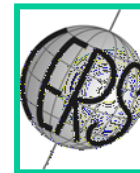


# ITRF2008 and the IGS Contribution



Zuheir Altamimi  
IGN, France



# 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. (?)

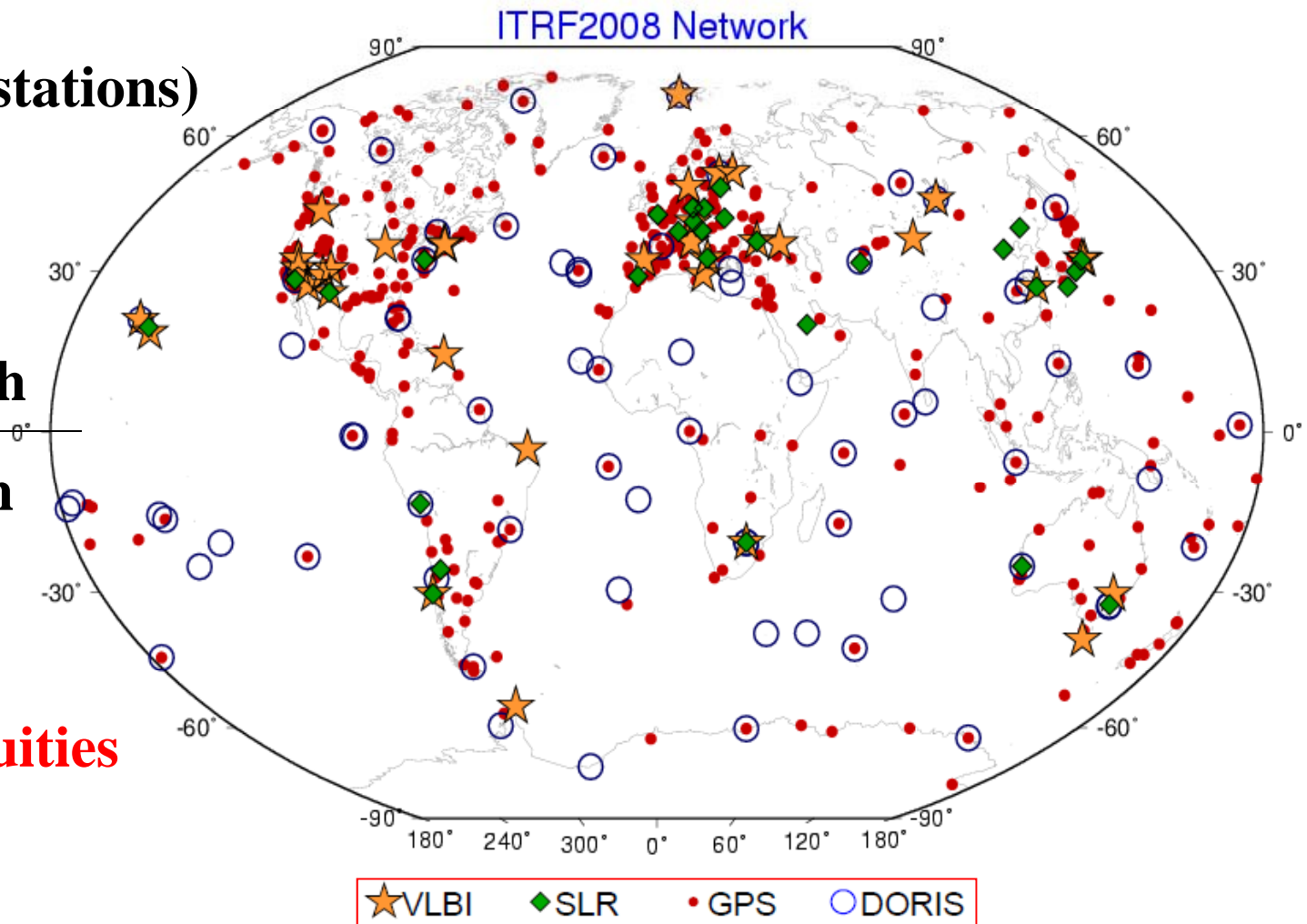
# ITRF2008 Network

580 sites (934 stations)

463 Sites North

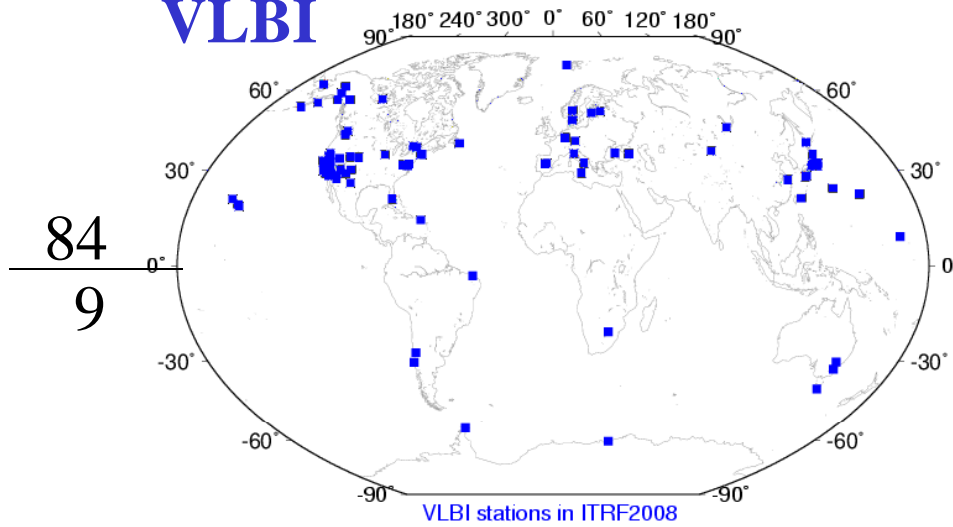
117 Sites South

638 discontinuities

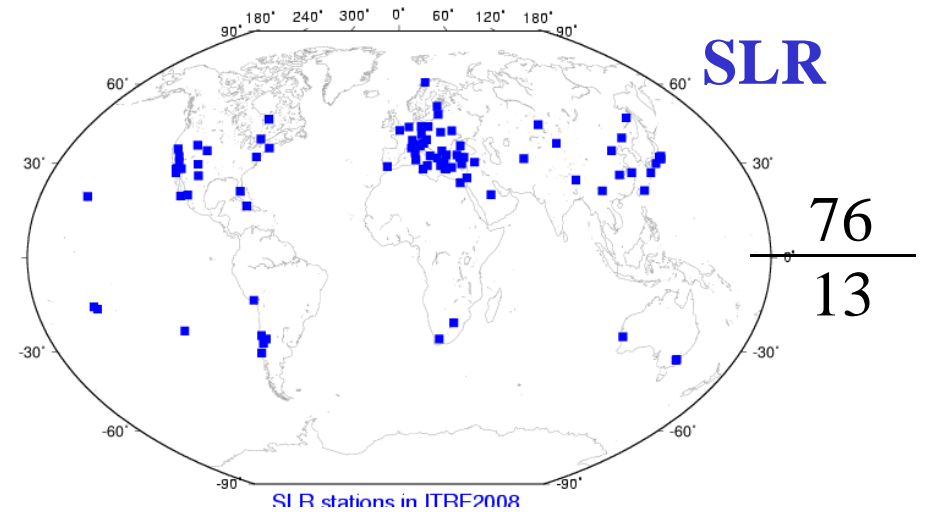


# ITRF2008: Site distribution per technique

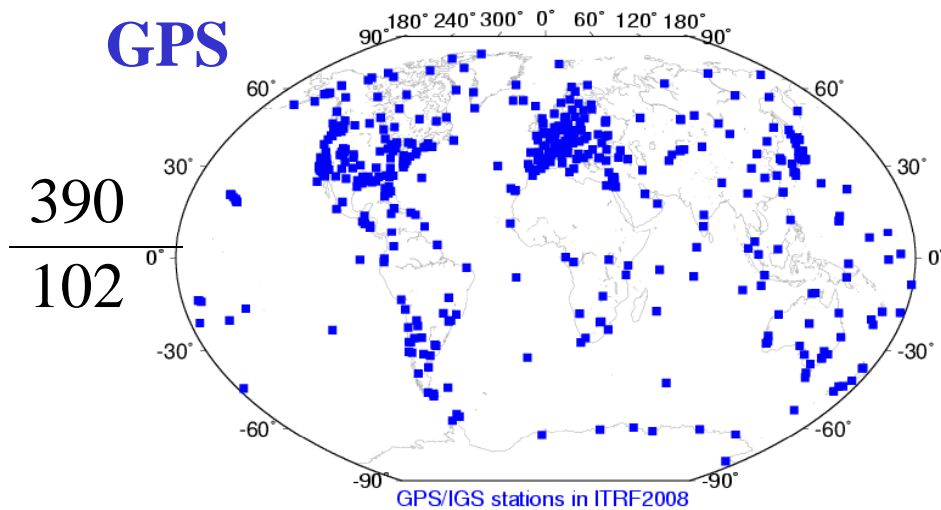
**VLBI**



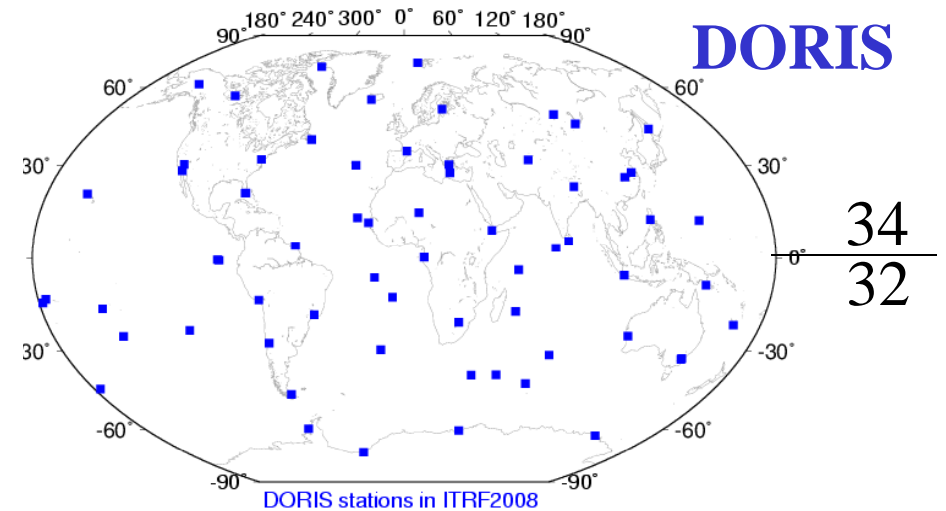
**SLR**



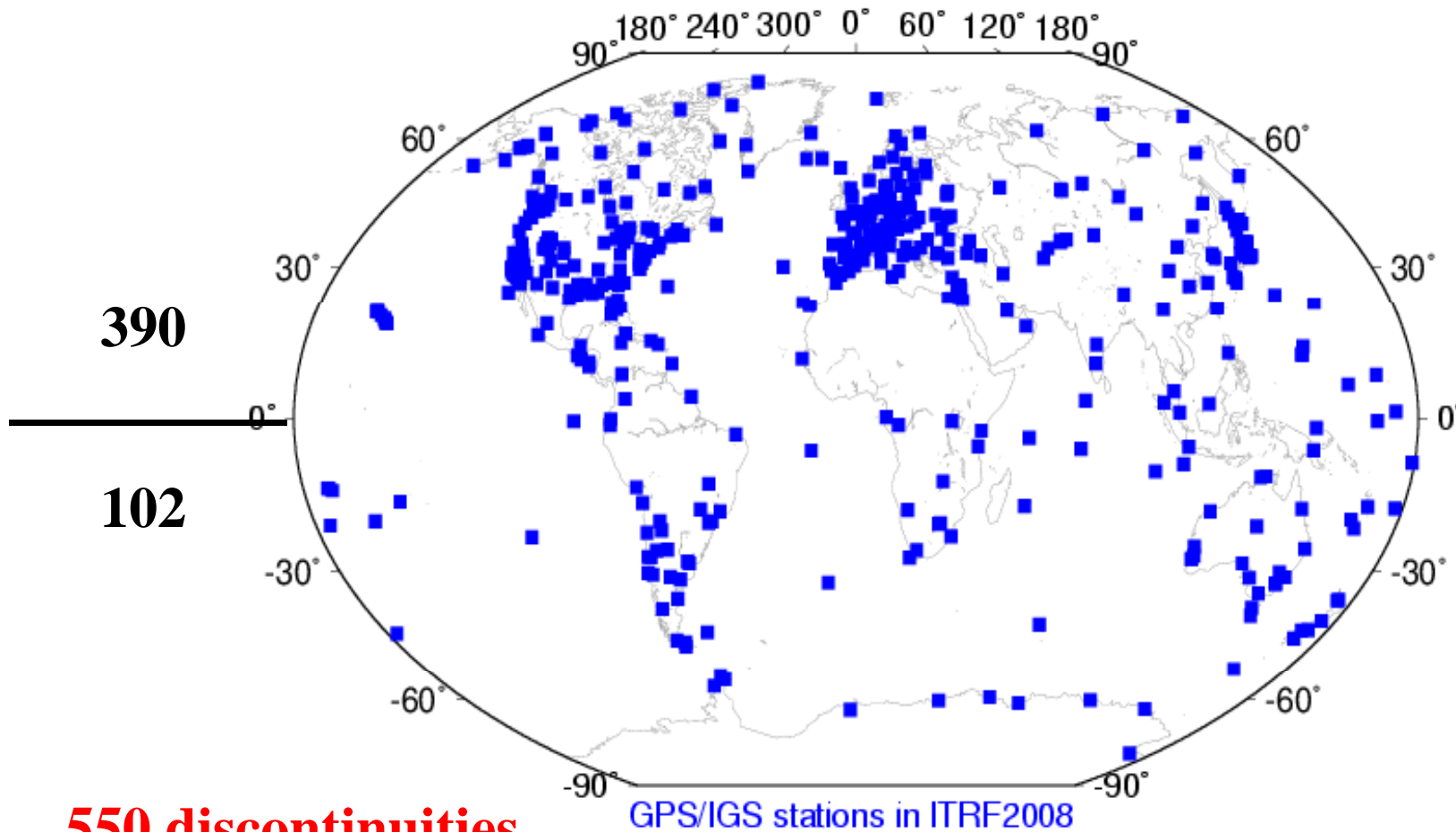
**GPS**



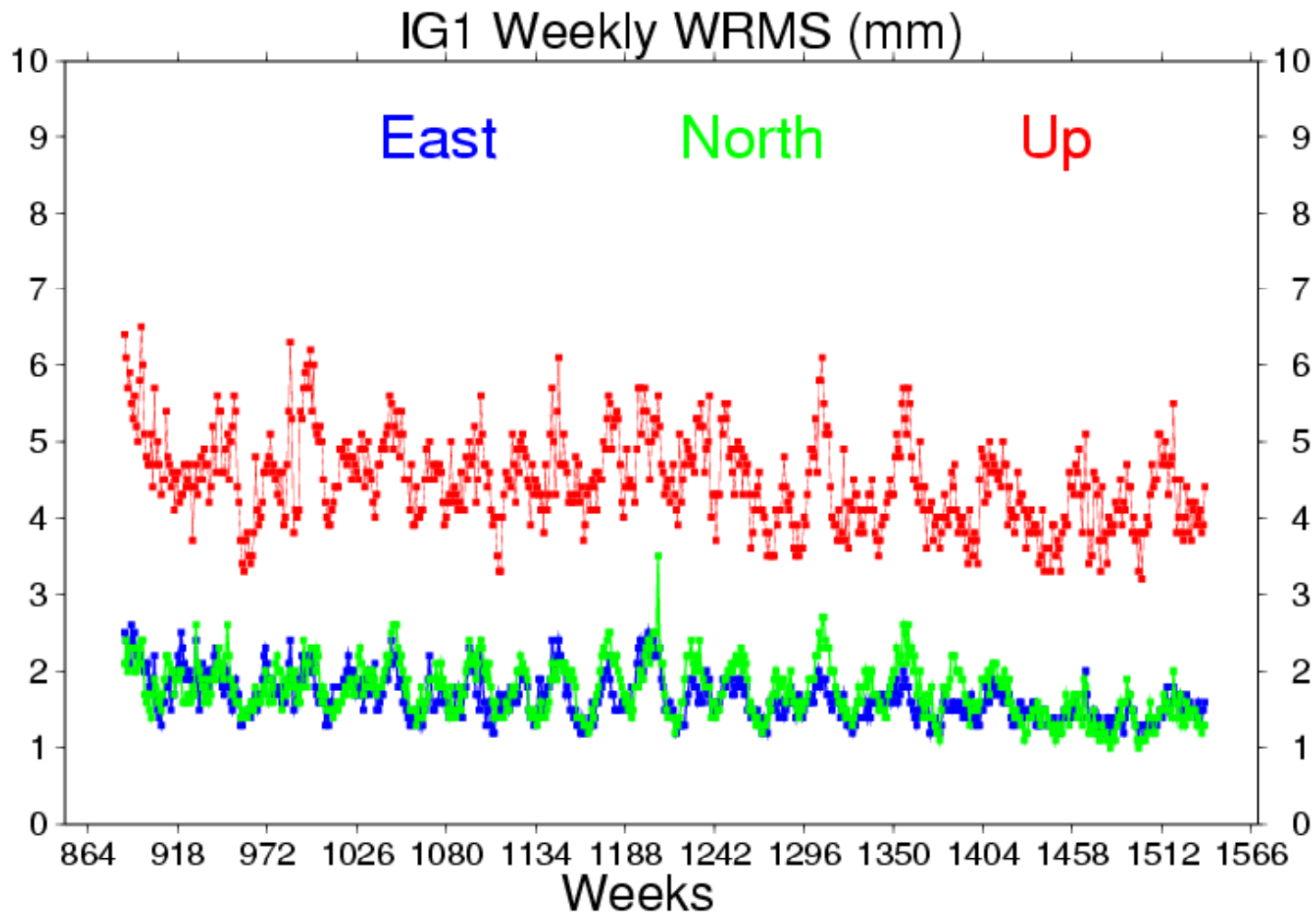
**DORIS**



# ITRF2008: GPS/IGS Site distribution



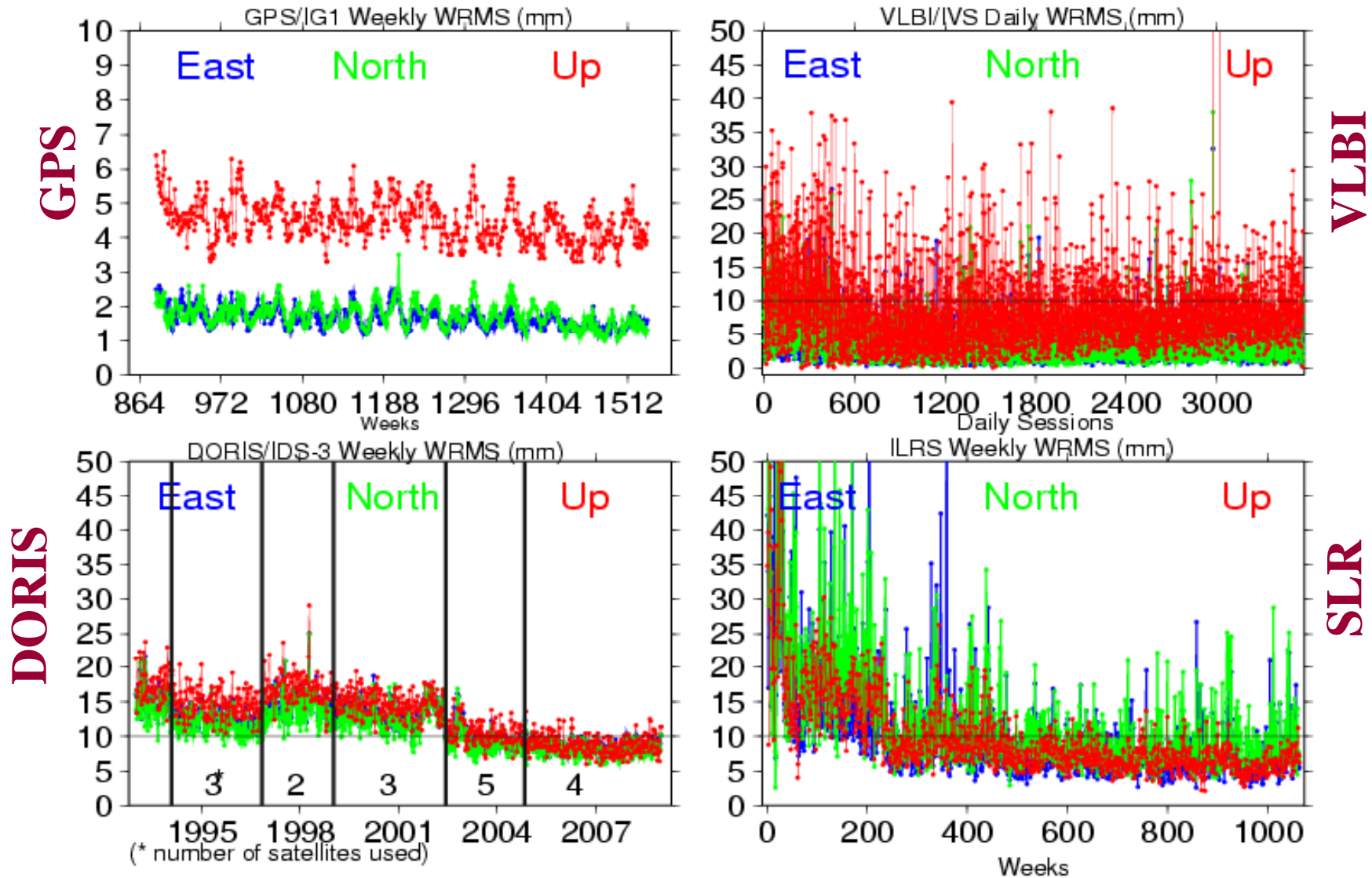
# IG1 internal precision (1997.0 - 2009.5)



# IG1 weekly WRMS: Amplitudes and Phases

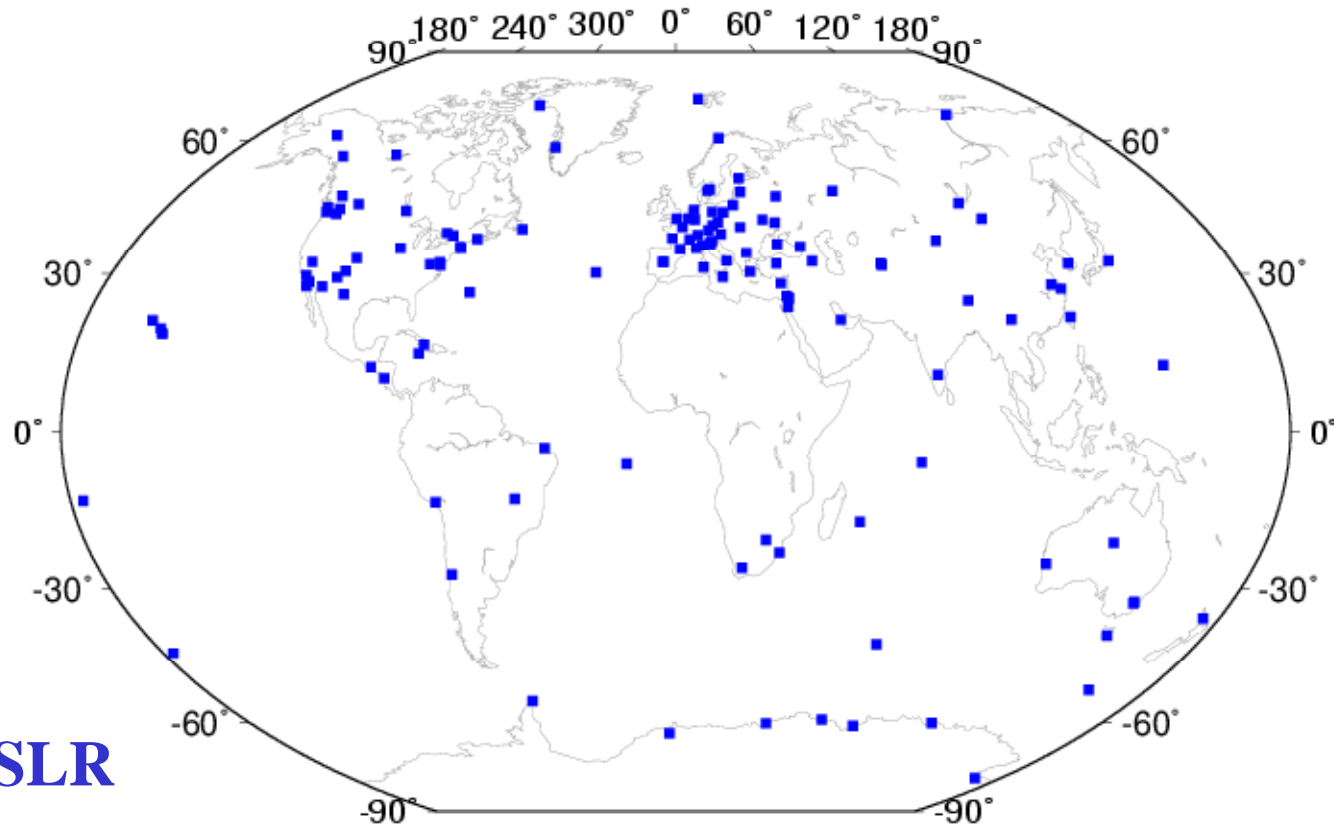
	<b>Annual Amplitude</b> mm	<b>Phase (degrees)</b>
<b>North</b>	<b>0.21</b>	<b>156.9</b>
<b>East</b>	<b>0.17</b>	<b>156.9</b>
<b>Up</b>	<b>0.50</b>	<b>156.9</b>

# Technique Internal Precision



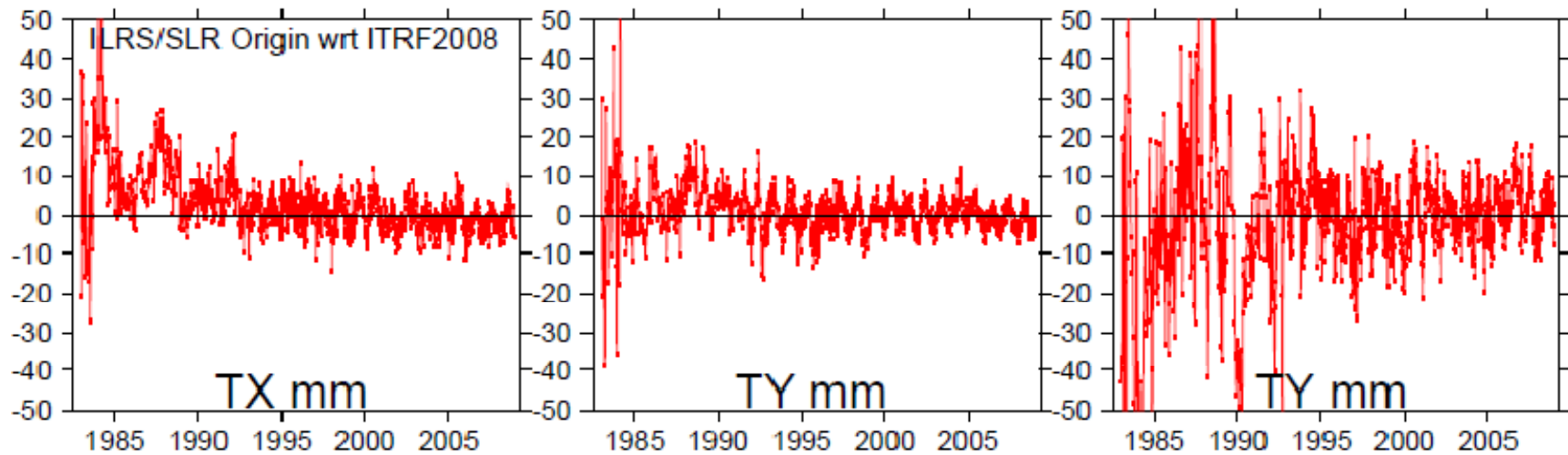


# ITRF2008 Datum Specification

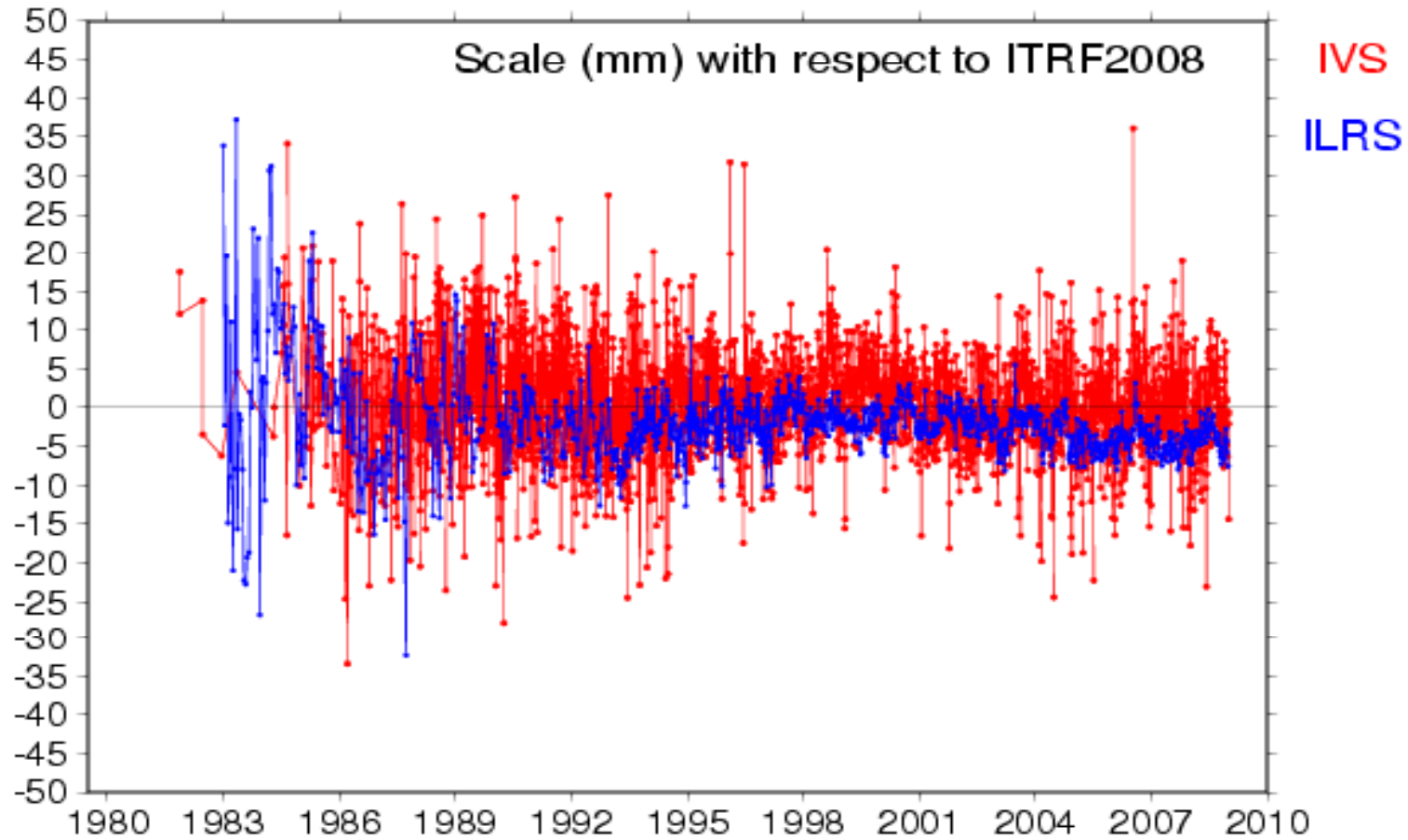


- **Origin:** SLR
  - **Scale :** Mean of SLR & VLBI
  - **Orientation:** Aligned to ITRF2005
- using 179 stations located at 131 sites:  
104 at northern hemisphere and 27 at southern hemisphere

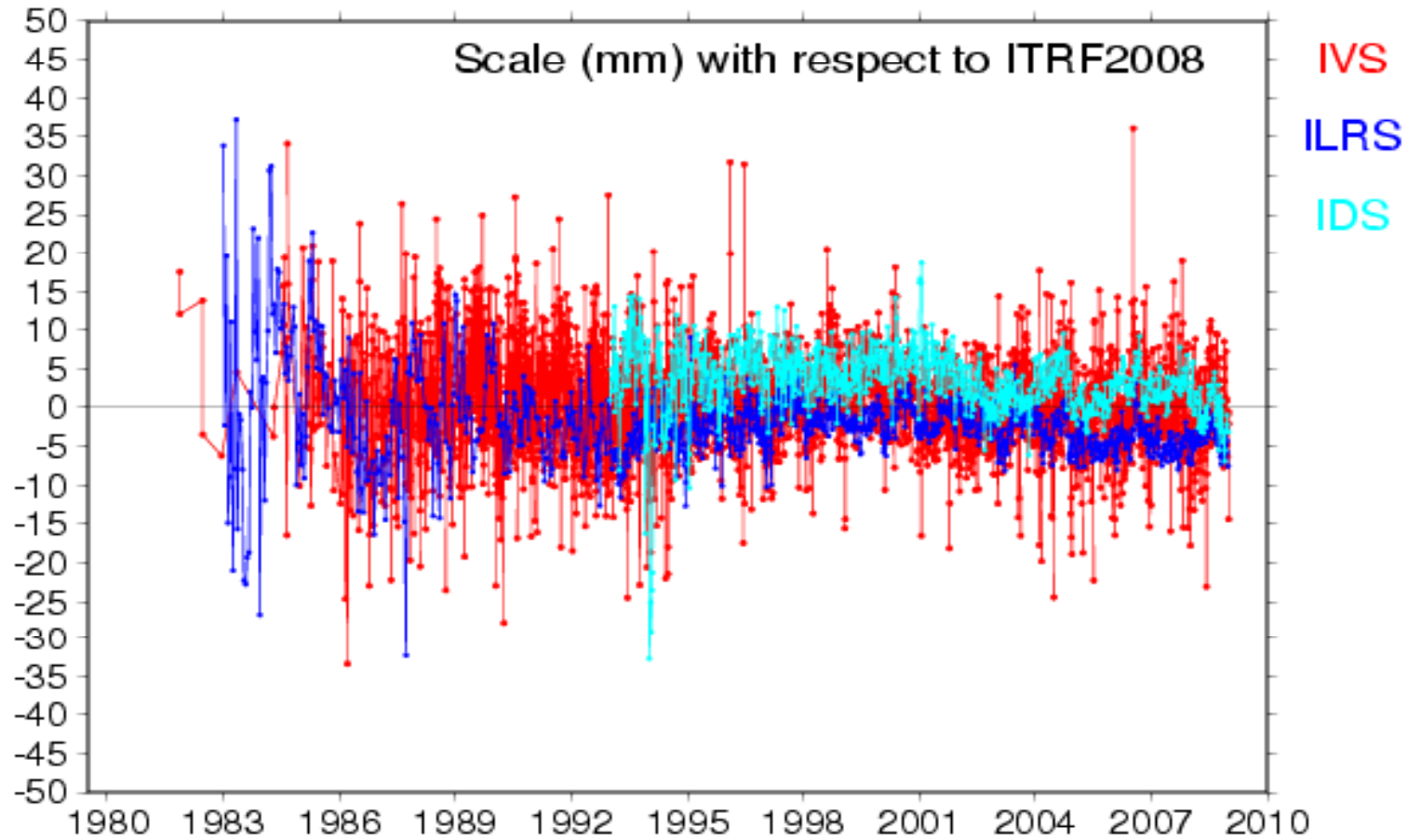
# SLR/ILRSA24 Origin wrt ITRF2008



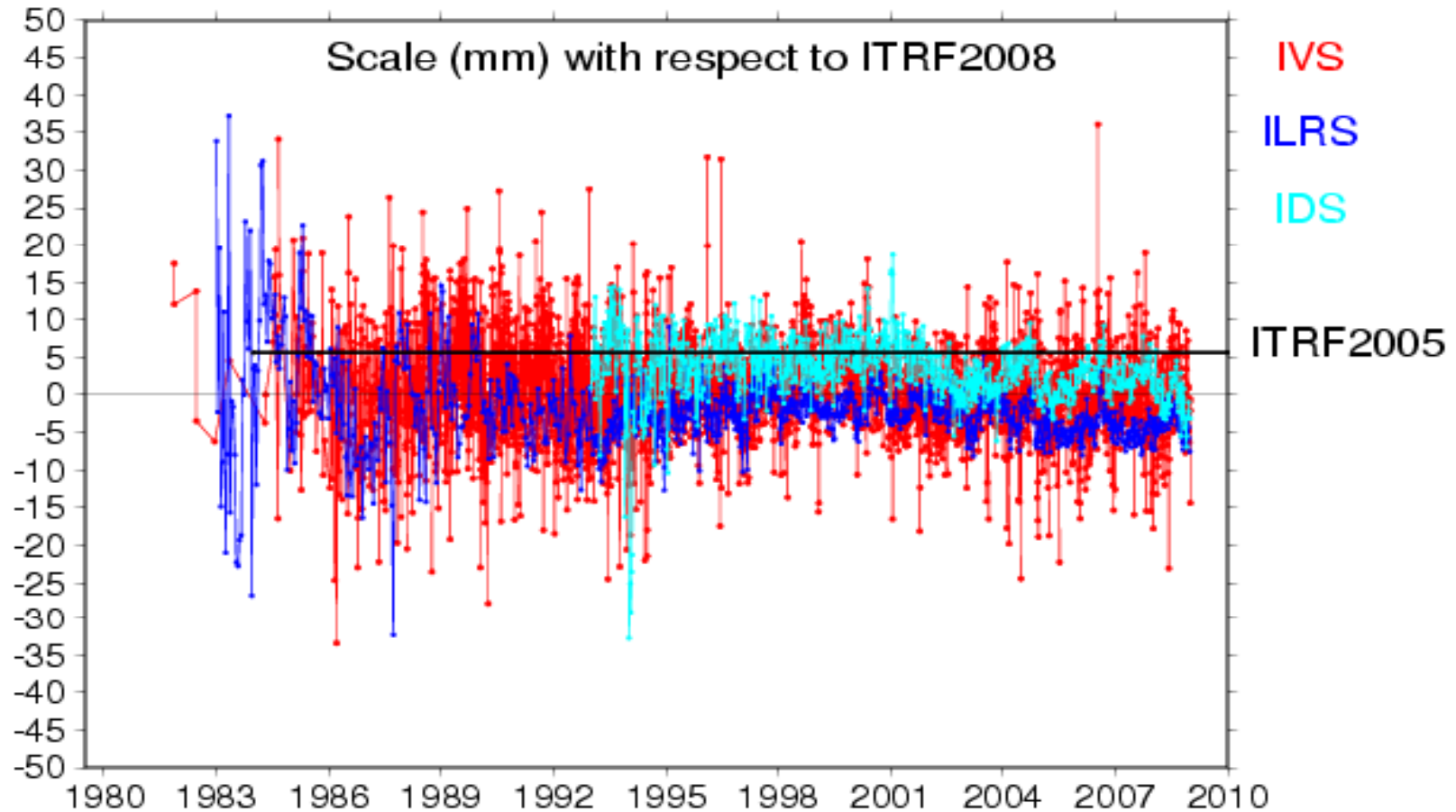
# Scales wrt ITRF2008



# Scales wrt ITRF2008



# Scales wrt ITRF2008

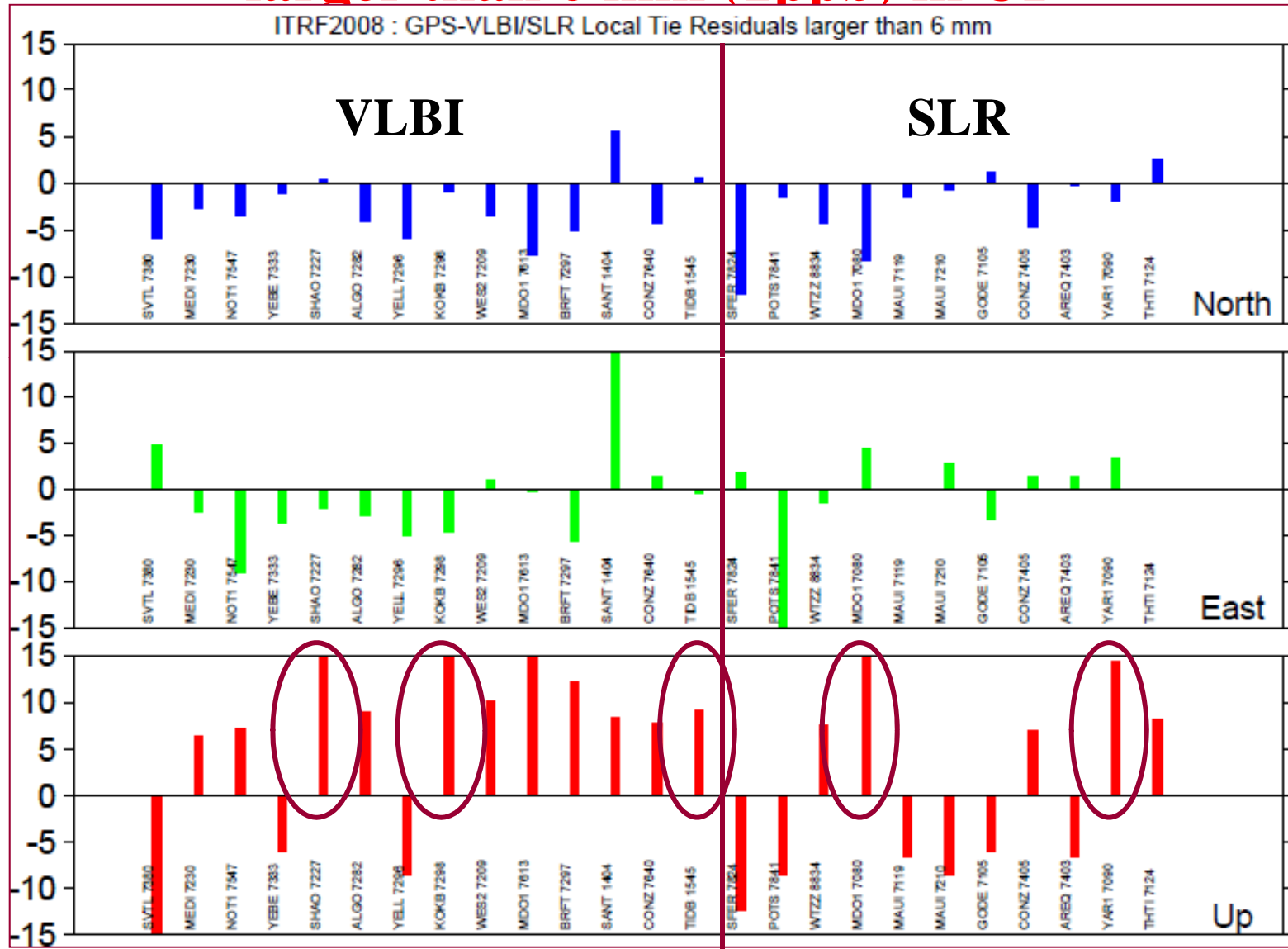


## Transformation Param Fm ITRF2008 To ITRF2005

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

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

# 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

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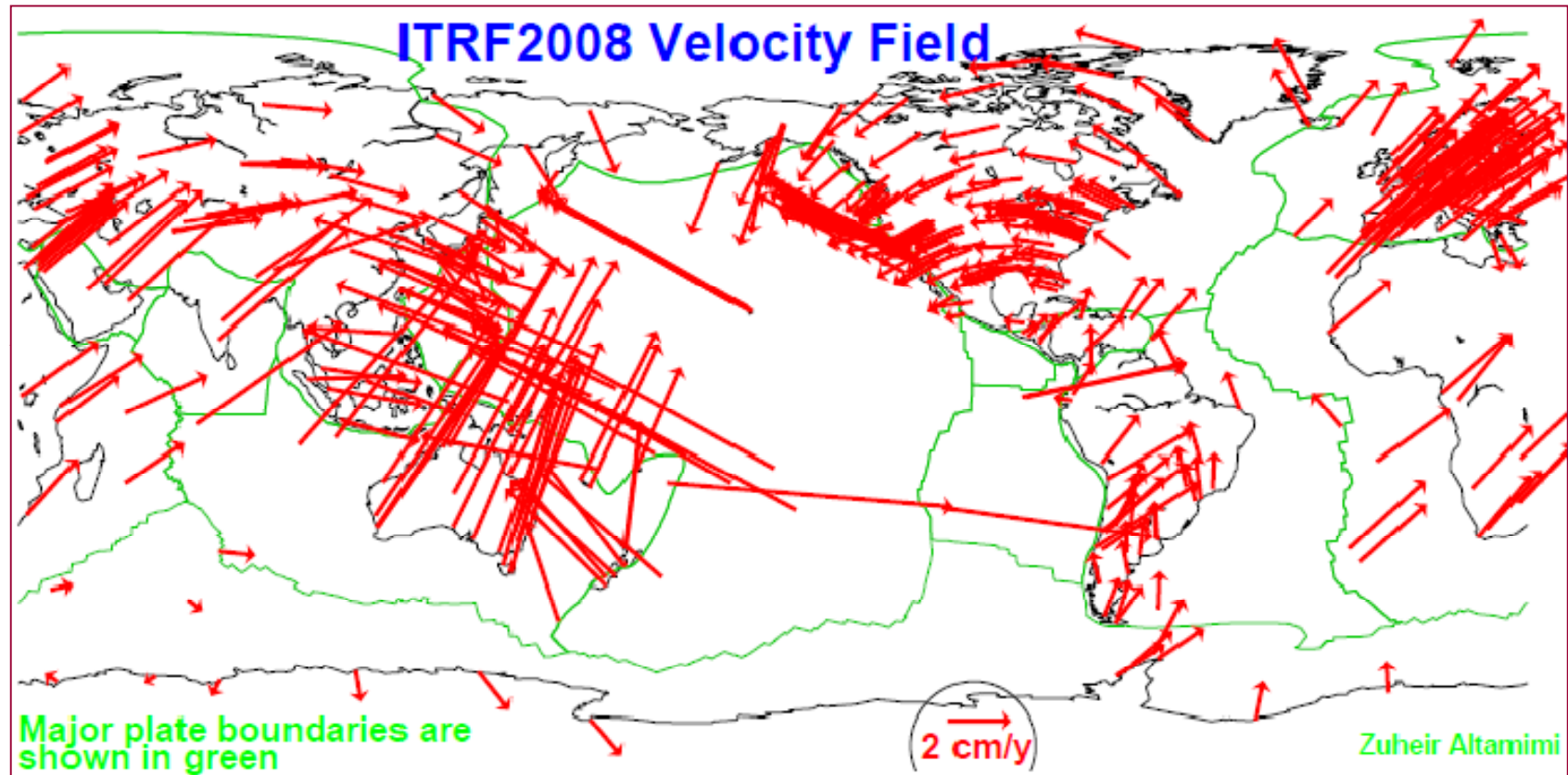
Input from IGS (Jim Ray):

\* = with uncalibrated radome

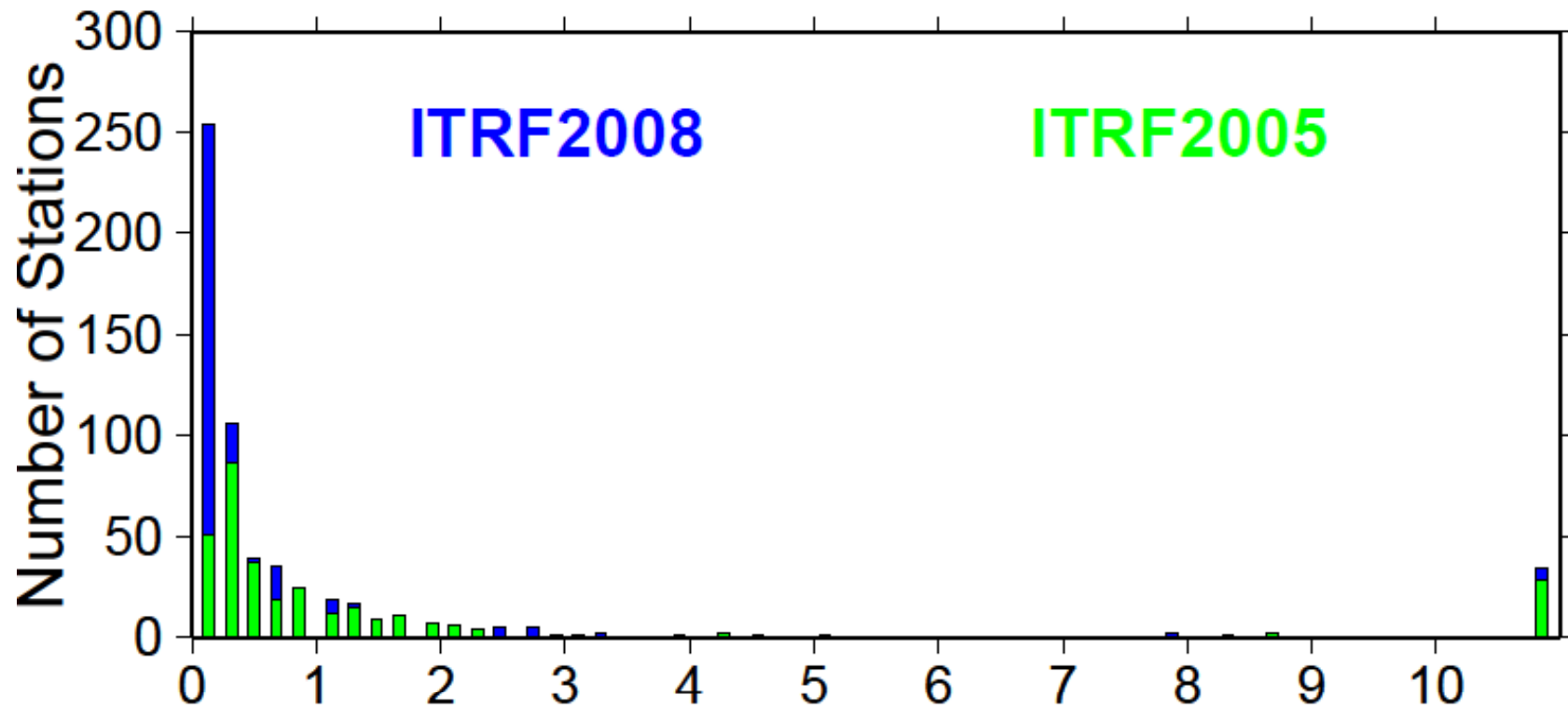
+ = had uncalibrated radome during part of its history



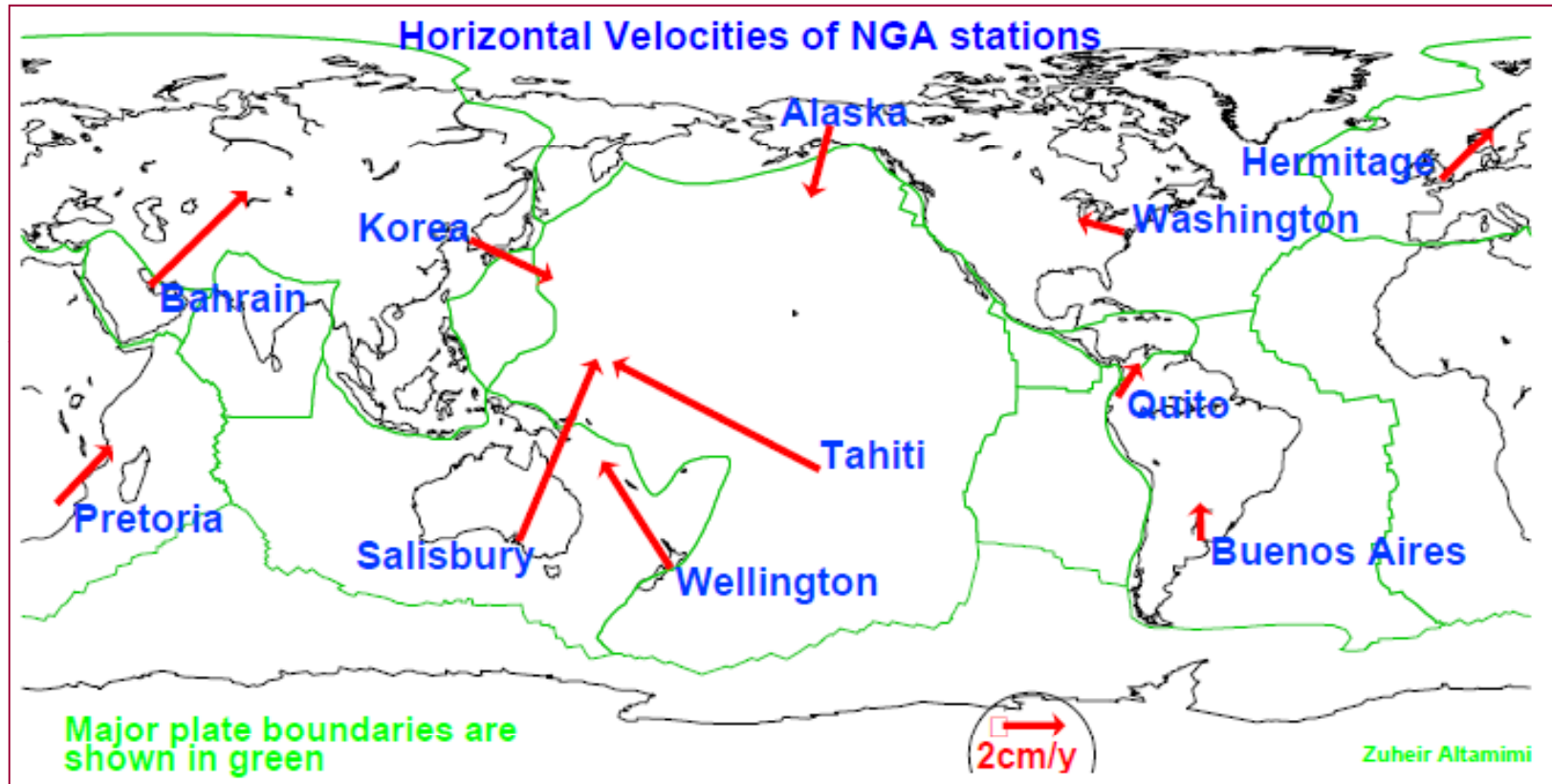
# ITRF2008 Velocity Field



# 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 (?)**