

Consistency evaluation of space geodetic techniques via ITRF combination



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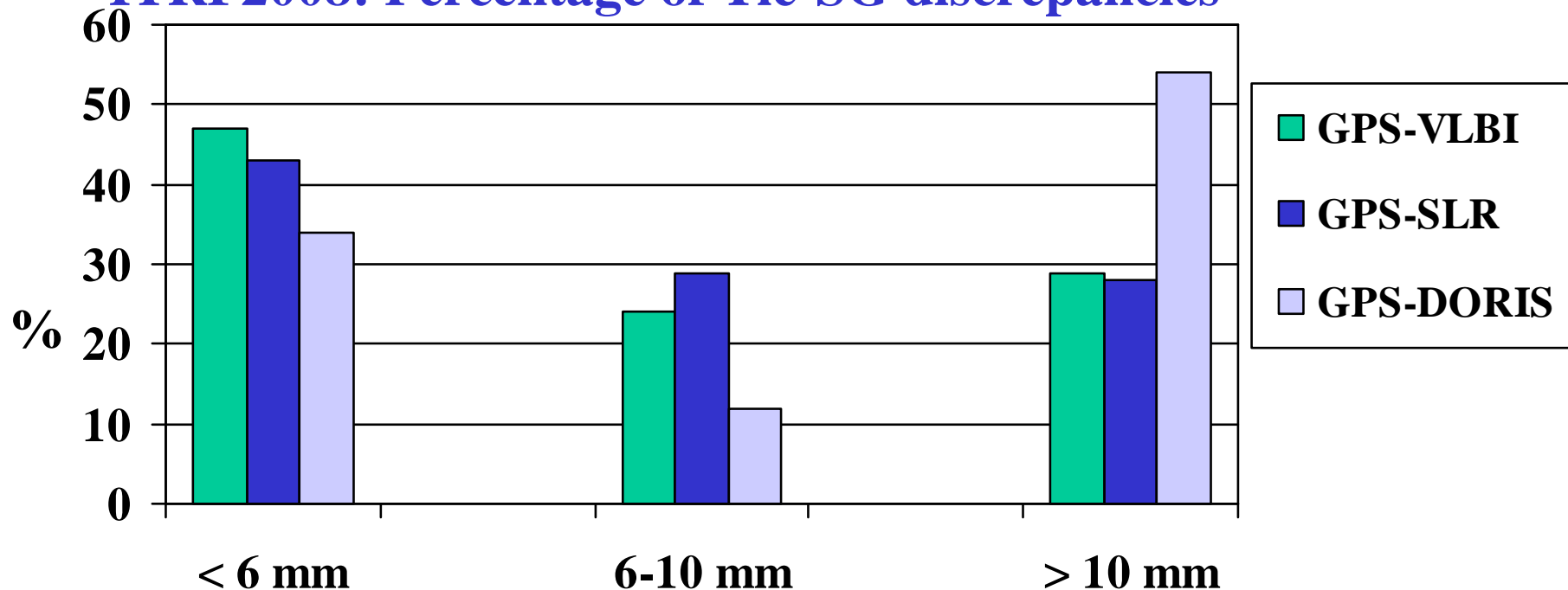


Outline

- **Consistency between Space Geodesy (SG) and local ties (A reminder)**
- **Consistency between techniques on site velocities**
- **Plate motion comparisons between SG and geological models**
- **Use ITRF2008 input/results**

ITRF2008: Consistency btw local ties and space geodesy estimates

- GPS is linking SLR, VLBI & DORIS because
 - VLBI-SLR alone: **8 co-locations only**
 - VLBI or SLR-DORIS alone : **10 co-locations only**
- ITRF2008: Percentage of Tie-SG discrepancies



See Altamimi et al (2011) for more details

GPS-VLBI horizontal velocity differences

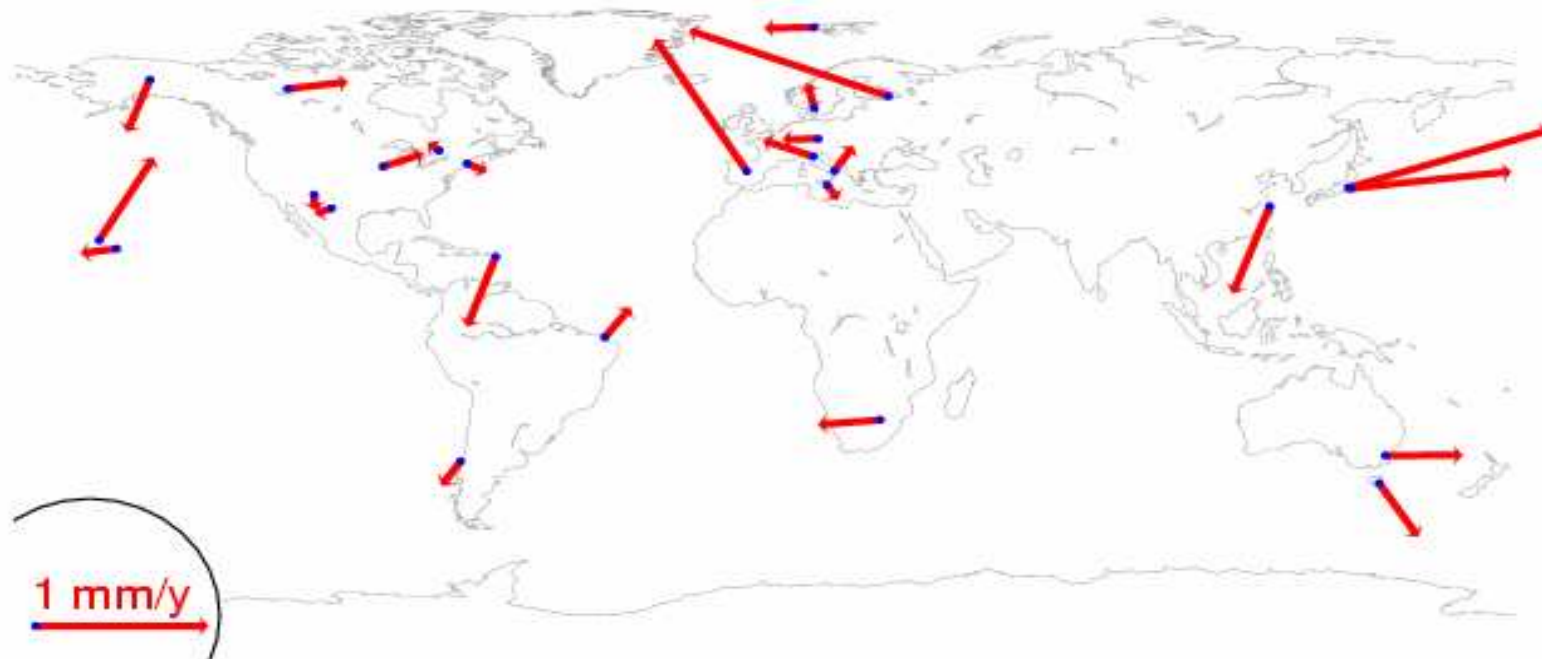
WRMS

East = 0.34 mm/yr

North = 0.23 mm/yr

sites 26

$\sigma = 0.3$ mm/yr



GPS-SLR horizontal velocity differences

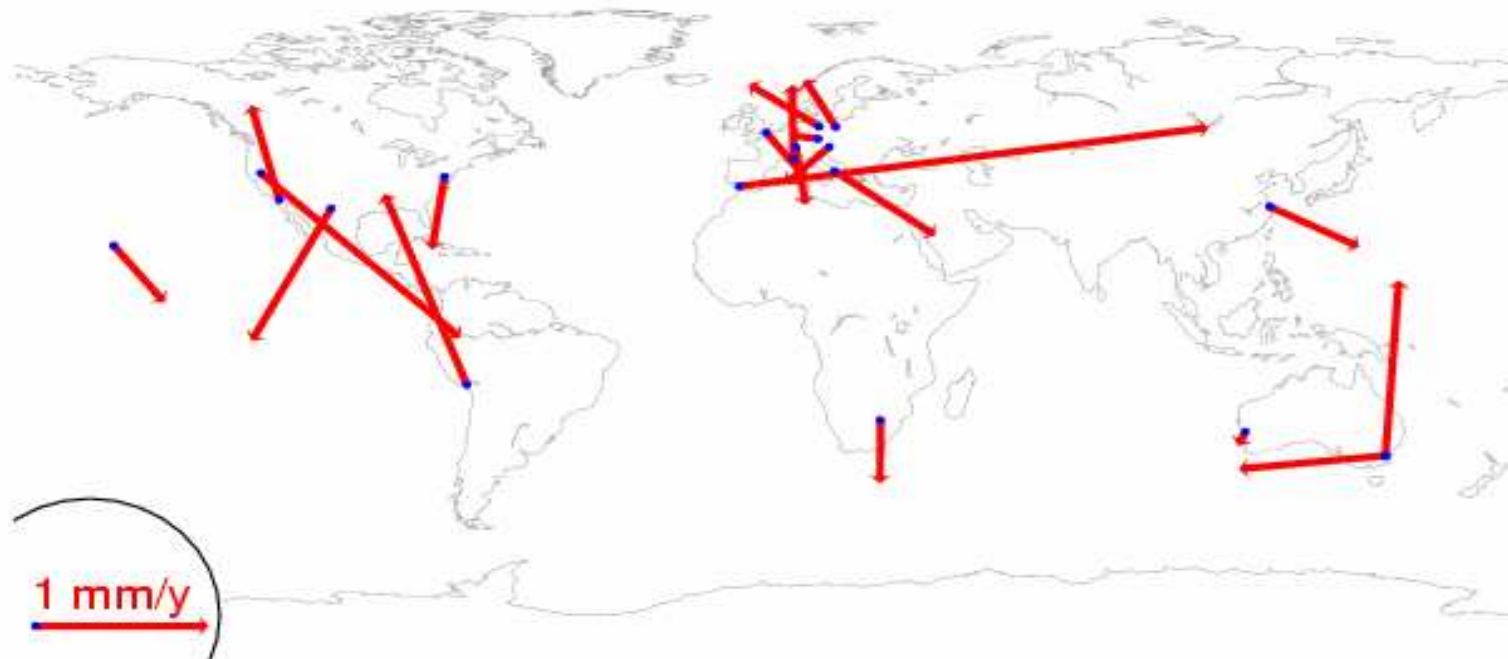
WRMS

East = 0.47 mm/yr

North = 0.48 mm/yr

sites 20

$\sigma = 0.3$ mm/yr



GPS-DORIS horizontal velocity differences

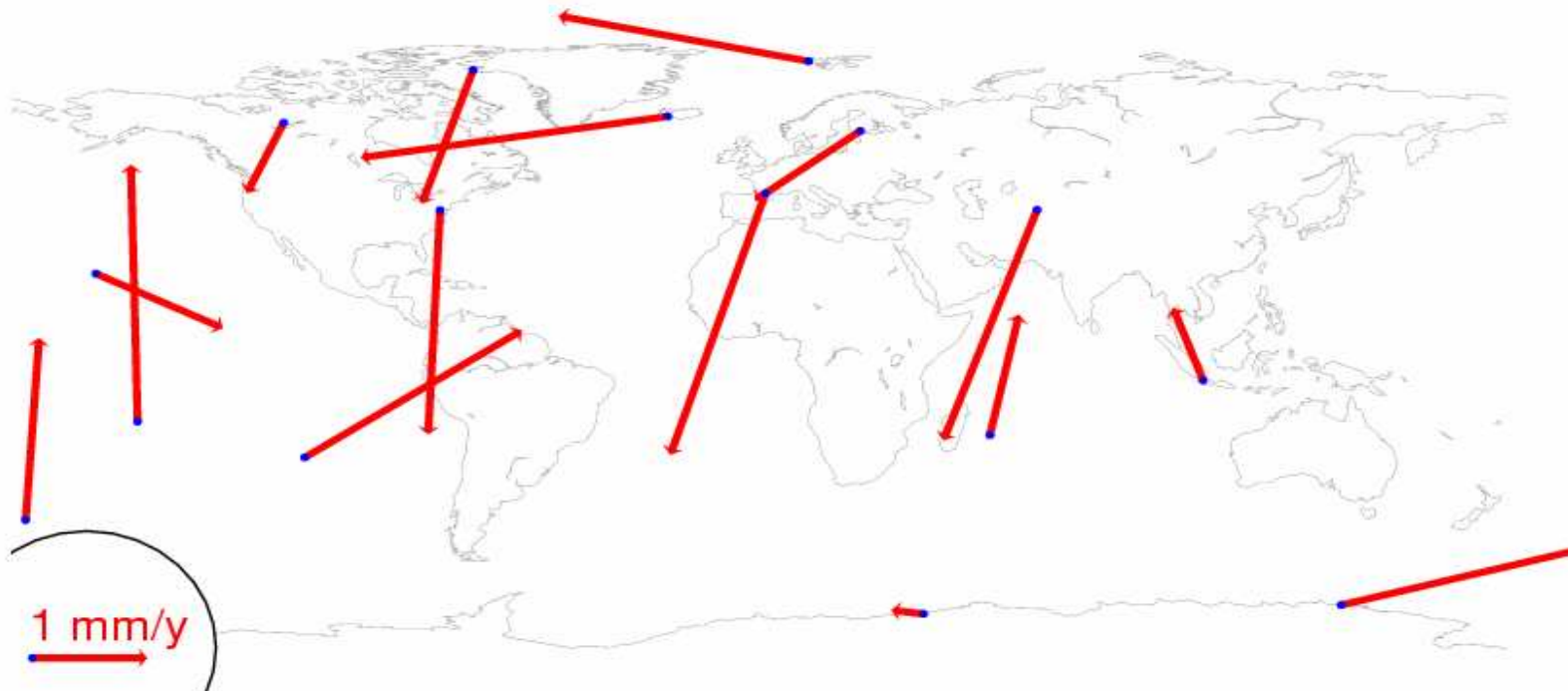
WRMS

East = 1.37 mm/yr

North = 1.33 mm/yr

sites 16

$\sigma = 0.3$ mm/yr



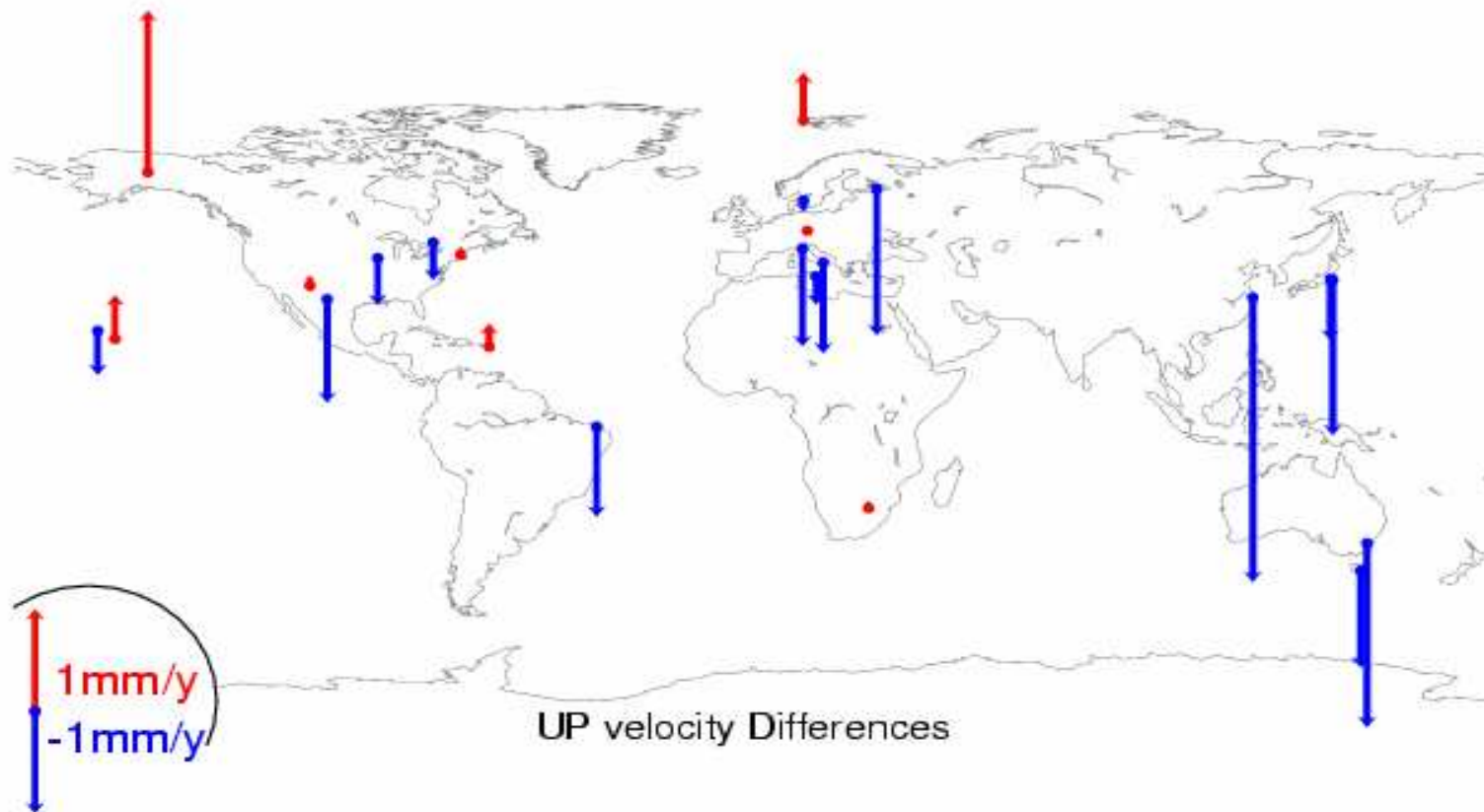
GPS-VLBI vertical velocity differences

WRMS

0.77 mm/yr

sites 23

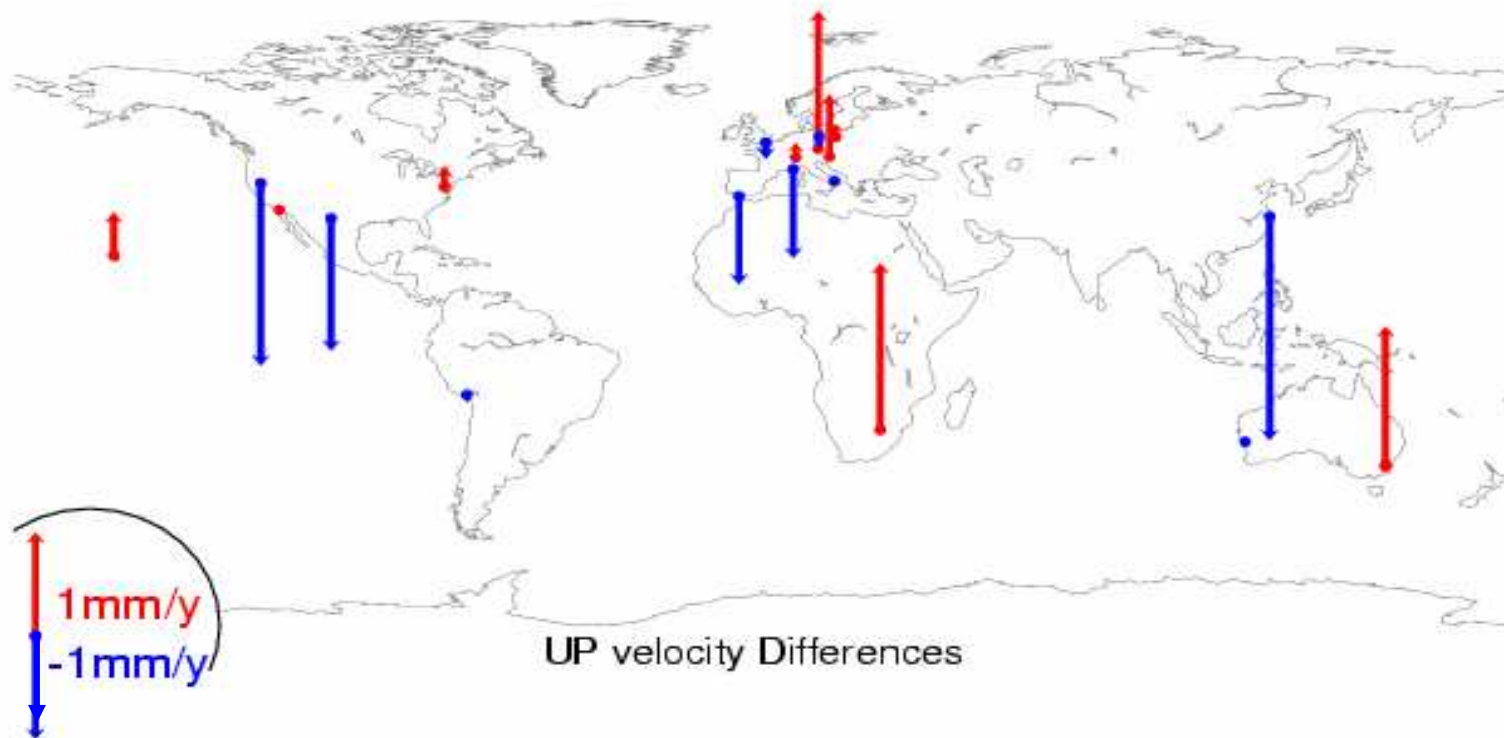
$\sigma = 0.3$ mm/yr



GPS-SLR vertical velocity differences

WRMS
0.62 mm/yr

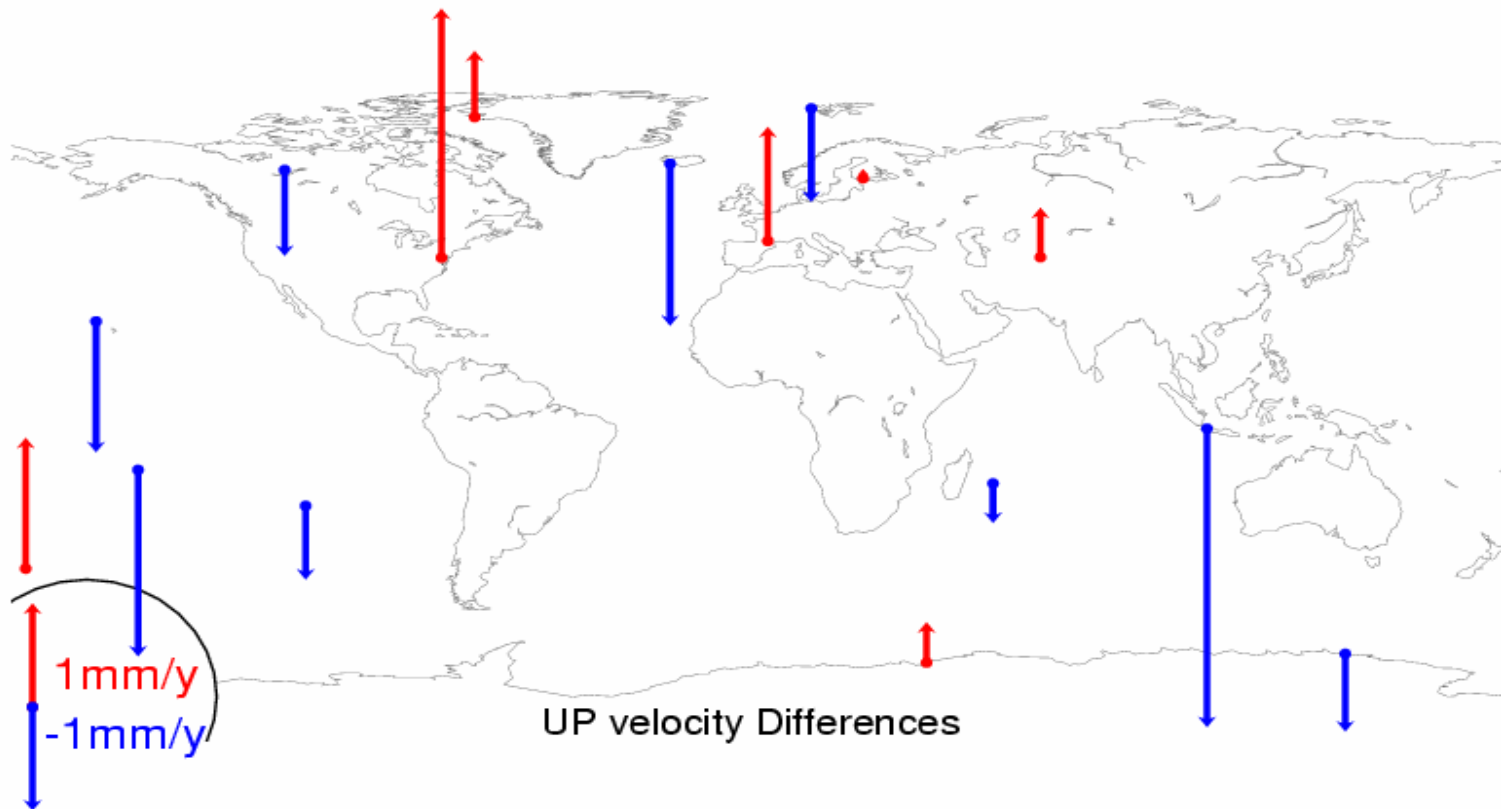
sites 20
 $\sigma = 0.3$ mm/yr



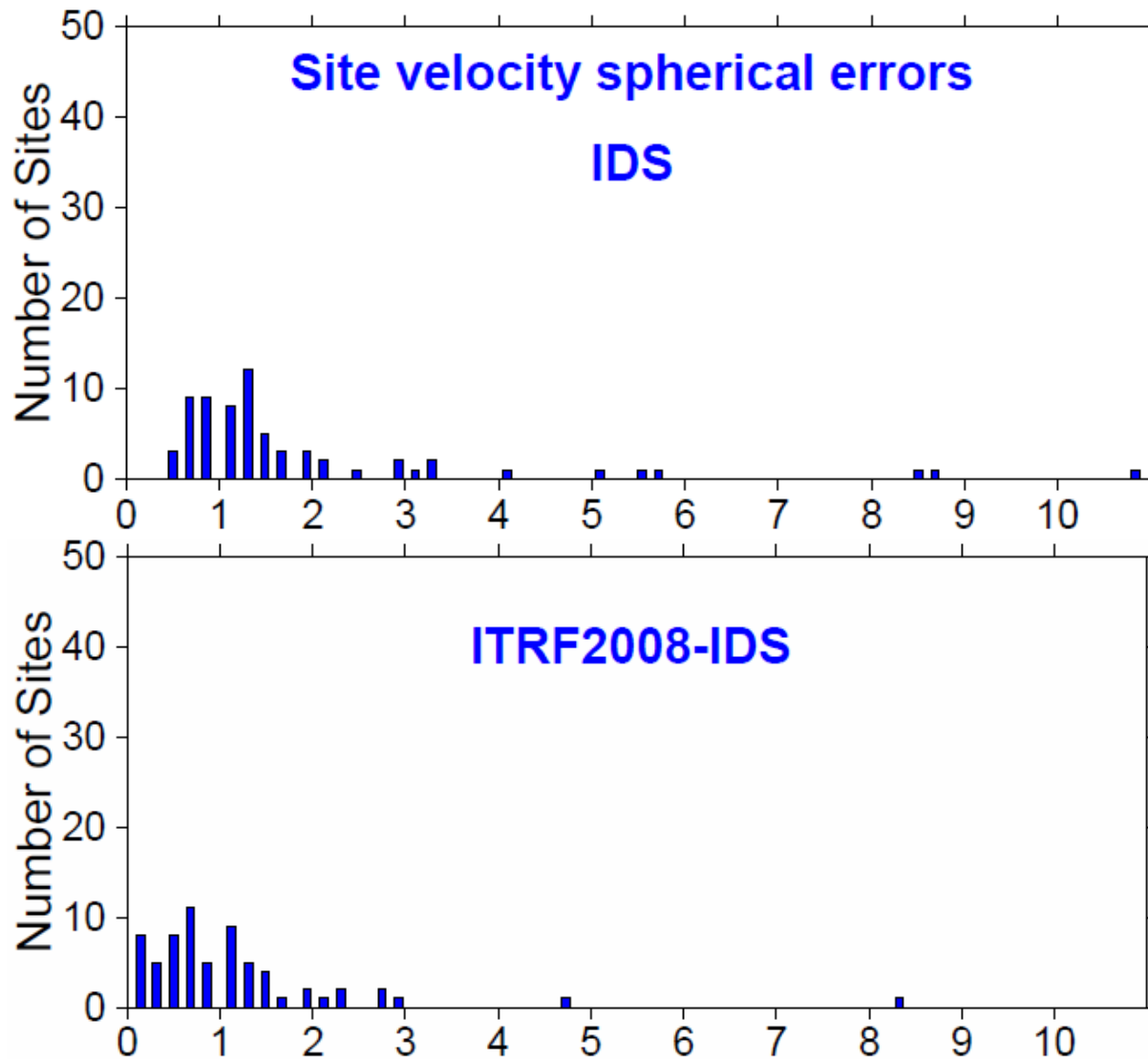
GPS-DORIS vertical velocity differences

WRMS
1.16 mm/yr

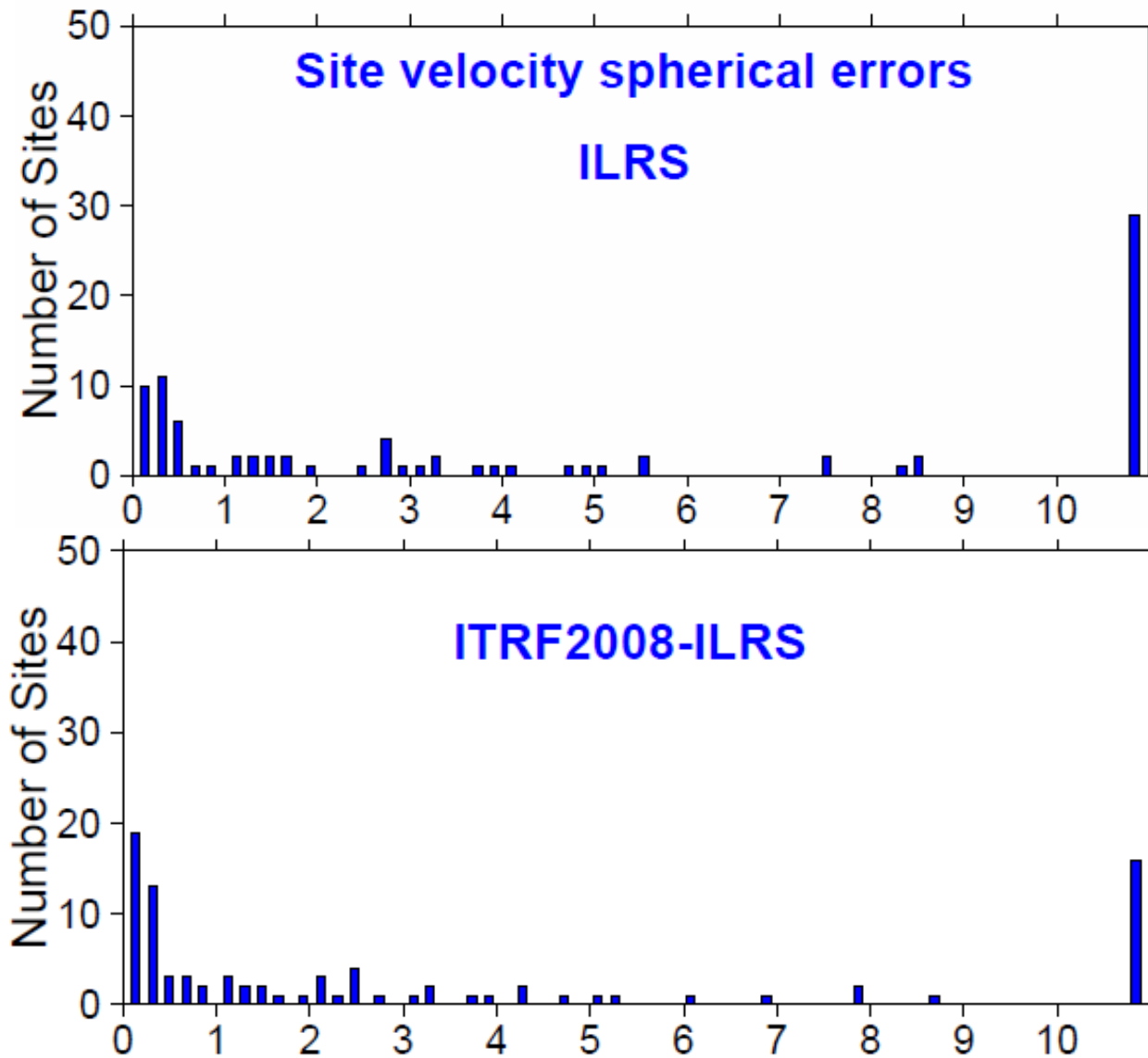
sites 16
 $\sigma = 0.3$ mm/yr



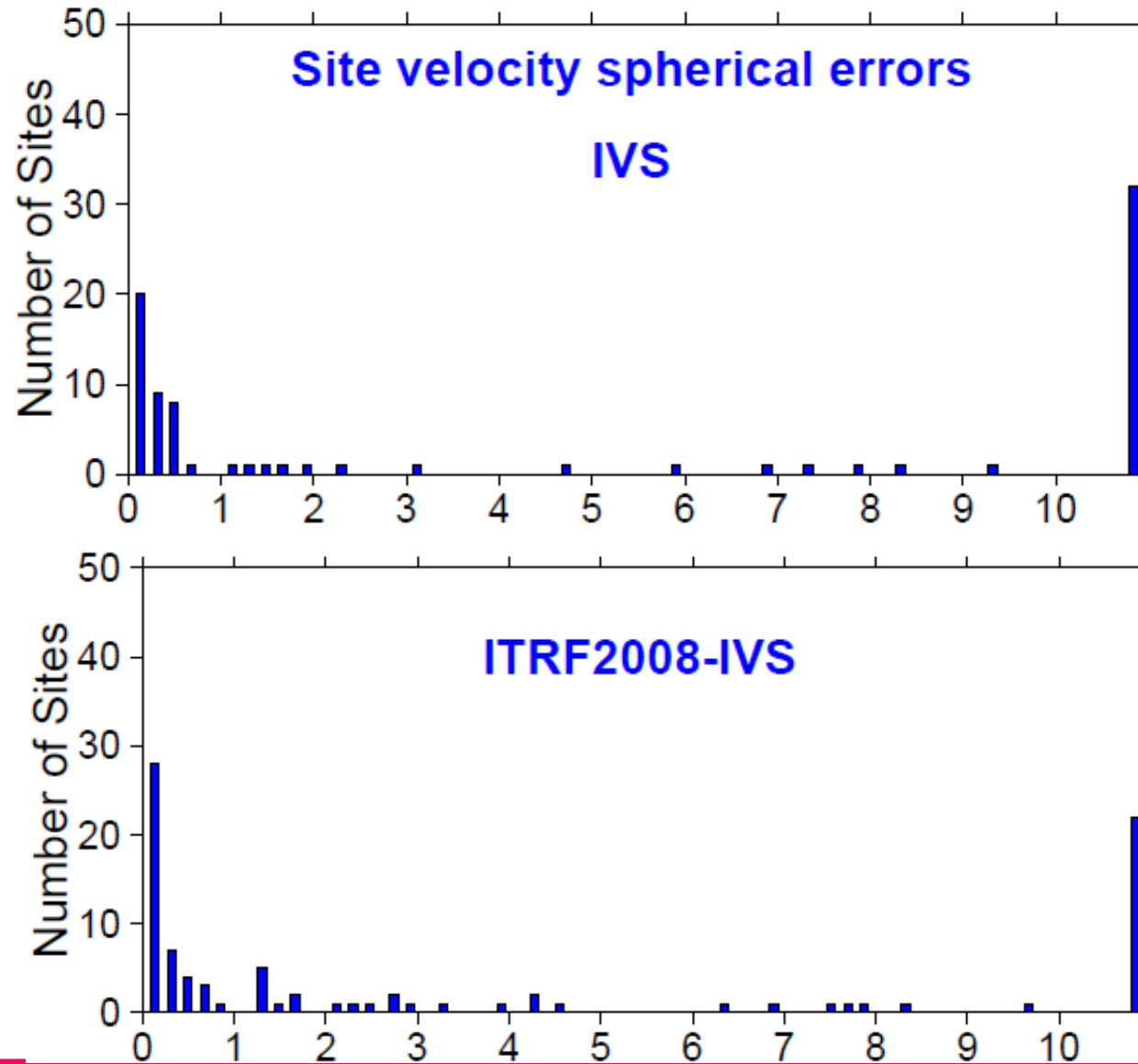
Velocity spherical errors



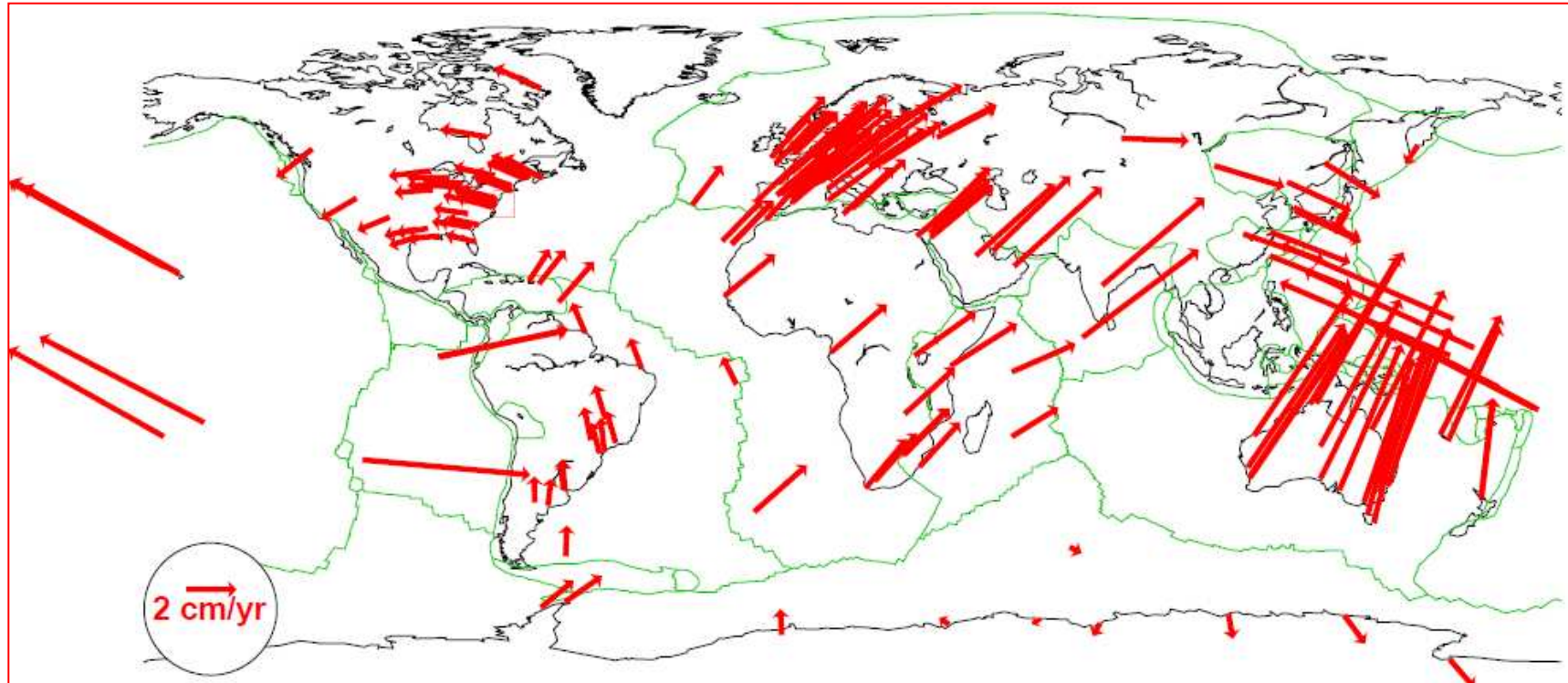
Velocity spherical errors



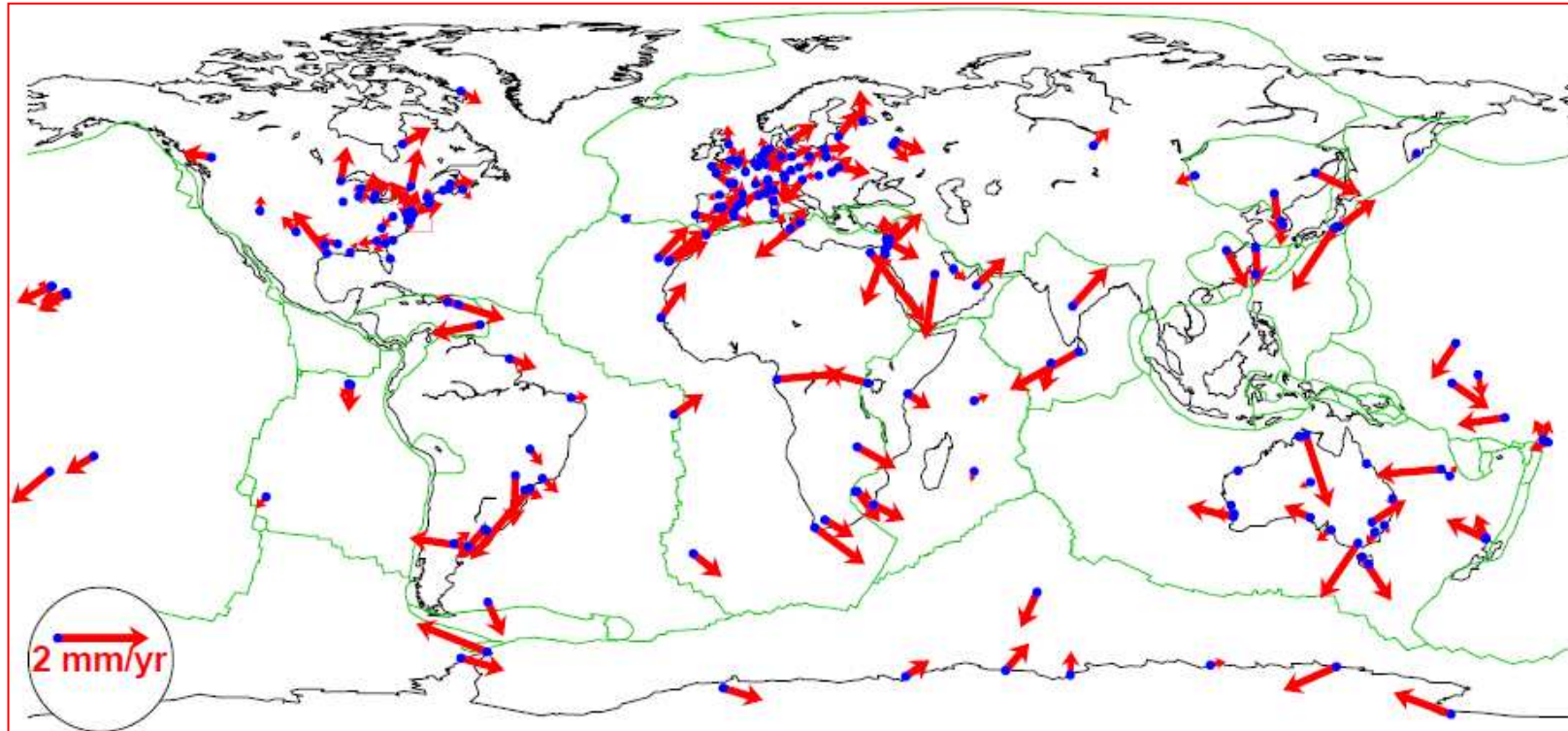
Velocity spherical errors



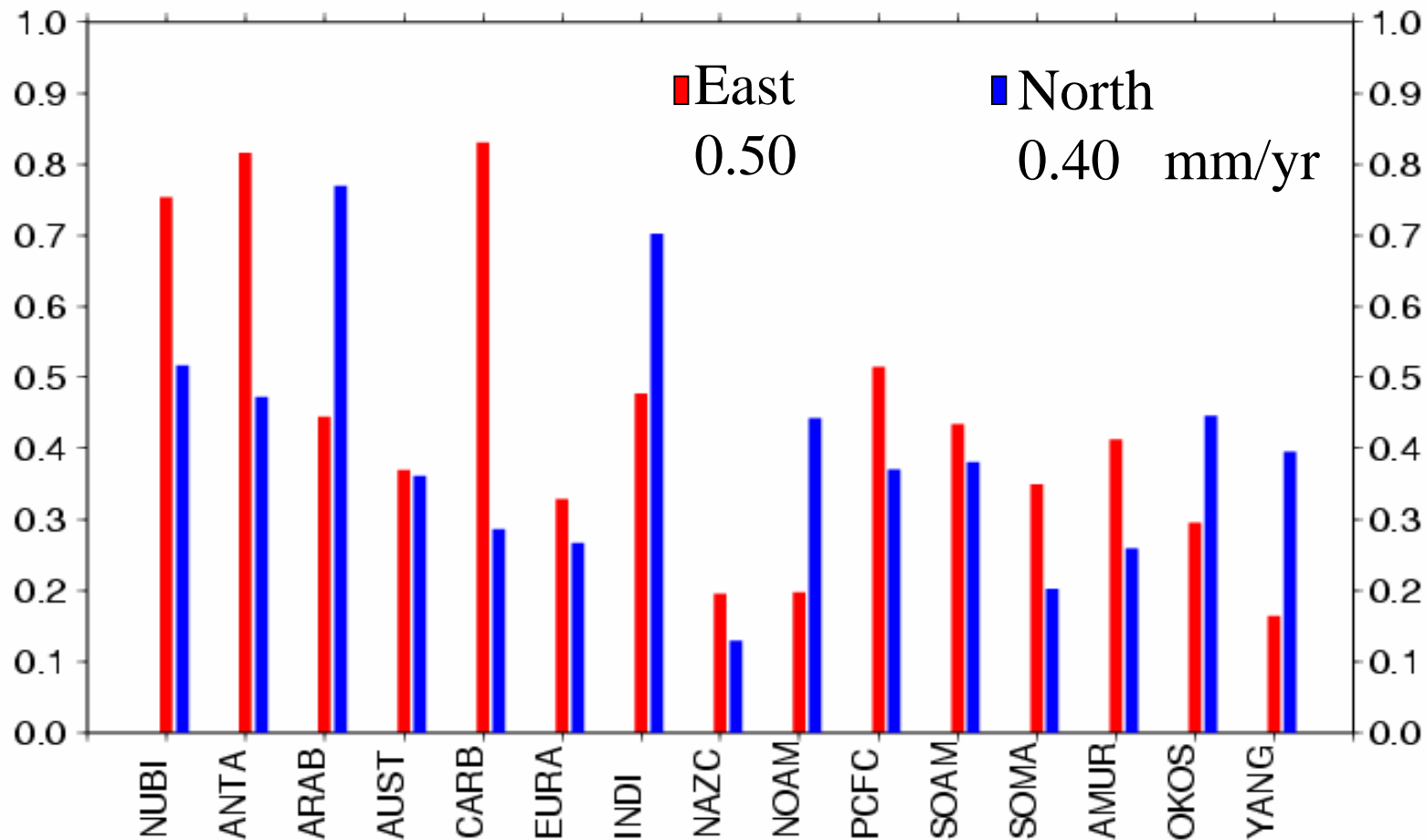
Site velocities used for ITRF2008 PMM



ITRF2008 PMM Post-fit site residuals



WRMS: simultaneous estimate of all plates angular velocities



Comparisons to geological models

Table 3. Rotation rate components from ITRF2008 to models

Model	NS	NP ^a	R_x	R_y	R_z	WRMS	
						E	N
NNR-NUVEL-1A	139	6	0.004	-0.003	0.003	1.1	1.1
±			0.003	0.002	0.003		
NNR-NUVEL-1A	156	7	0.015	-0.010	0.014	1.1	1.1
±			0.003	0.002	0.003		
NNR-MORVEL65	171	12	0.053	-0.015	0.015	1.1	1.1
±			0.002	0.002	0.002		

^a Number of plates. R_x , R_y and R_z are the rotation rate components in mas/yr

The NNR realization uncertainty is about 2 mm/yr

See poster # 4750 for more details

Summary

- **Technique velocity consistencies, via GPS**

Technique	WRMS 2D mm/yr	WRMS UP mm/yr
VLBI	0.3	0.8
SLR	0.5	0.6
DORIS	1.3	1.2

- **VLBI, SLR & DORIS benefit from GPS for site velocities, but probably SG-Tie discrepancies are due to GPS in some sites**
- **Discrepancy mitigation in ITRF computation: down-weighting the ties and relaxing the constraint on velocity equality**
- **Precise ITRF2008 Plate Motion Model: WRMS 0.5 mm/y**
- **Uncertainty of ITRF2008 NNR implicit realization = ~ 2 mm/yr**