ITRF2008 and the IGS Contribution

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IGS contribution to ITRF is fundamental

- **Links the three other techniques together**

  ==>Any GPS bias in co-location sites might impact the ITRF quality and its defining parameters (scale & origin)

- **IGS polar motion dominates combination & helps tie technique frames together**

- **Allows access to and densification of the ITRF**
  - **Regional/national access to ITRF**
  - **Contribute to GNSS interoperability**
    - **Initial GTRF is aligned to ITRF via IGS network/products**
    - **11 NGA/WGS84 stations are included in the ITRF2008**
    - **GLONASS, COMPASS, etc. (?)**

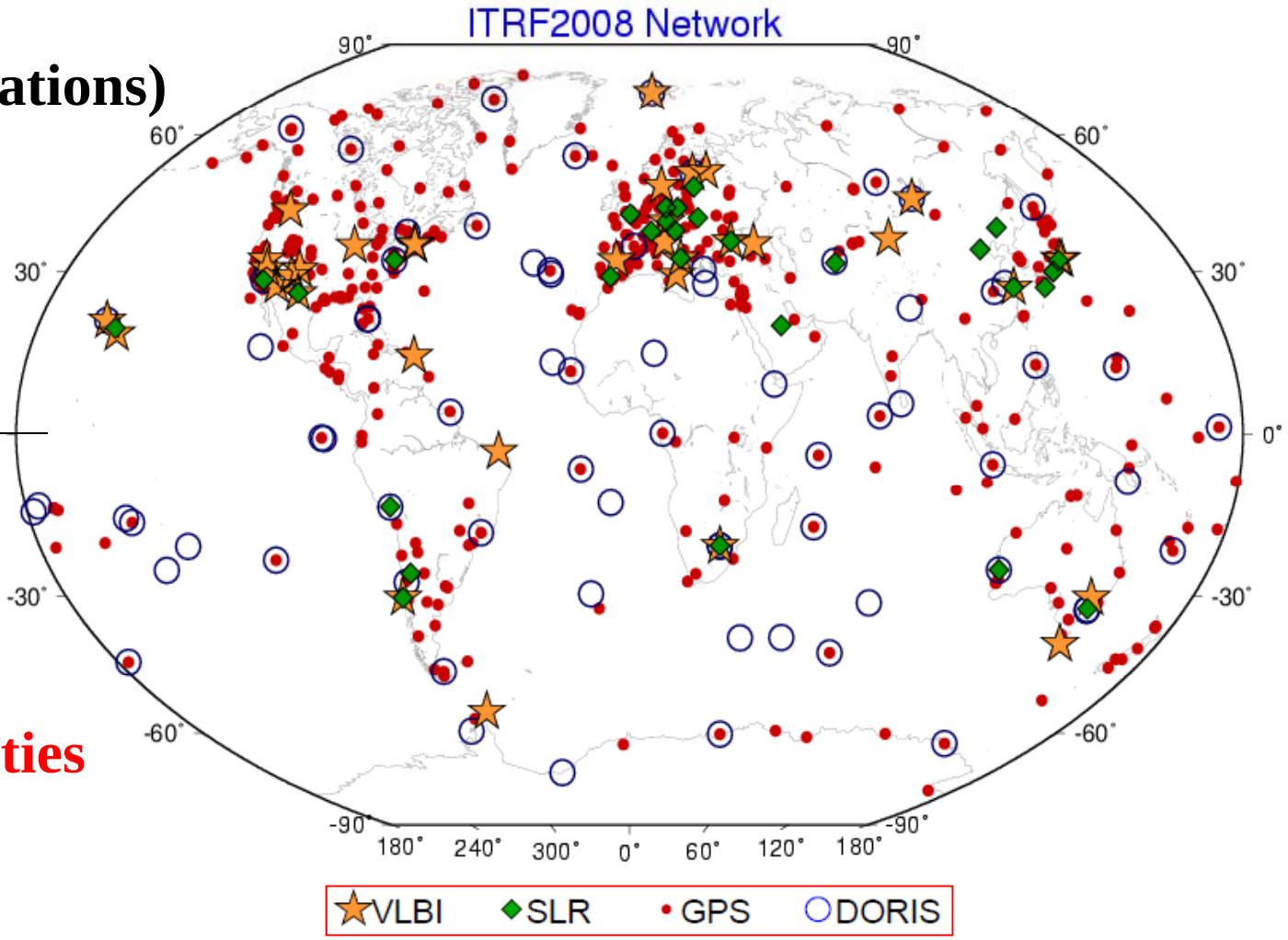
ITRF2008 Network

580 sites (934 stations)

463 Sites North

117 Sites South

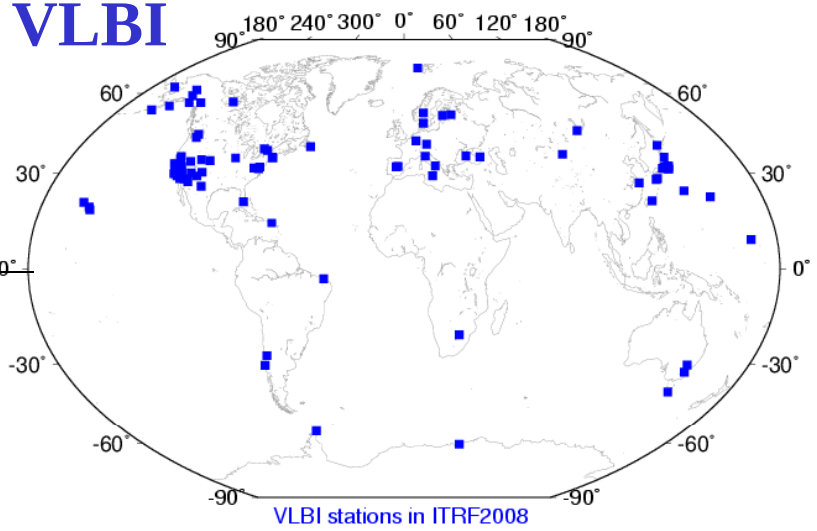
638 discontinuities



ITRF2008: Site distribution per technique

VLBI

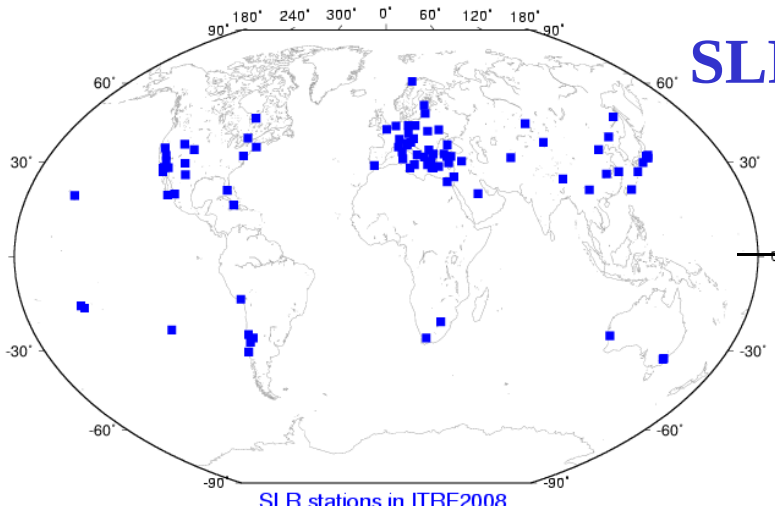
84 / 9



VLBI stations in ITRF2008

SLR

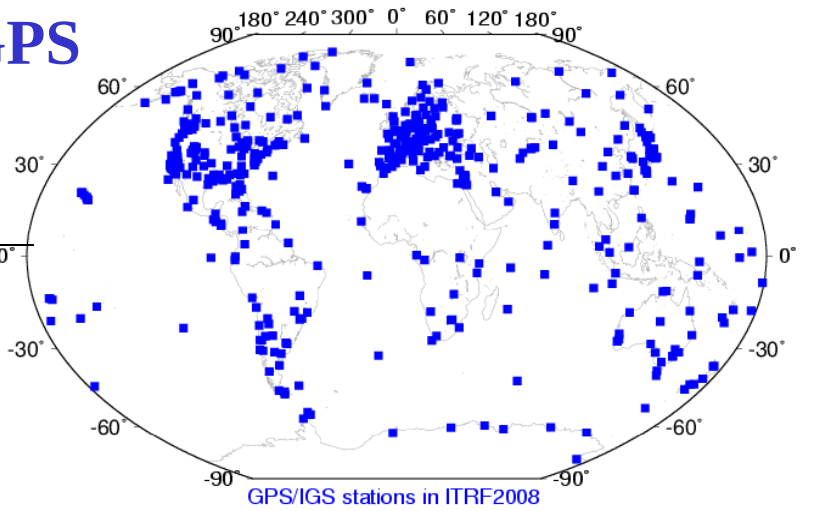
76 / 13



SLR stations in ITRF2008

GPS

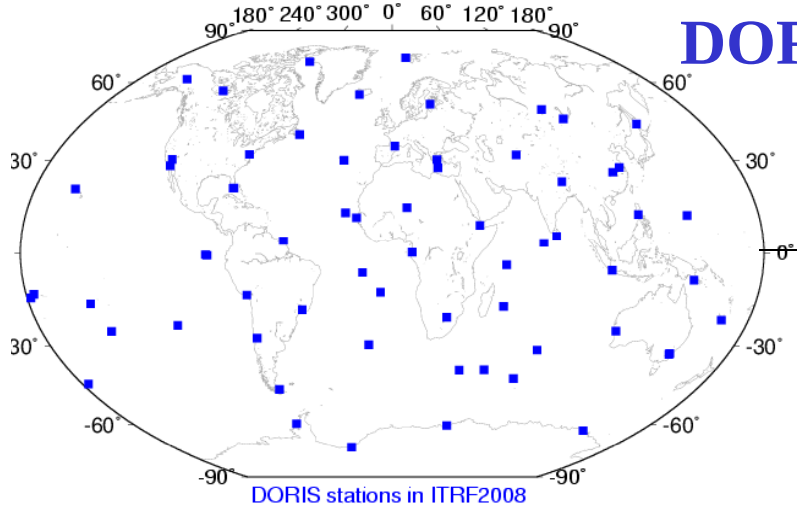
390 / 102



GPS/IGS stations in ITRF2008

DORIS

34 / 32

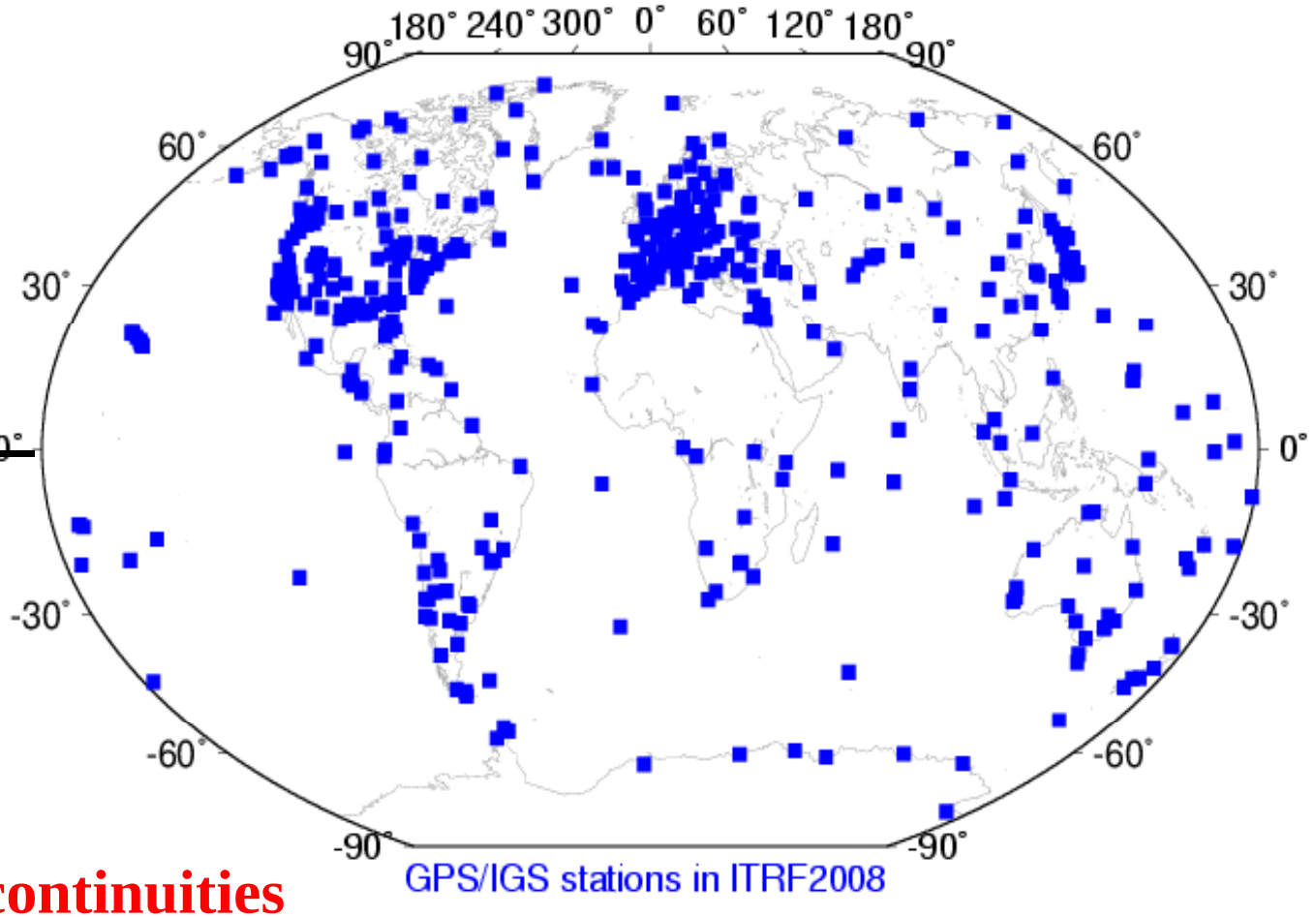


DORIS stations in ITRF2008

ITRF2008: GPS/IGS Site distribution

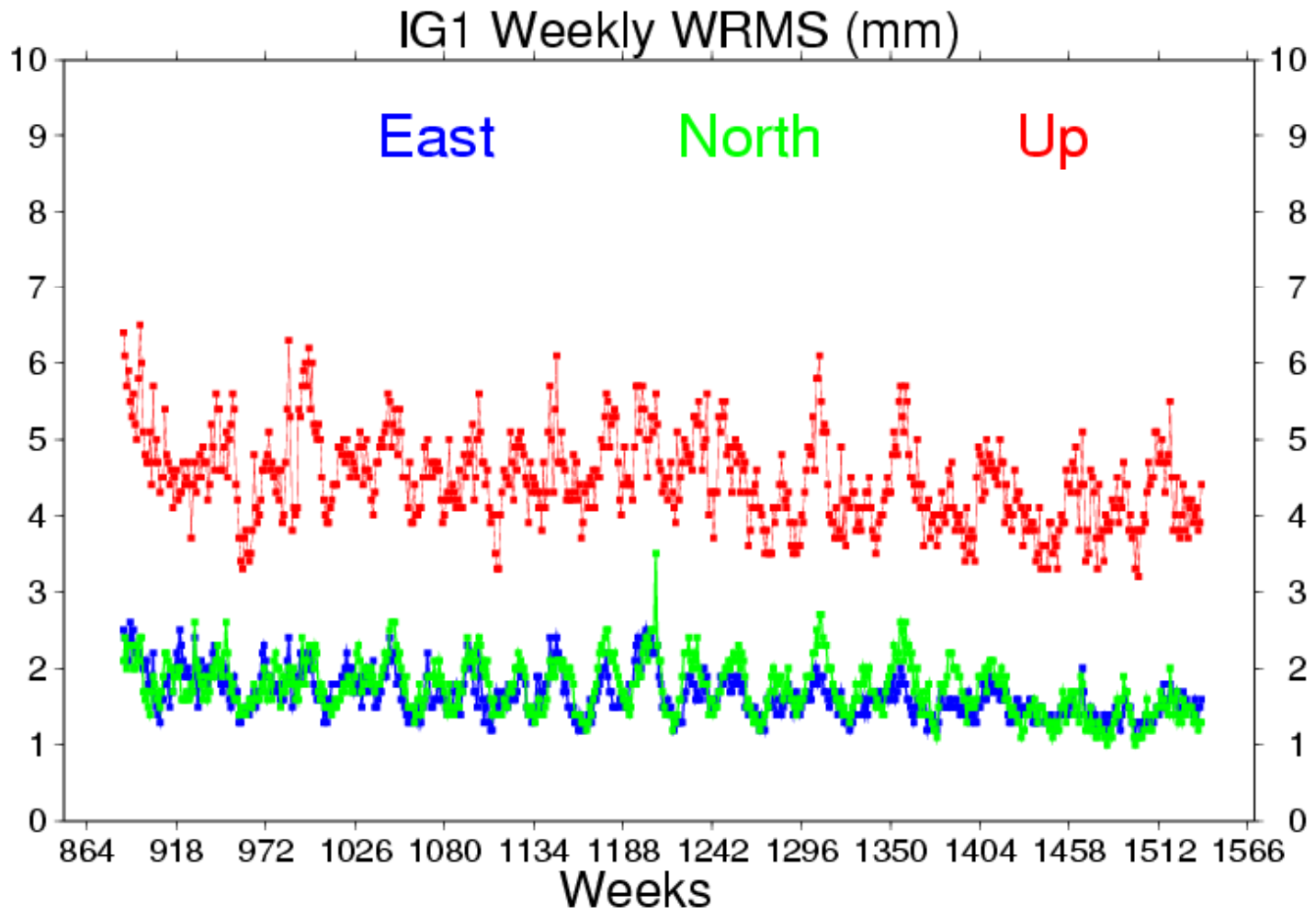
390

102



550 discontinuities

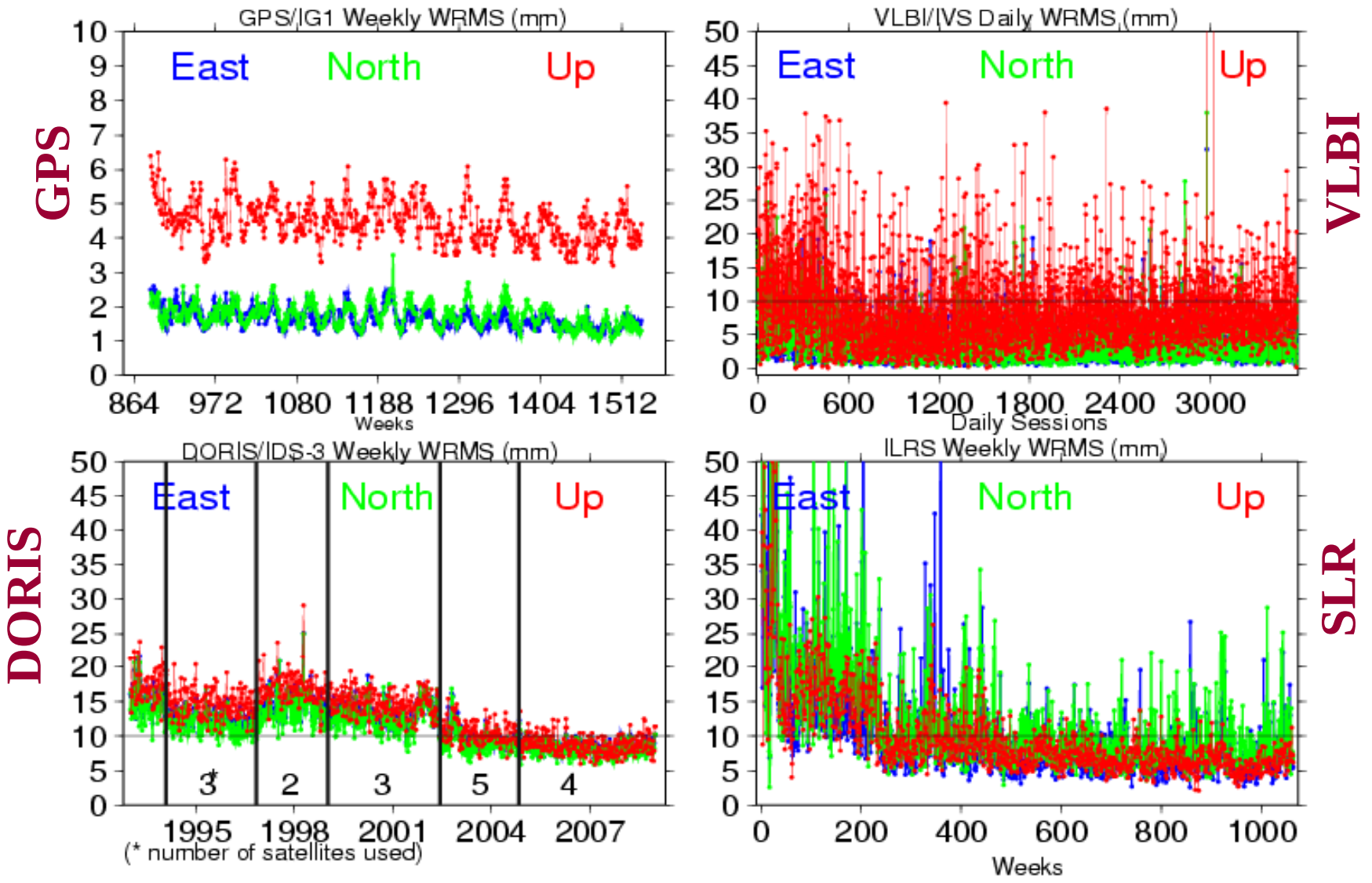
IG1 internal precision (1997.0 - 2009.5)



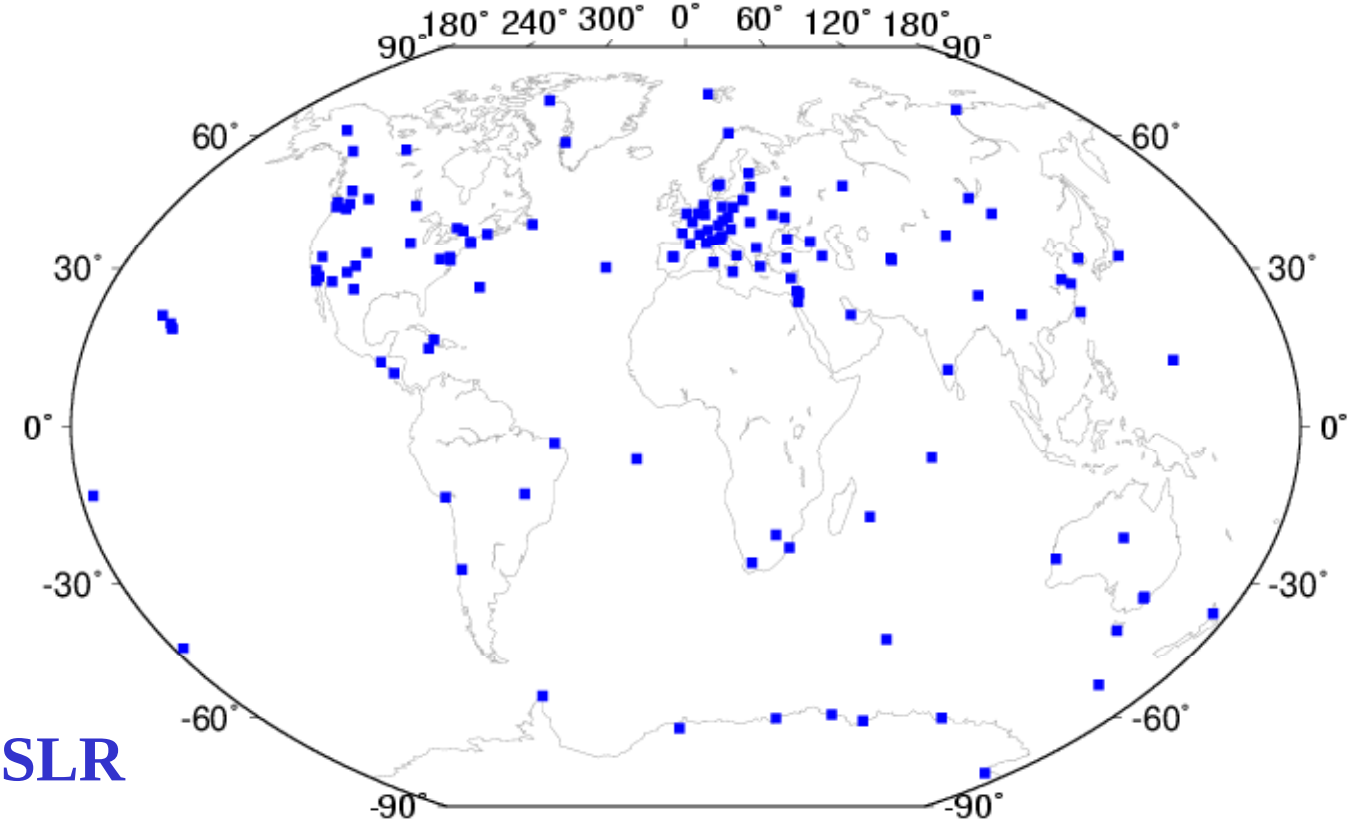
IG1 weekly WRMS: Amplitudes and Phases

	Annual Amplitude mm	Phase (degrees)
North	0.21	156.9
East	0.17	156.9
Up	0.50	156.9

Technique Internal Precision



ITRF2008 Datum Specification

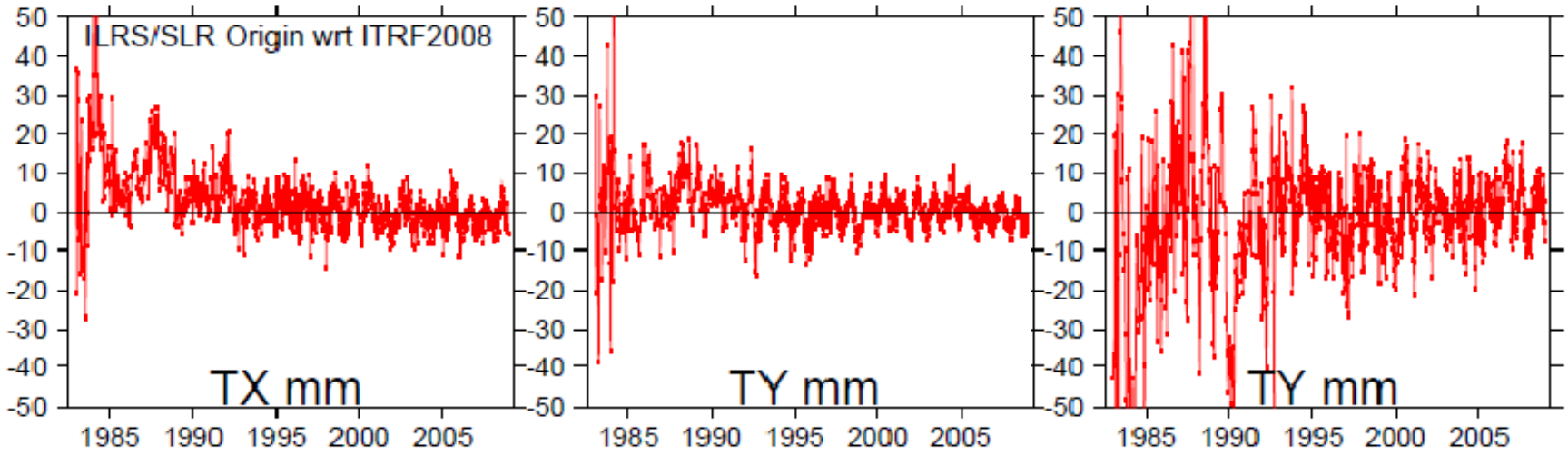


- **Origin: SLR**
- **Scale : Mean of SLR &VLBI**
- **Orientation: Aligned to ITRF2005**

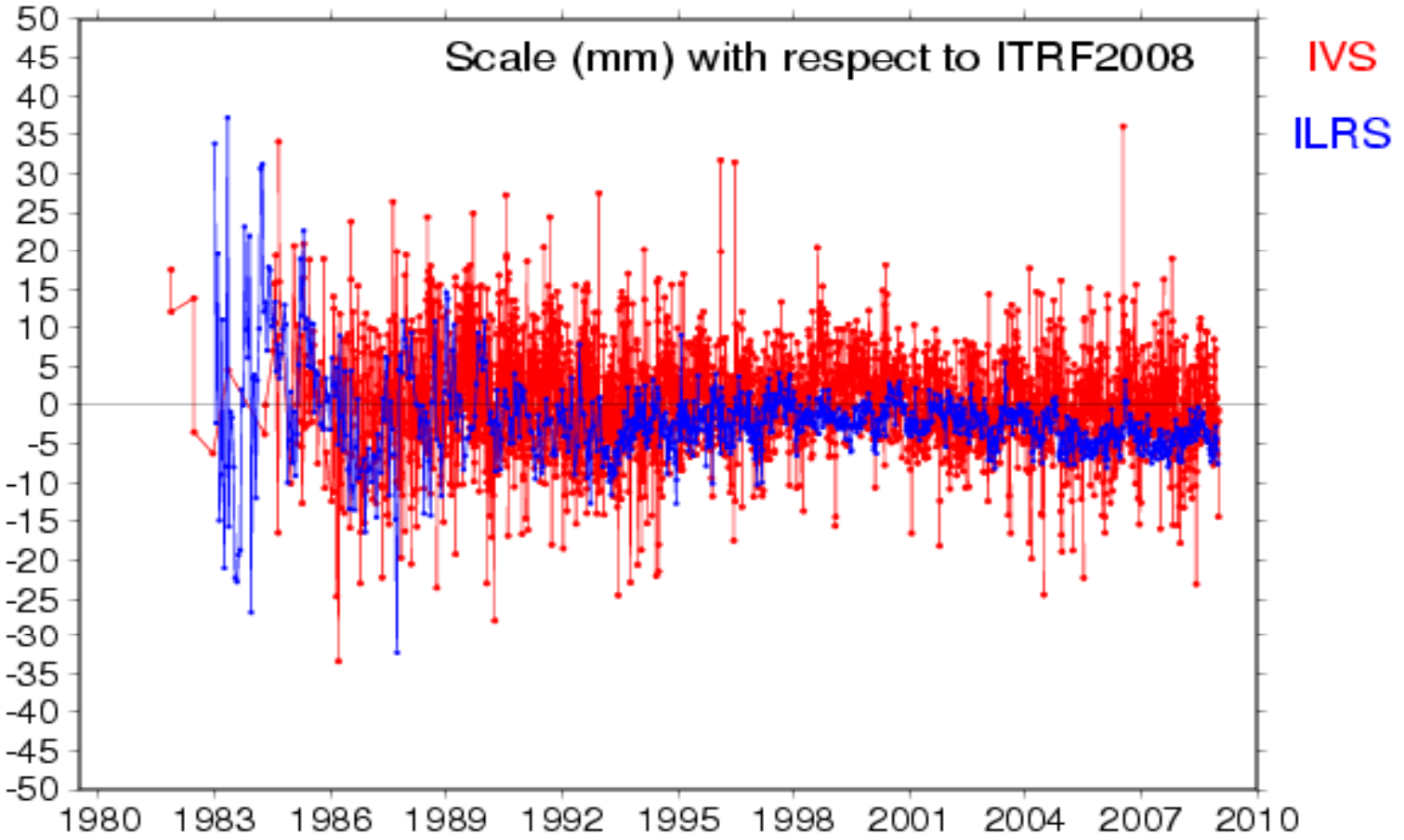
using 179 stations located at 131 sites:

104 at northern hemisphere and 27 at southern hemisphere

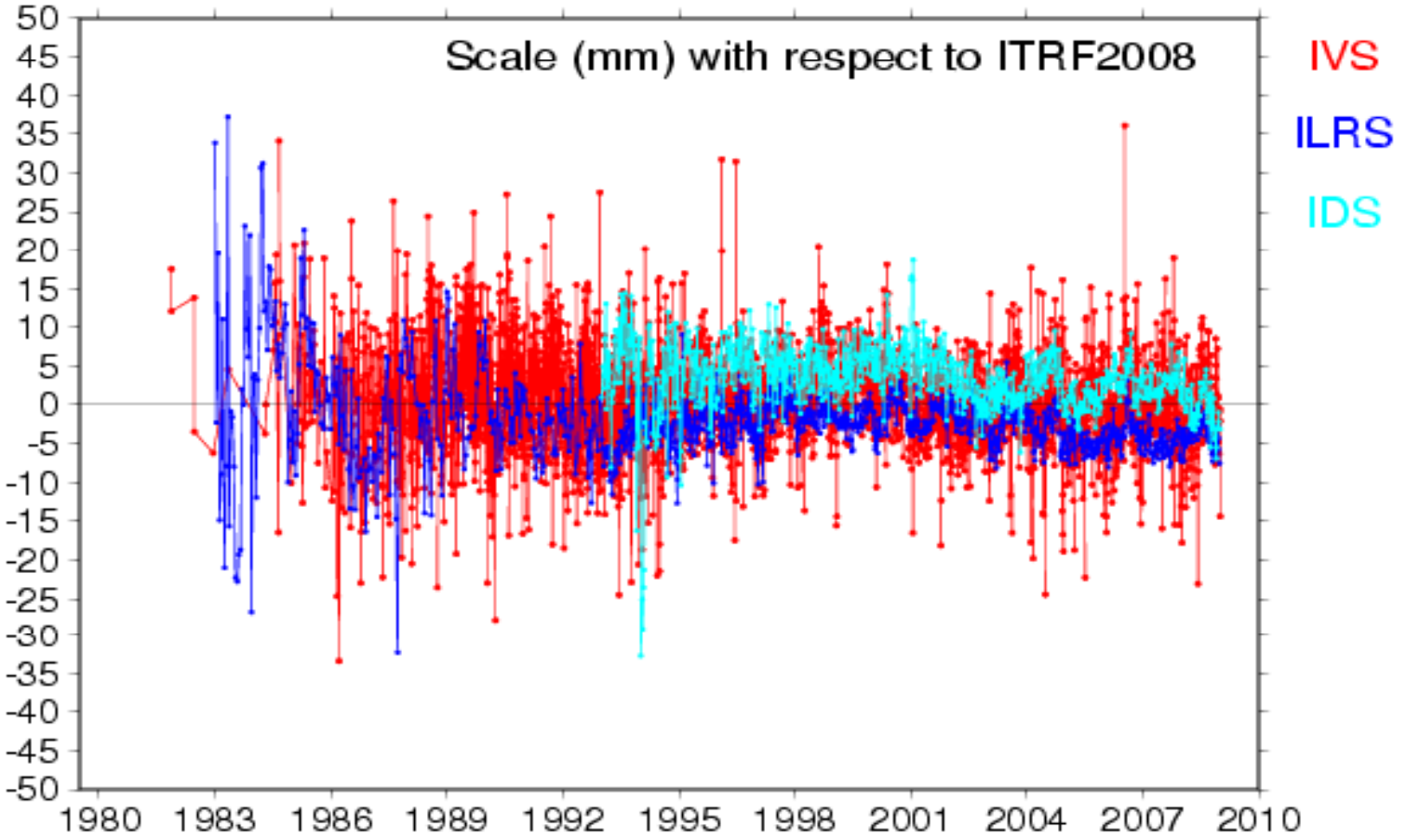
SLR/ILRSA24 Origin wrt ITRF2008



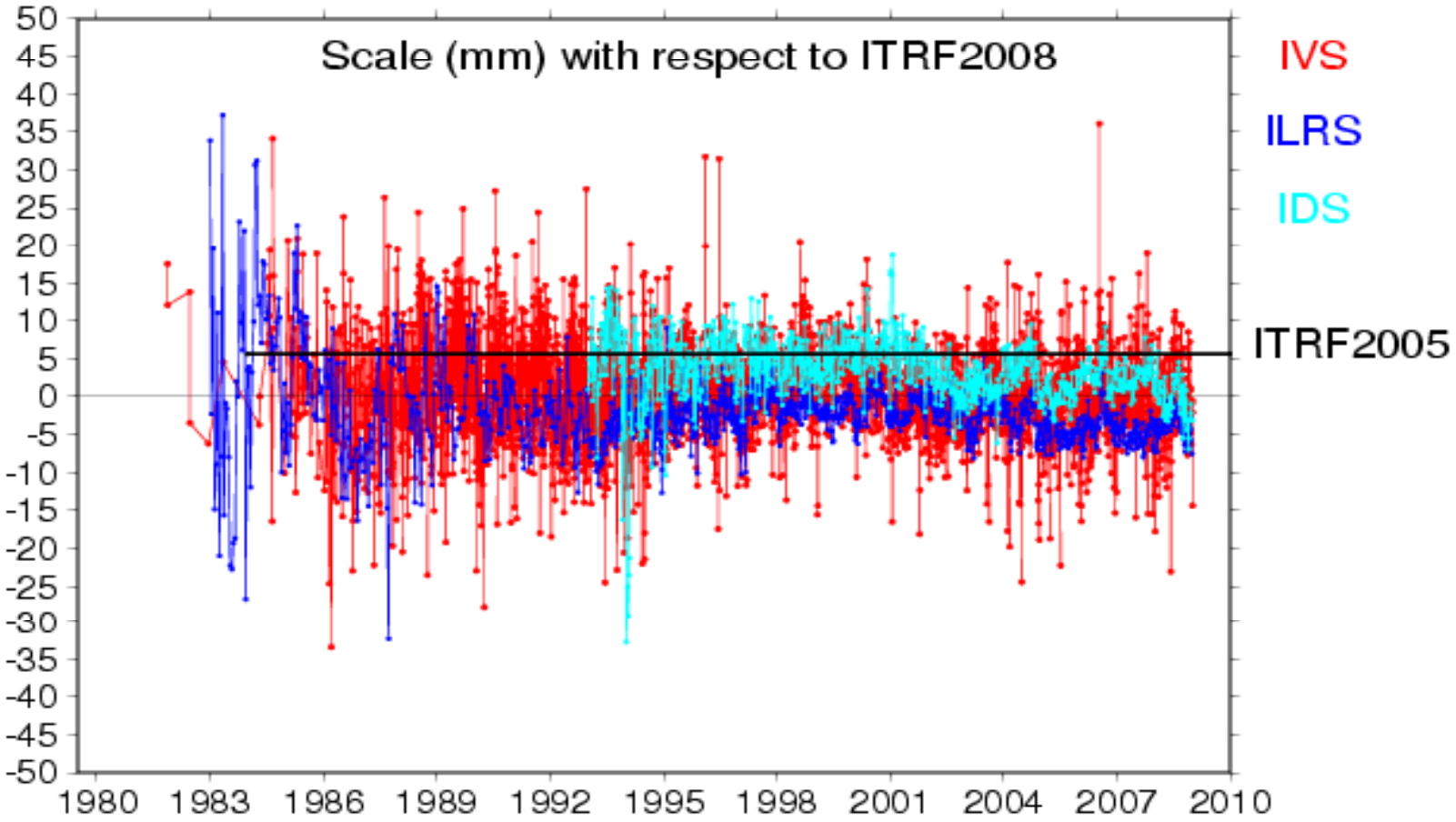
Scales wrt ITRF2008



Scales wrt ITRF2008



Scales wrt ITRF2008



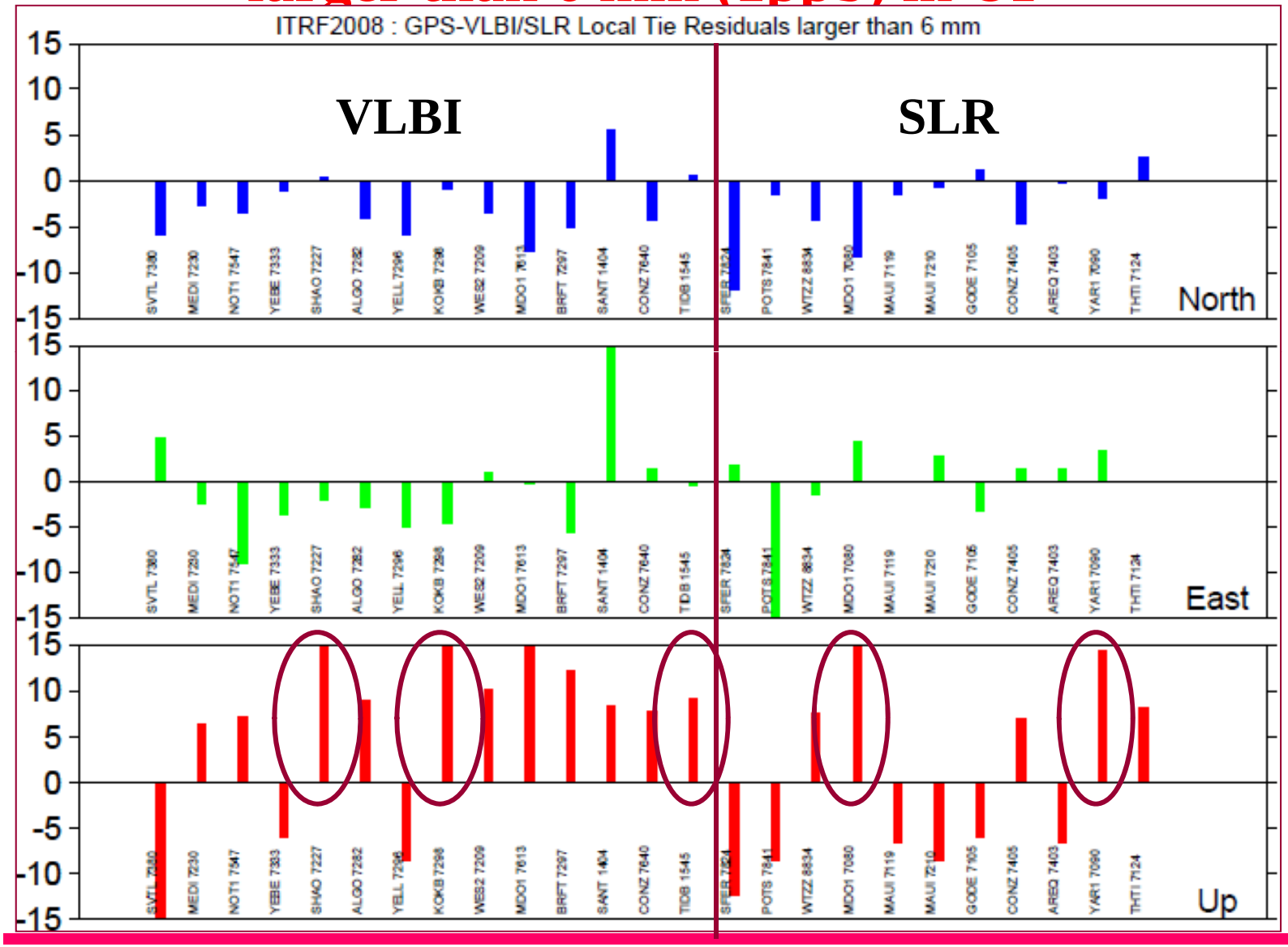
Transformation Param Fm ITRF2008 To ITRF2005

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

At epoch 2005.0

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

GPS VLBI/SLR local tie residuals larger than 6 mm (1ppb) in UP

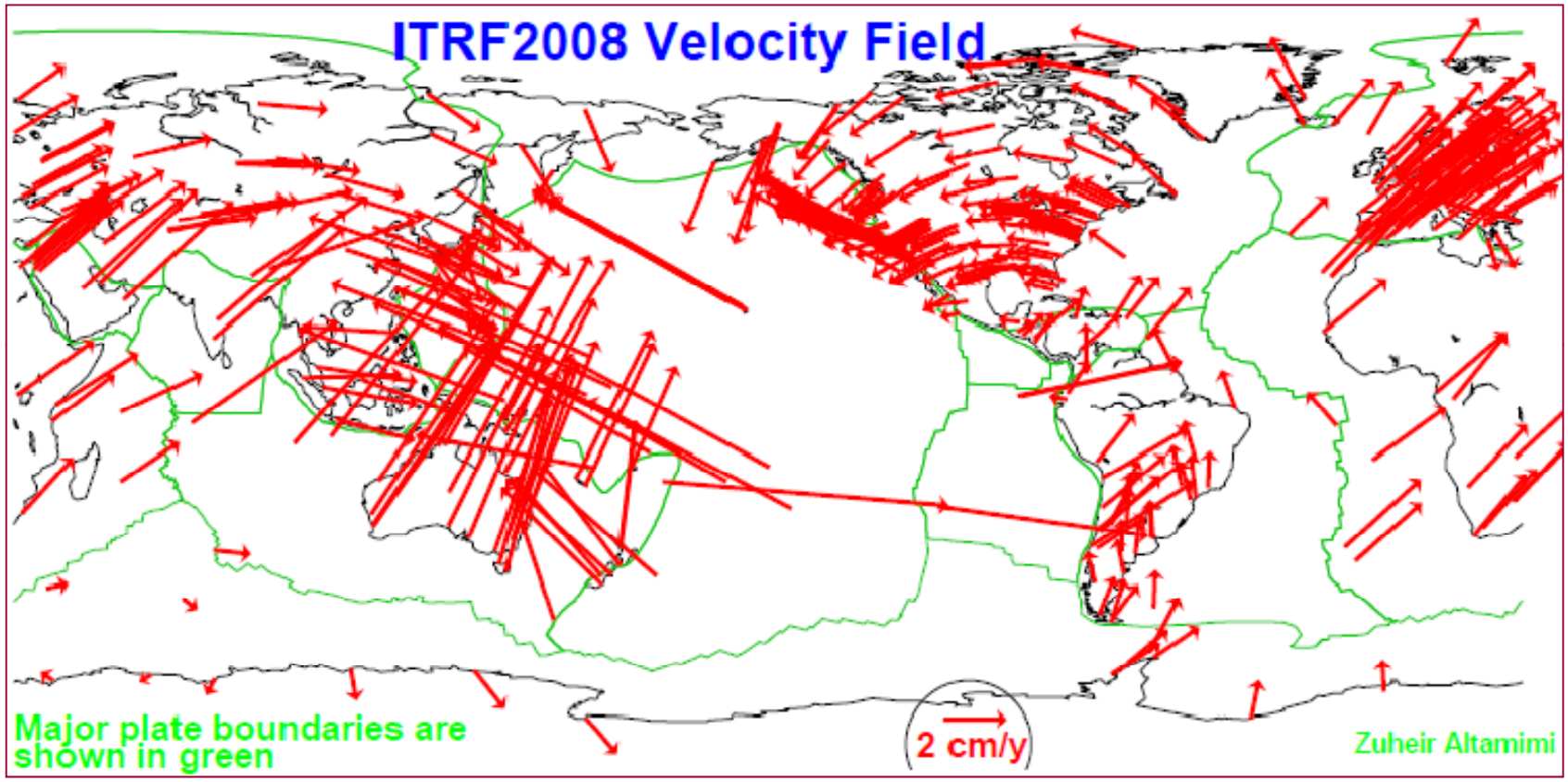


GPS: Examples of uncalibrated radomes!!

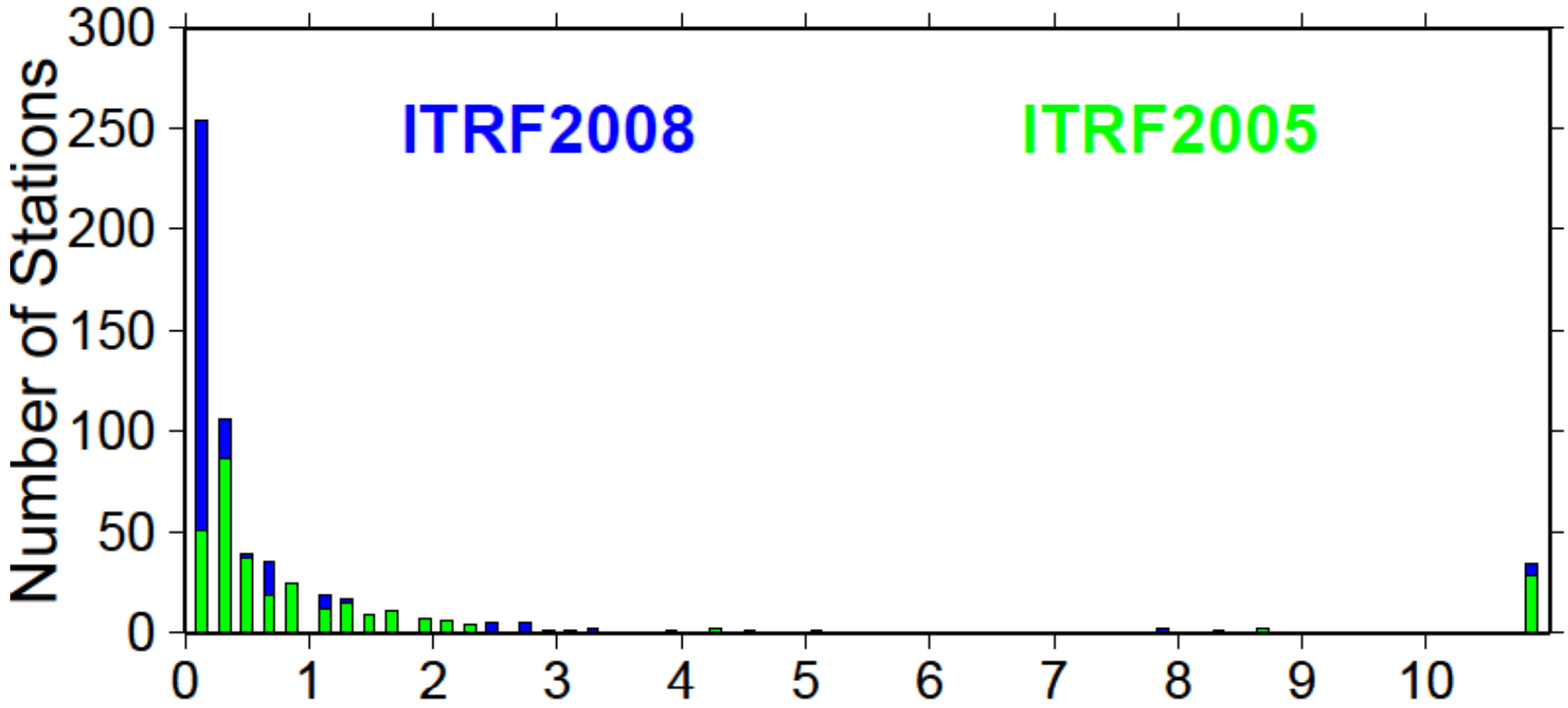
FORT*	radome error corrected by JR based on GPS-GPS tie, discrepancy reduced (FORT replaced by BRFT/no radome in 2005)
GODE*	6 mm with SLR; uncalibrated JPLA radome
KOKB+	20 mm (a real problem), but different antennas used; uncalibrated JPLA radome removed 2002-09-24
MADR	seems OK, but has 10 discontinuities & 9 mm in East!! (no radome)
MDO1*	15-20 mm, seems real problem; uncalibrated JPLA radome
ONSA*	5.2 mm; uncalibrated OSOD radome
QUIN*	25 mm (but old SLR data - 1982 to 1997); uncalibrated JPLA radome
SANT*	8 mm in up but 19 mm in East! uncalibrated JPLA radome
SHAO*	OK with SLR, but 20 mm with VLBI? uncalibrated JPLA radome
WES2	10 mm, 8 discontinuities and tie sigma 5 mm (but no radome)
MAUI	8 mm with old SLR location & 6 mm with new SLR location; has calibrated SNOW radome
TIDB*	9 mm; uncalibrated JPLA radome
YAR1*	14 mm

Input from IGS (Jim Ray):
* = with uncalibrated radome
+ = had uncalibrated radome during part of its history

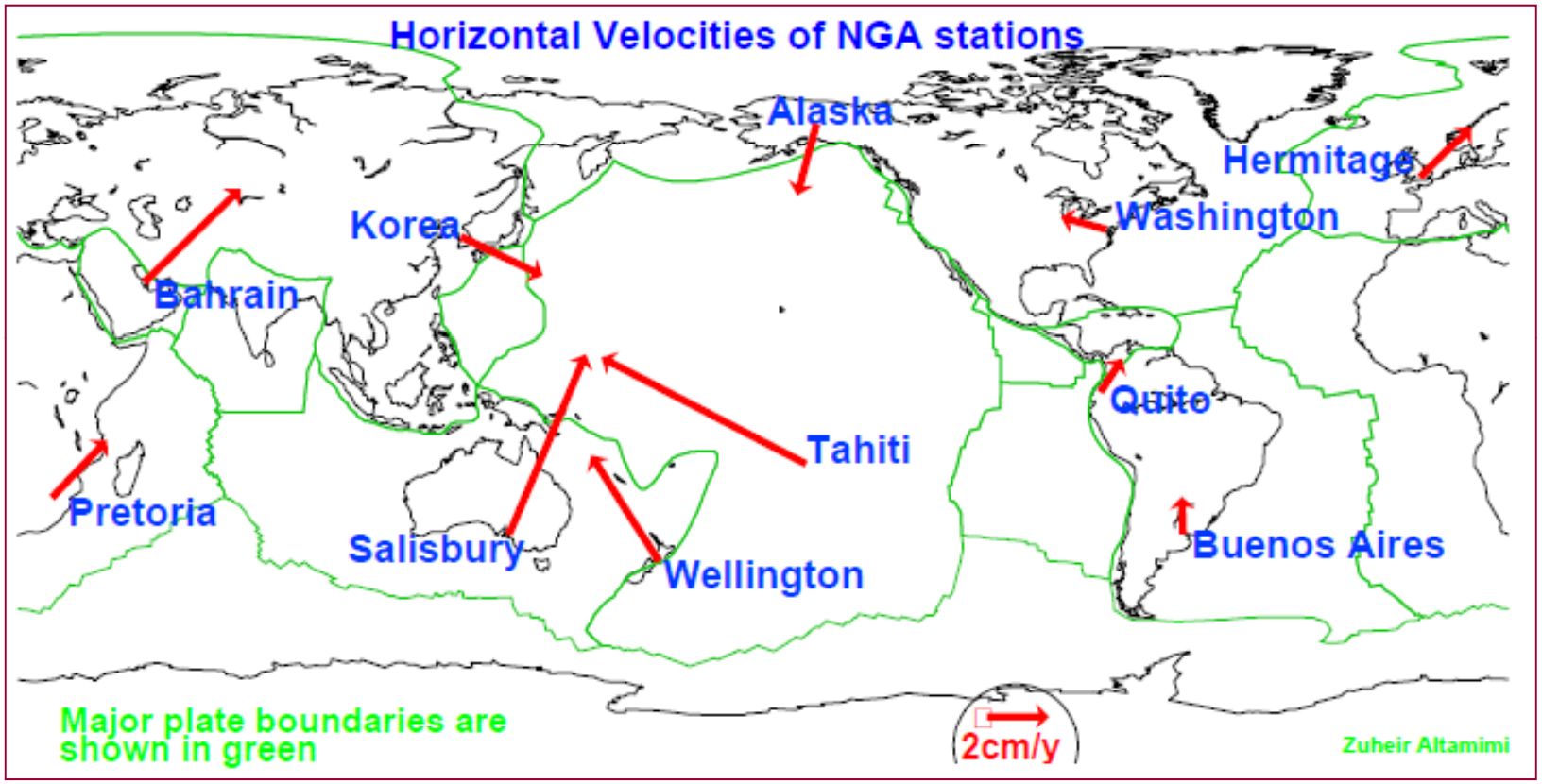
ITRF2008 Velocity Field



ITRF2008: Velocity Spherical Errors



WGS84 - NGA Stations in ITRF2008



Conclusion

- **IGS contribution to the ITRF is fundamental**

- **GPS uncalibrated radome effects should absolutely be resolved by IGS**

- **Measures should be taken by the IGS to secure co-location and IGS RF sites for the mutual benefit of ITRF and IGS:**
  - **double or triple GPS stations at co-location sites (?)**
  - **call for participation (?)**