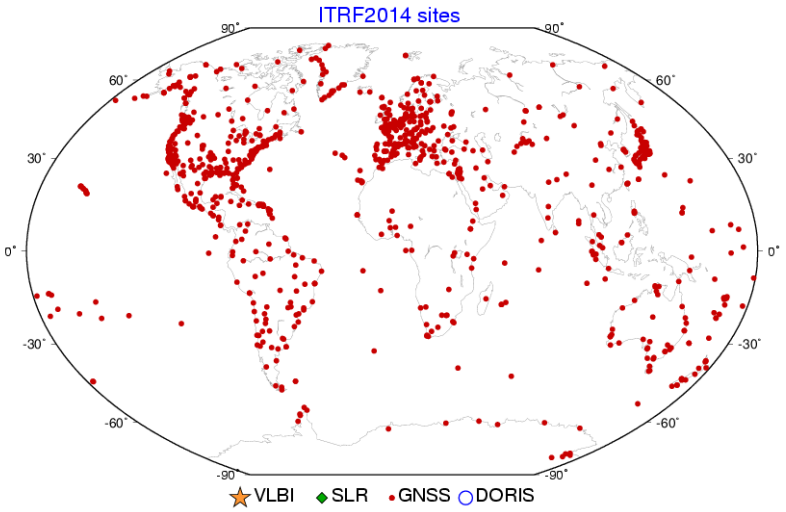


# ITRF access & densification through IGS Products

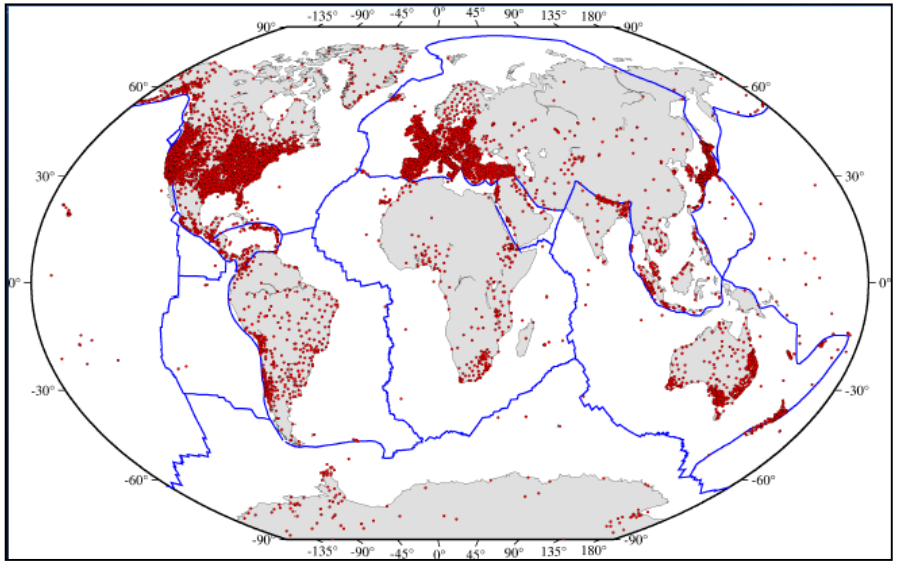
**Some facts**

- **GNSS exponential data explosion**
- **Local, National & Regional GNSS networks**

- **Using IGS Products provides universal access to, and densification of, the ITRF**




**13,400 stations processed by NGL (Blewitt et al., 2015)**



**ITRF2014:**

- **884 GNSS Sites**
- **Facilitates the alignment of the GNSS-based frames to the ITRF**

**More than 80% of National RFs are aligned to the ITRF (source: UN-GGIM GGRF questionnaire)**

# Concluding Remarks

**The fundamental contribution of the IGS/GNSS is to:**

1. **Reinforce the ITRF frame definition (origin, scale & orientation)**
2. **Determine ITRF2014 Post-Seismic Deformation Models**
3. **Determine ITRF2014 Plate Motion Model**
4. **Determine ITRF Polar Motion**
5. **Allow ITRF Access & Densification**