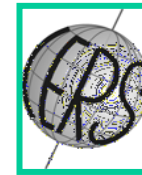


ITRF2008



Zuheir Altamimi
IGN, France



Technique contributions

- **IVS: (1980.0 – 2009.0) : Full EOP set (91 sites)**
- **IGS: (1997.0 – 2009.5) : PM, PMrate, LOD (492 sites)**
- **ILRS: (1983.0 – 2009.0) : PM, LOD (89 sites)**
- **IDS: (1993.0 – 2009.0) : PM, LOD (67 sites)**

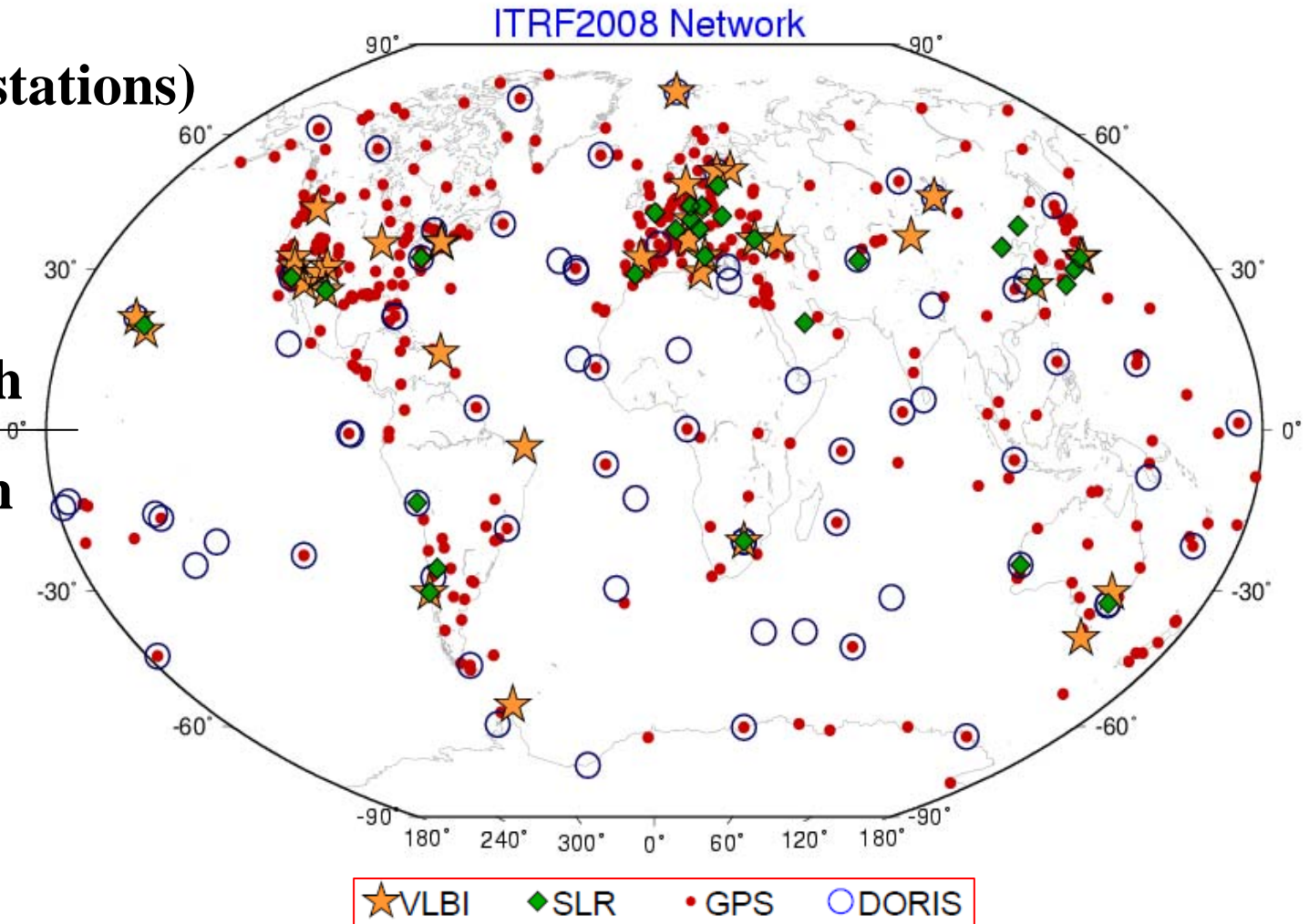
- **New local ties since ITRF2005:**
 - **Tahiti : GPS SLR DORIS**
 - **Tsukuba: GPS VLBI**
 - **Herstmonceaux: GPS SLR**
 - **Medicina & Noto : GPS VLBI**
 - **Greenbelt: VLBI SLR GPS DORIS**
 - **Maui/Haleakala**
 - **San Fernando : GPS SLR**

ITRF2008 Network

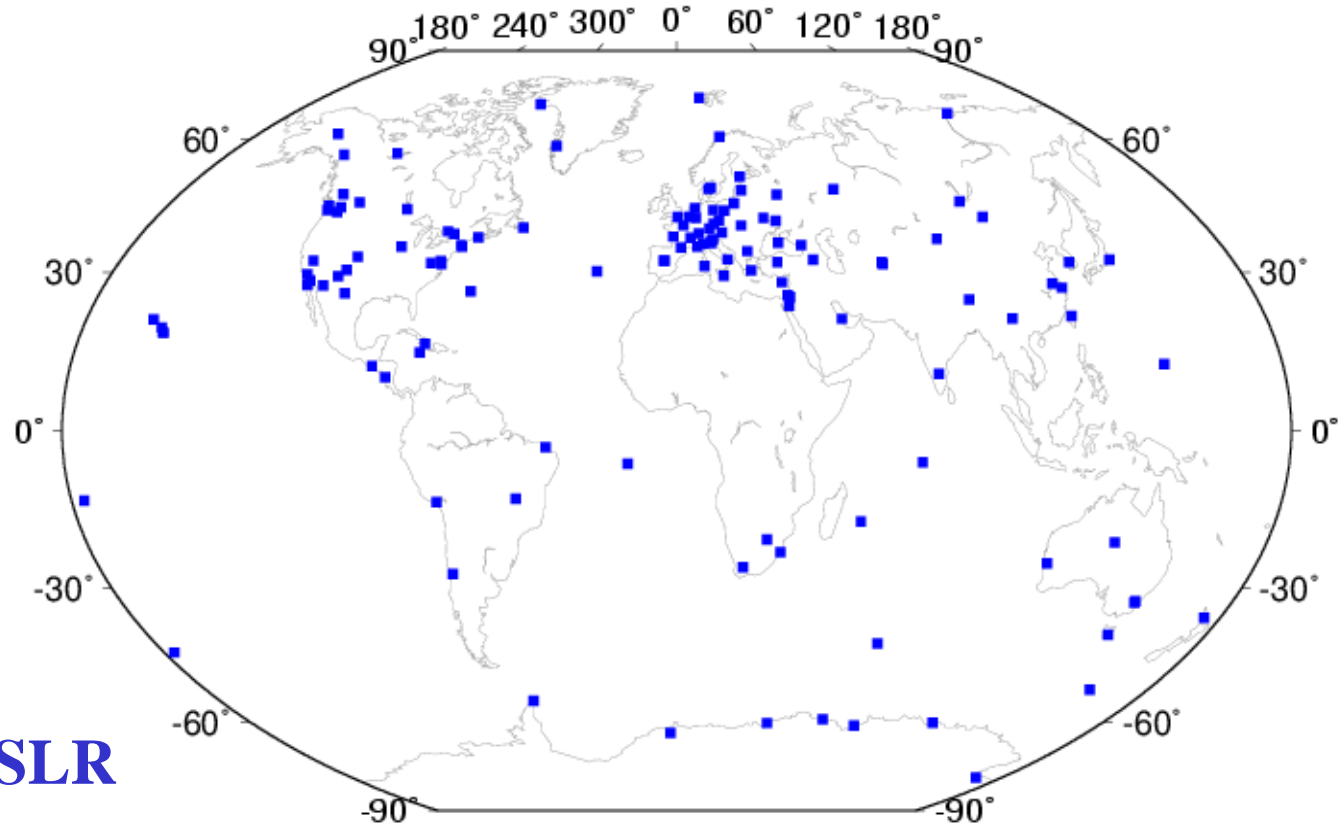
579 sites (920 stations)

461 Sites North

118 Sites South



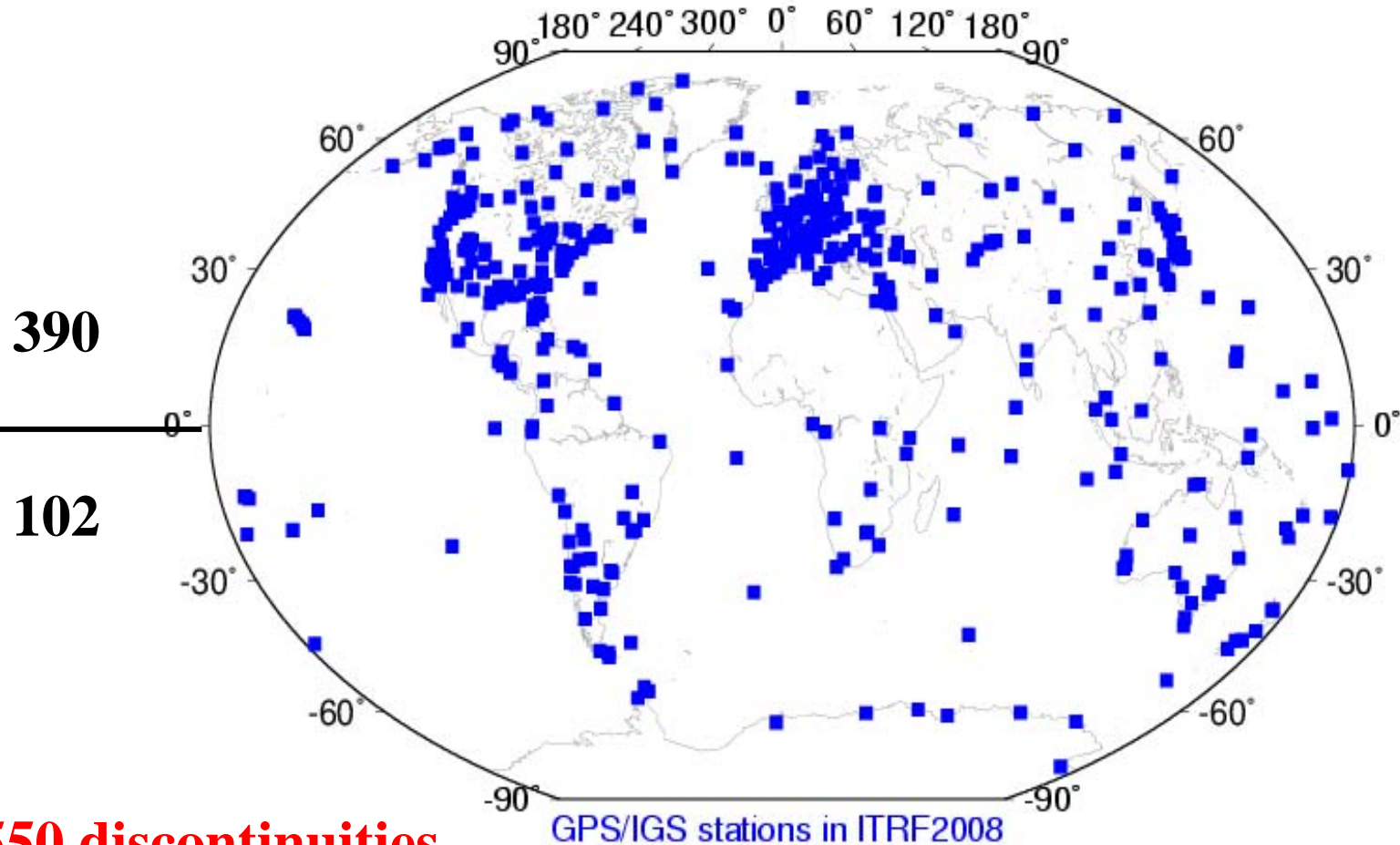
ITRF2008 Datum Specification



- **Origin:** SLR
 - **Scale :** Mean of SLR & VLBI
 - **Orientation:** Aligned to ITRF2005
- using 179 stations located at 131 sites:

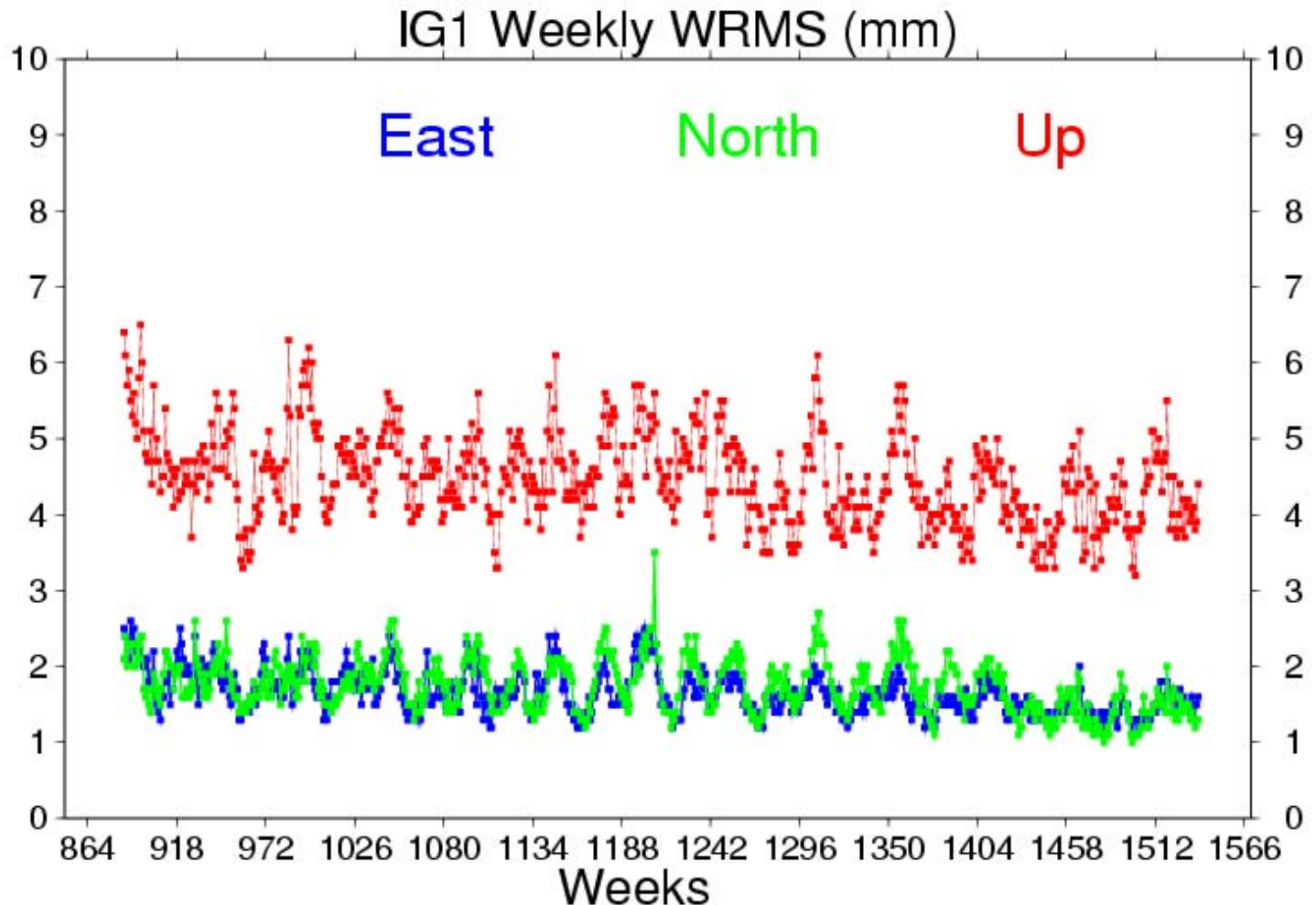
104 at northern hemisphere and 27 at southern hemisphere

ITRF2008: GPS/IGS Site distribution

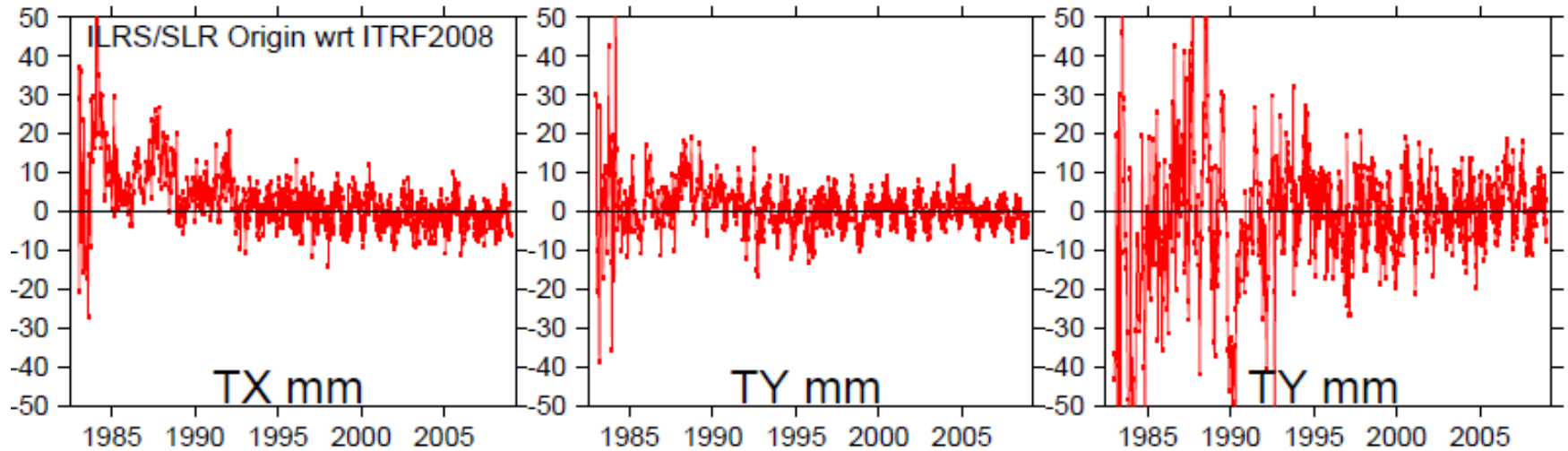


550 discontinuities

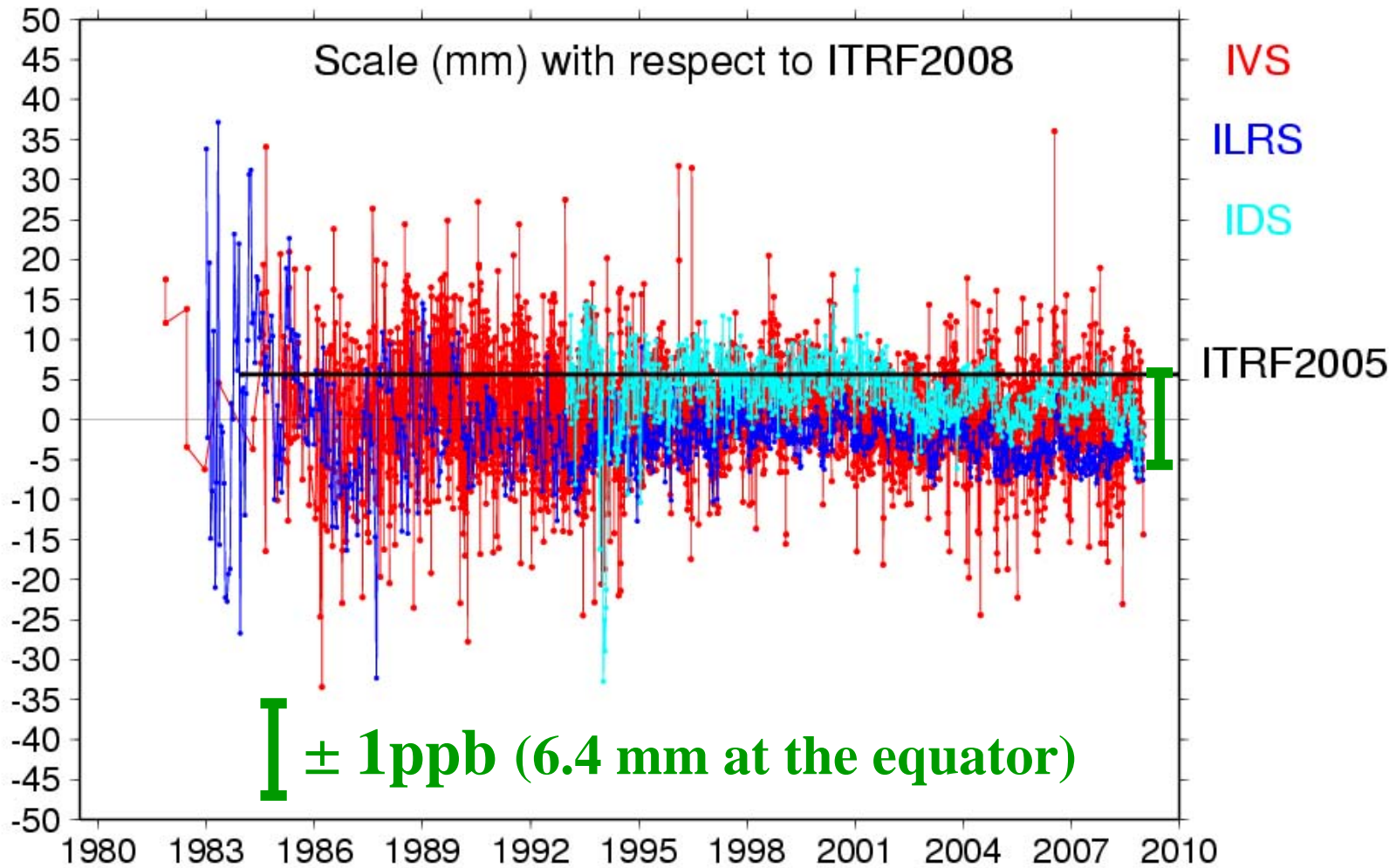
IG1 internal precision (1997.0 - 2009.5)



SLR-ILRSA Origin wrt ITRF2008



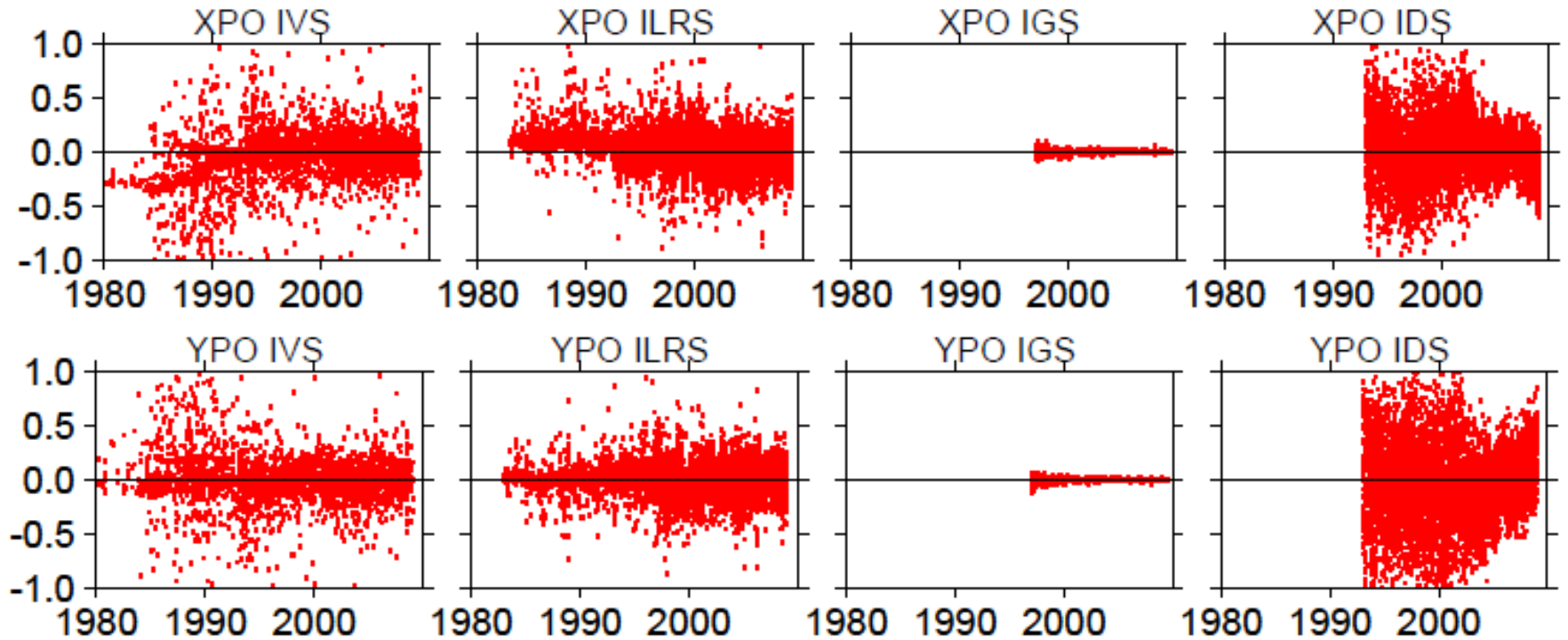
ITRF2008 Scale: mean of VLBI and SLR



Scale FORMAL errors (1σ) via ties to GPS

	Scale ppb	Scale rate ppb/yr
VLBI	± 0.10	± 0.01
SLR	± 0.12	± 0.01
DORIS	± 0.20	± 0.03

ITRF2008 PM residuals



WRMS in μas

	X-pole	Y-pole
GPS	10	10
DORIS	239	353

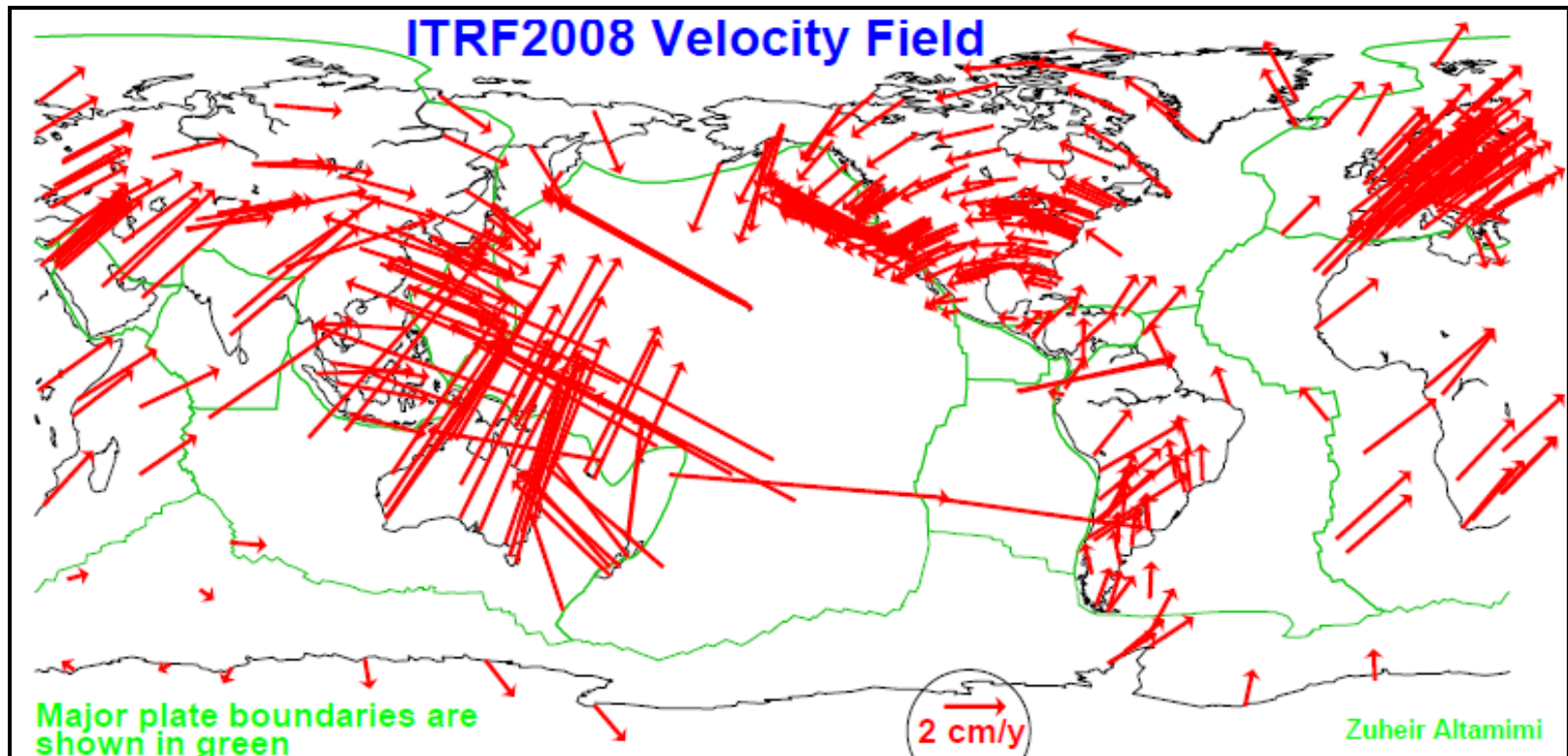
	X-pole	Y-pole
VLBI	142	120
SLR	144	128

Transformation Param Fm ITRF2008 To ITRF2005

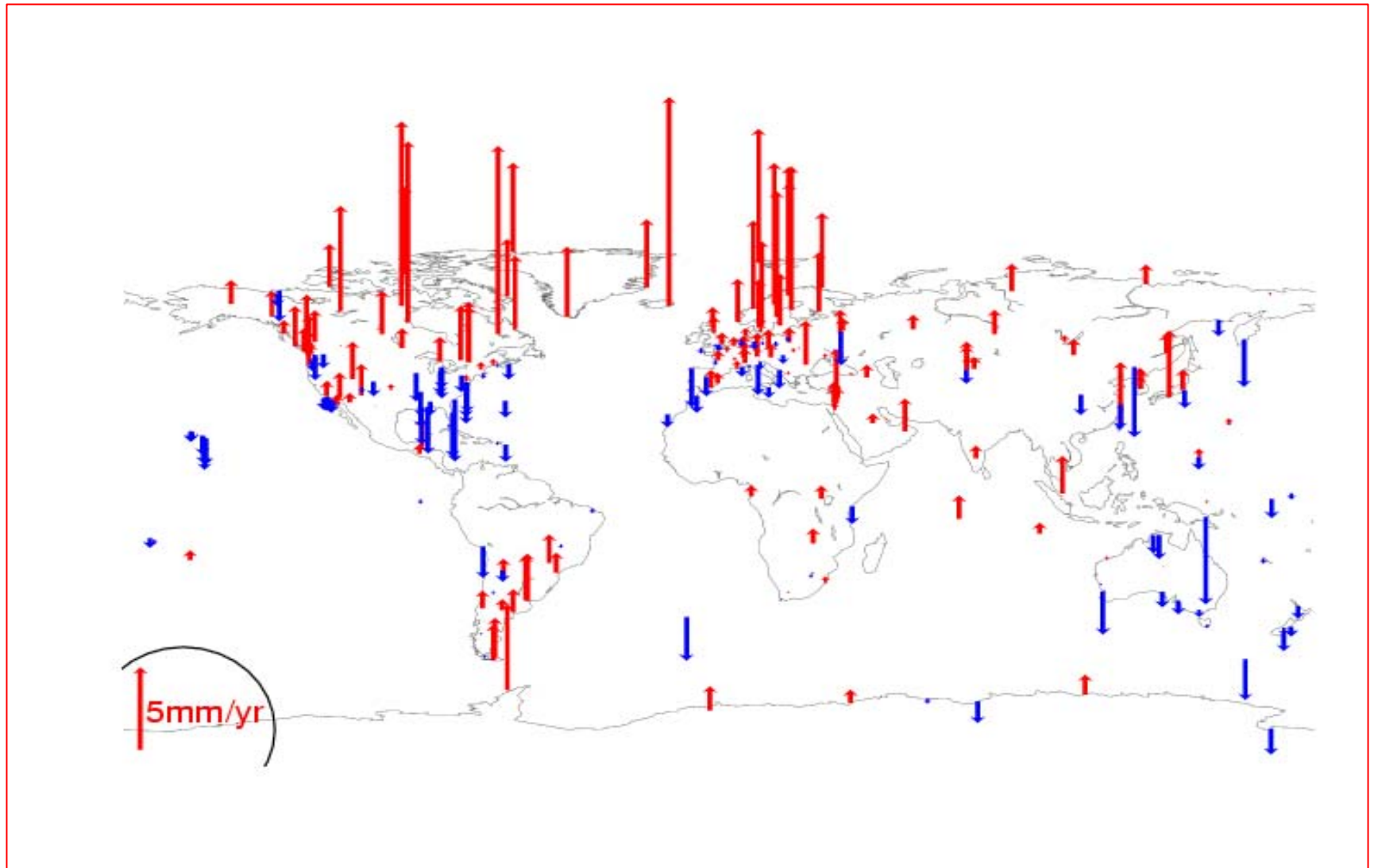
Tx mm	Ty mm	Tz mm	Scale ppb	At epoch 2005.0
-0.5 ± 0.2	-0.9 ± 0.2	-4.7 ± 0.2	0.94 ± 0.03	

Tx rate mm/yr	Ty rate mm/yr	Tz rate mm/yr	Scale rate ppb/yr
0.3 ± 0.2	0.0 ± 0.2	0.0 ± 0.2	0.00 ± 0.03

ITRF2008 Horizontal Velocity Field



ITRF2008 Vertical Velocity Field



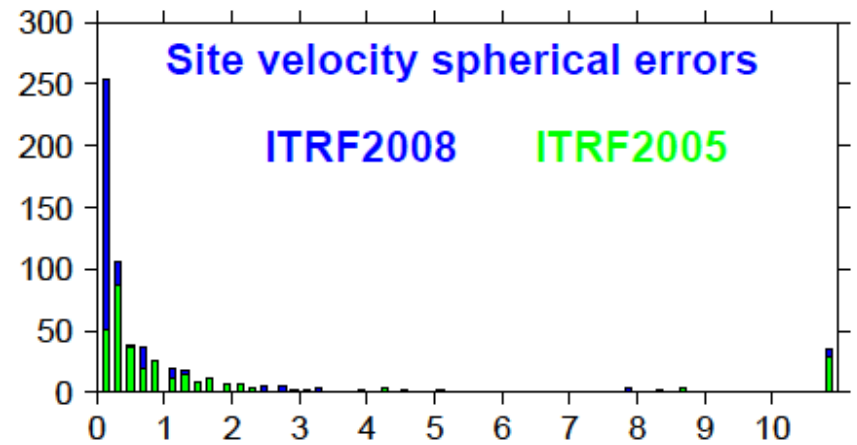
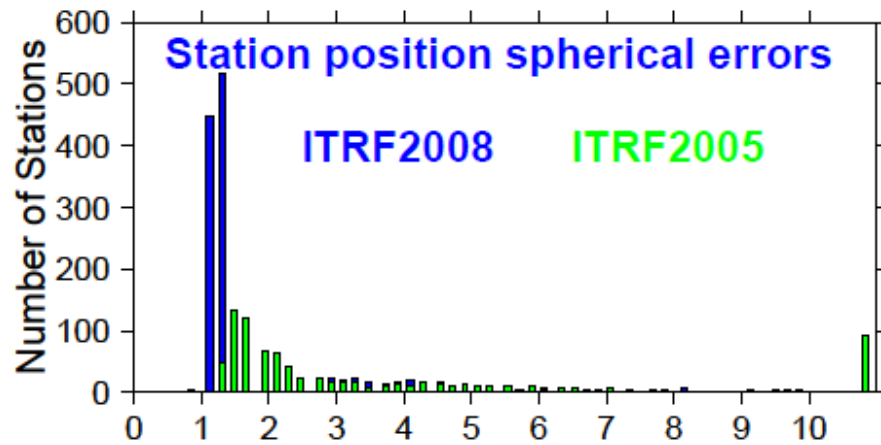
Accuracy of ITRF2008 Origin

- **Defined by SLR only**
- **Agreement with ITRF2005**
 - **4.7 mm in Z-translation at epoch 2005**
 - **0.3 mm/yr drift in X-translation**
- **==> “Accuracy”: 1 cm over the time-span of SLR observations**

Accuracy of ITRF2008 Scale

- **Defined by the average of VLBI and SLR**
- **Difference btw the two technique solutions:**
 - 1.05 ppb at epoch 2005.0
 - 0.049 ppb/yr
- **==> “Accuracy”: 1.2 ppb (8 mm) over the common time-span of VLBI and SLR observations**

ITRF2008 precision gain

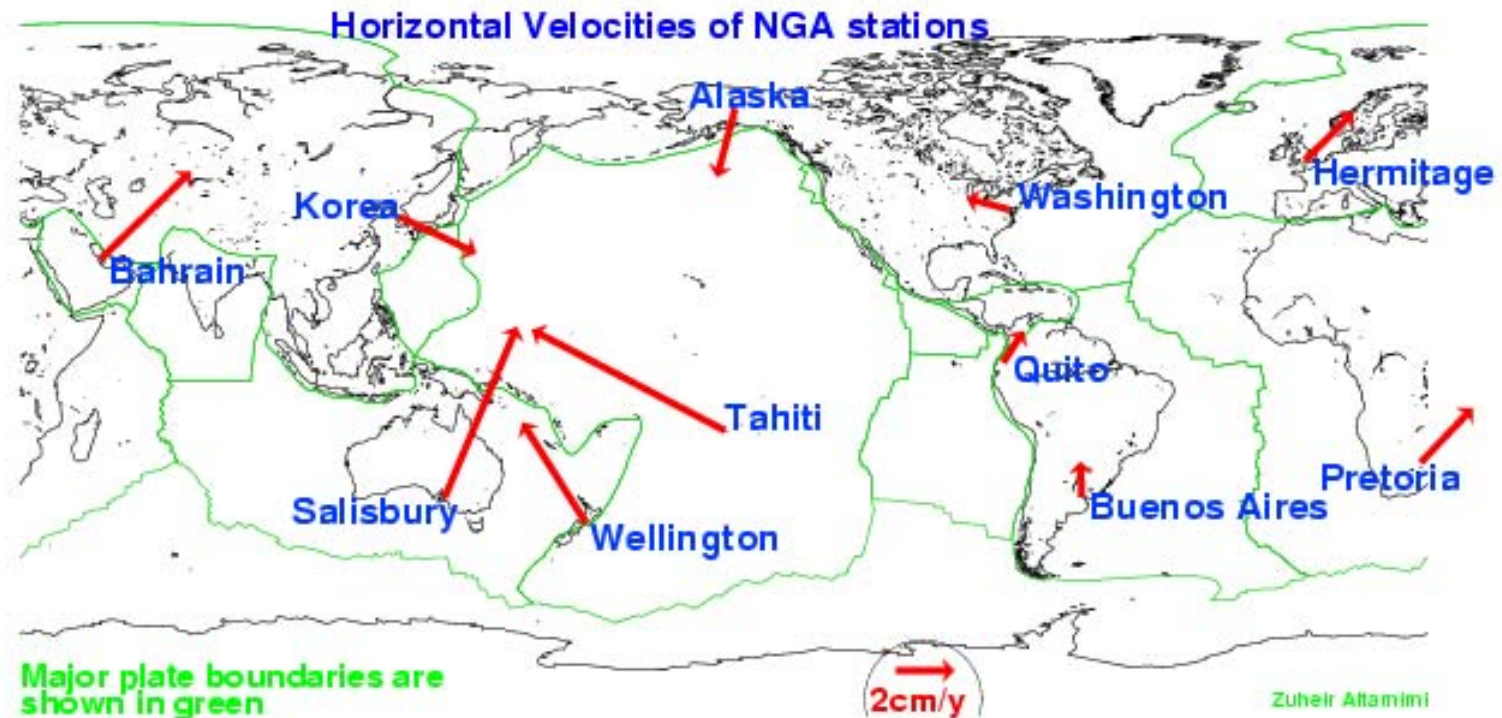


Uncertainties of the Transfer of SLR origin and SLR&VLBI mean scale to GPS frame

TX mm	TY mm	TZ mm	Scale mm
0.6	0.5	0.6	0.6

WGS84 - NGA Stations in ITRF2008

NGA: National Geospatial-Intelligence Agency



$$X(t) = X(t_0) + \dot{X}(t - t_0)$$

Conclusions

- **ITRF2008 is an improved solution, compared to ITRF2005**
- **Accuracy of ITRF2008 origin&scale: ~ 1 cm**
- **Future Improvement: Technique-specific systematic errors to be mitigated**
 - GPS uncalibrated radome
 - VLBI antenna gravitational deformations
 - SLR range/timing biases
 - DORIS beacon reference point behavior ?