Preparation for ITRF2013

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ITRF2013: Status of submissions

- LLR solution from Hanover Univ. but does not comply with ITRF2013 CfP specifications
- IDS: submitted a V0 preliminary solution
- ILRS, IVS: Promised to deliver their solutions by end of April, but now in July!!

- IGS:
  - 5 ACs are ready: ESA, GFZ, CODE, GRGS, ULR
  - EMR, JPL, MIT promised to deliver their solutions by end of May

- Solutions with no NT load corrections

Preparation for ITRF2013 (1/2)

- **Expected Improvements & Developments:**
  - **Reprocessed solutions from the 4 techniques ;**
  - **Revisiting the weighting of Local Ties and Space Geodesy solutions included in the ITRF combination;**
  - **Improving the process of detection of discontinuities in the time series;**
  - **Applying NT-ATML (+) corrections to ITRF2013 input data**
  - **Modeling non-linear station motions:**
    - **Periodic signals (at least annual & semi-annual)**
    - **Co- & Post-seismic deformation**

Preparation for ITRF2013 (2/2)

- **Revisiting the weighting of Local Ties**
  - Use a variance factor per LT SNX, with 3 mm lower bound sigma
  - Weighting as a function of LT and SG agreement
  - down-weighting discrepant ties, iteratively
- **Velocity equalities at co-location sites: as a function of technique uncertainties**
- **Annual & semi annual terms: equal for all stations within the same site**
- **ITRF2013 specifications:**
  - Origin: SLR
  - Scale : average of VLBI & SLR
  - If no change wrt ITRF2008, scale of the latter will be retained
  - Scale rate from GPS could be used!
  - DORIS origin and scale will be evaluated

Data used for this presentation in preparation for ITRF2013

- **Space Geodesy:**

  SLR: ILRS contribution to ITRF2008, extended up to 2013.96 by ILRS operational weekly SNX solutions

  VLBI: GSFC 2011b session-wise solutions: 1983-2013.9

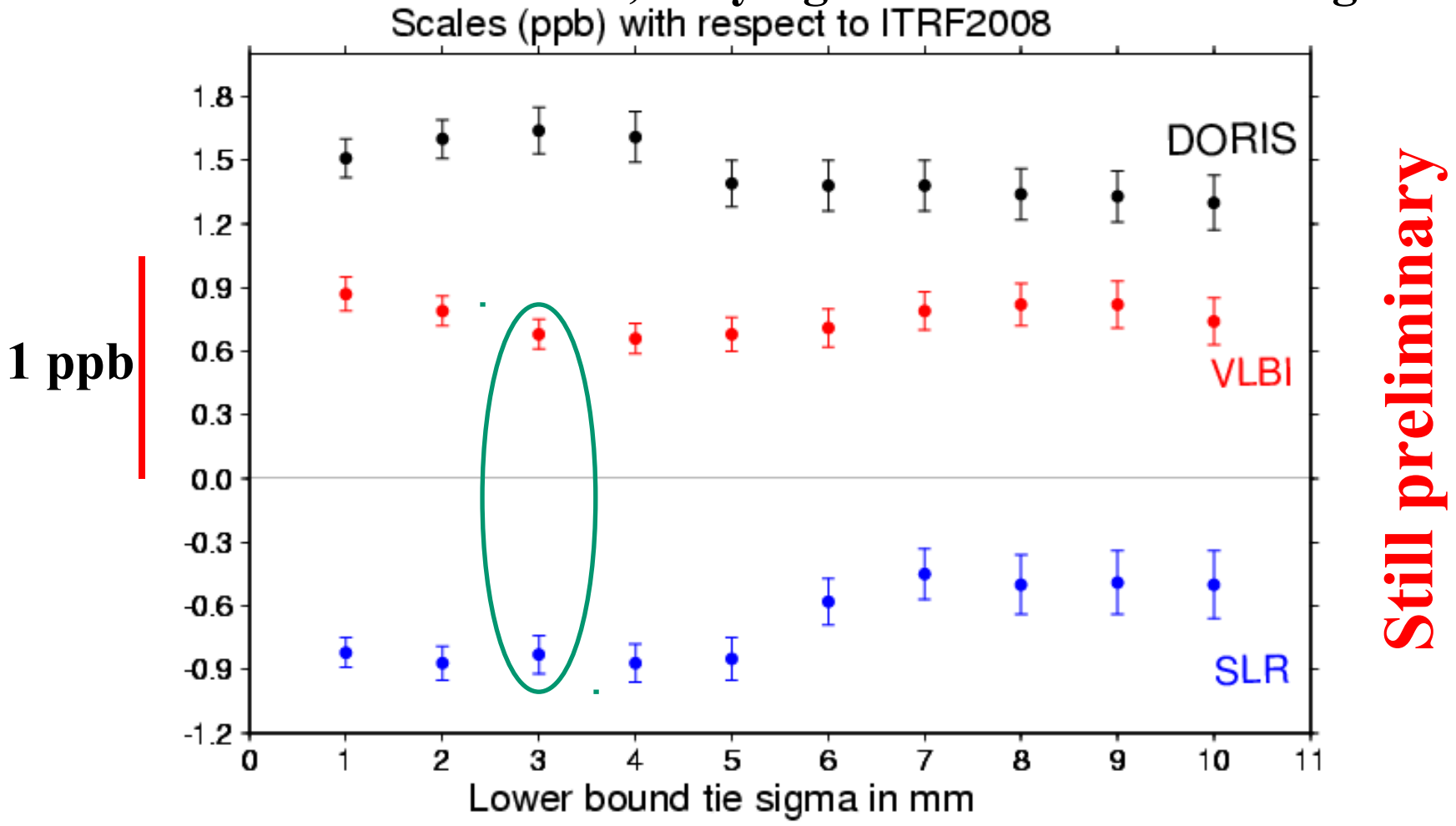
  GNSS: IGS repro1 weekly solutions extended up to 2003.9 with IGS operational weekly solutions

  DORIS: IDS03v0 preliminary solution

- **Local ties: ITRF2008 local ties + few new ties**

Scale Factors of VLBI, SLR & DORIS wrt ITRF2008

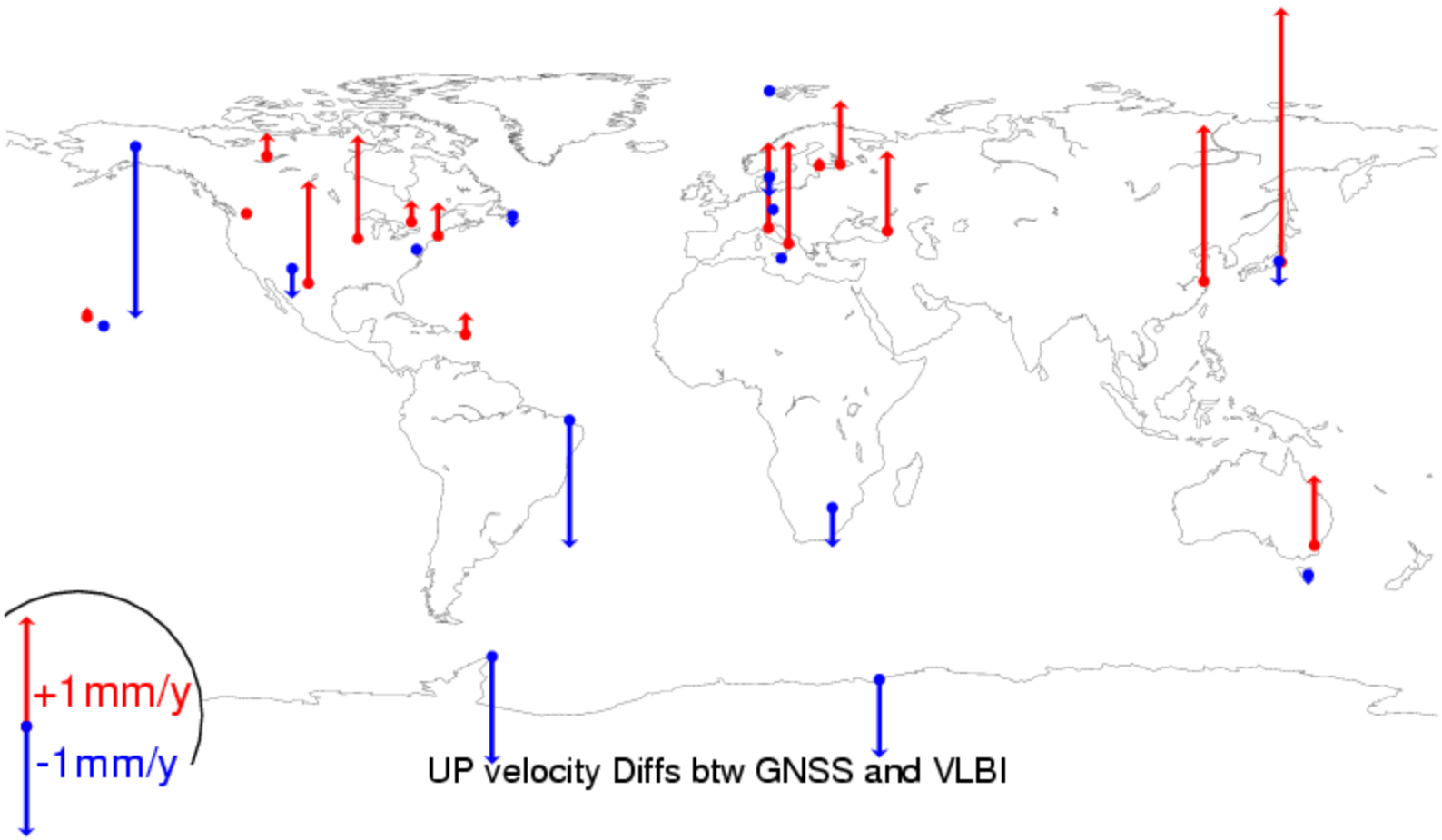
Ten combination tests, varying the lower bound tie sigma



3 mm as lower bound tie sigma is used in this analysis

GNSS & VLBI vertical velocity discrepancies

Formal error ± 0.3 mm/yr



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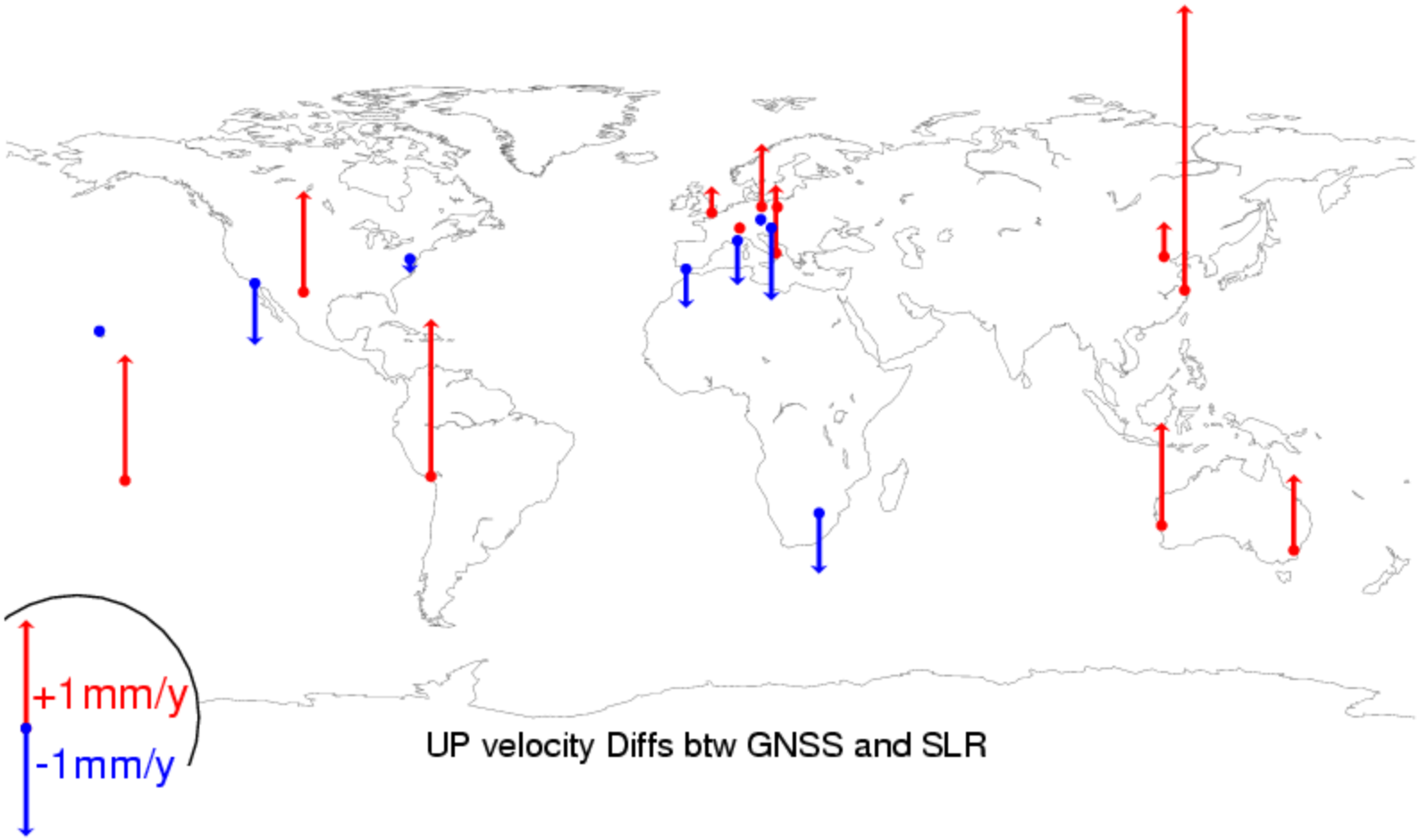
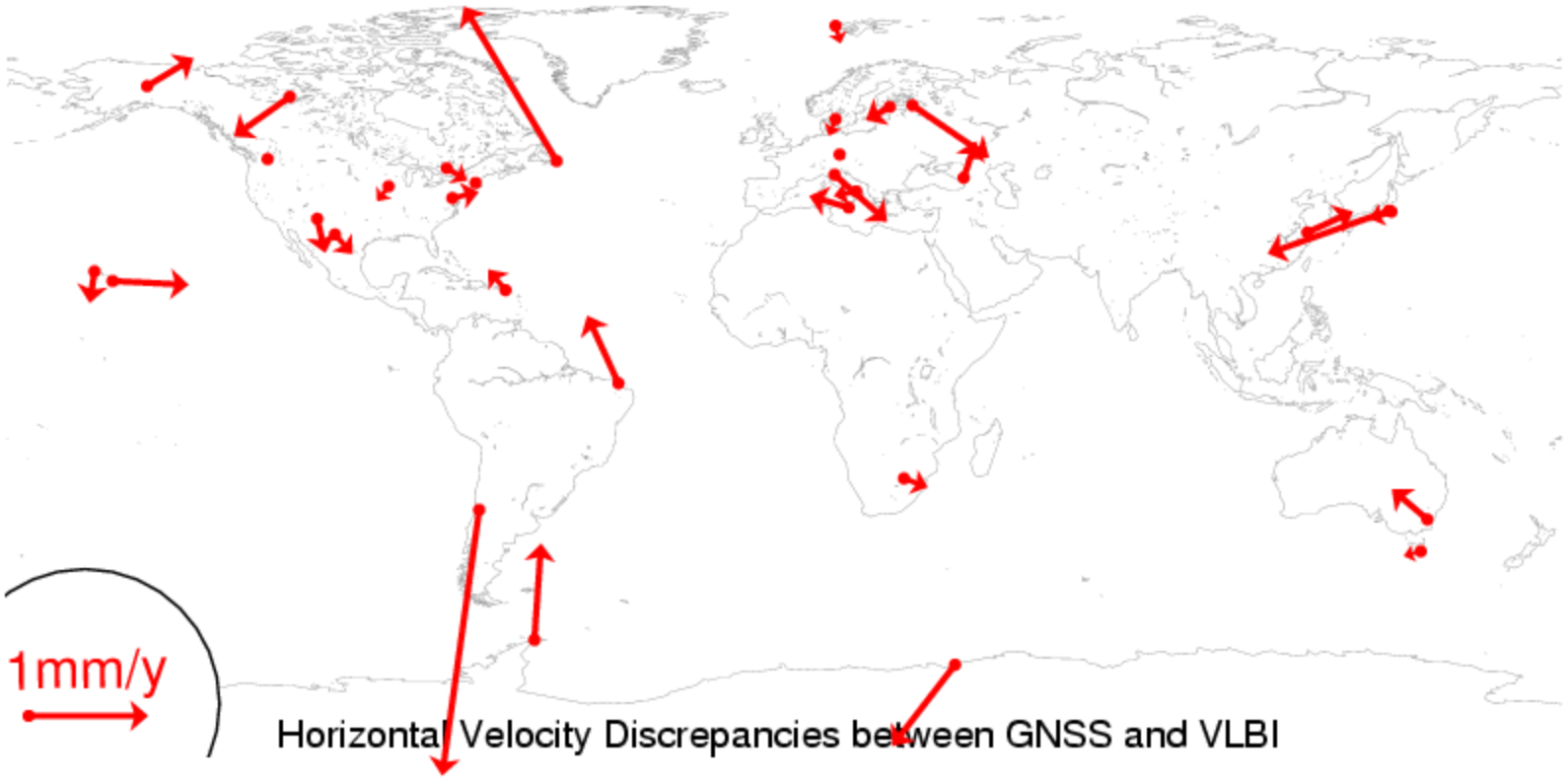
GNSS & SLR vertical velocity discrepancies

Formal error ± 0.3 mm/yr



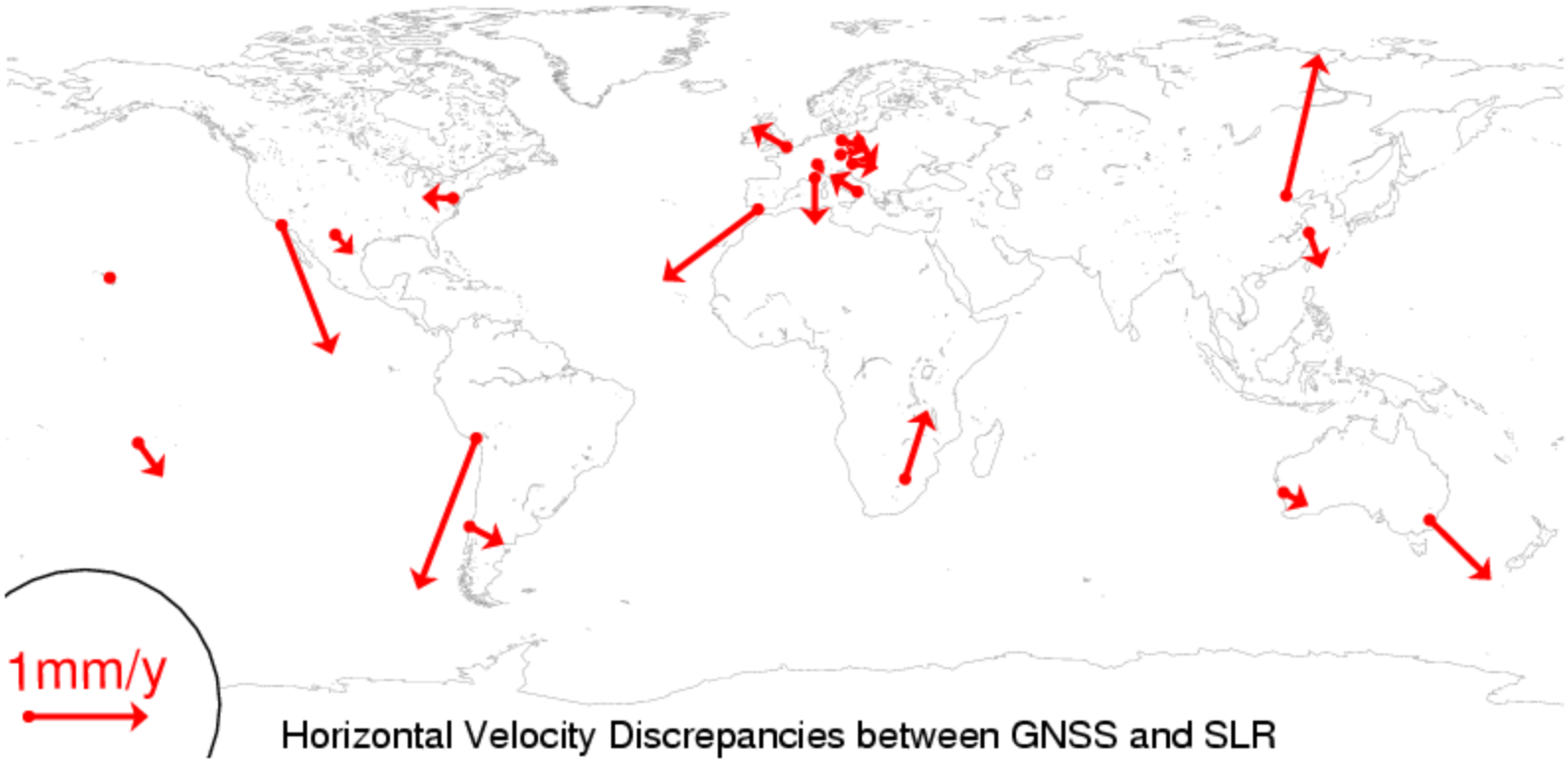
GNSS & VLBI horizontal velocity discrepancies

Formal error ± 0.2 mm/yr



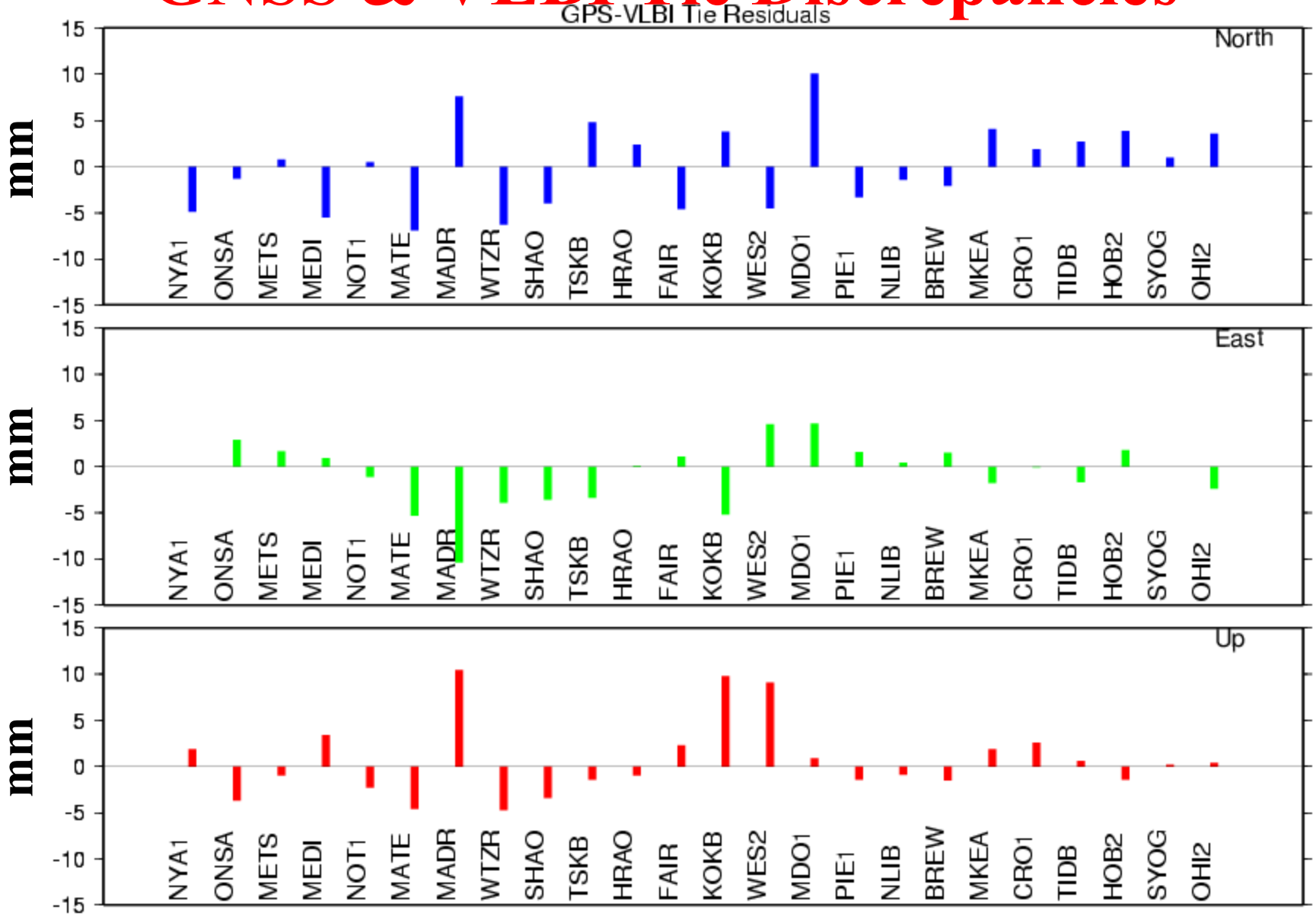
GNSS & SLR horizontal velocity discrepancies

Formal error ± 0.2 mm/yr

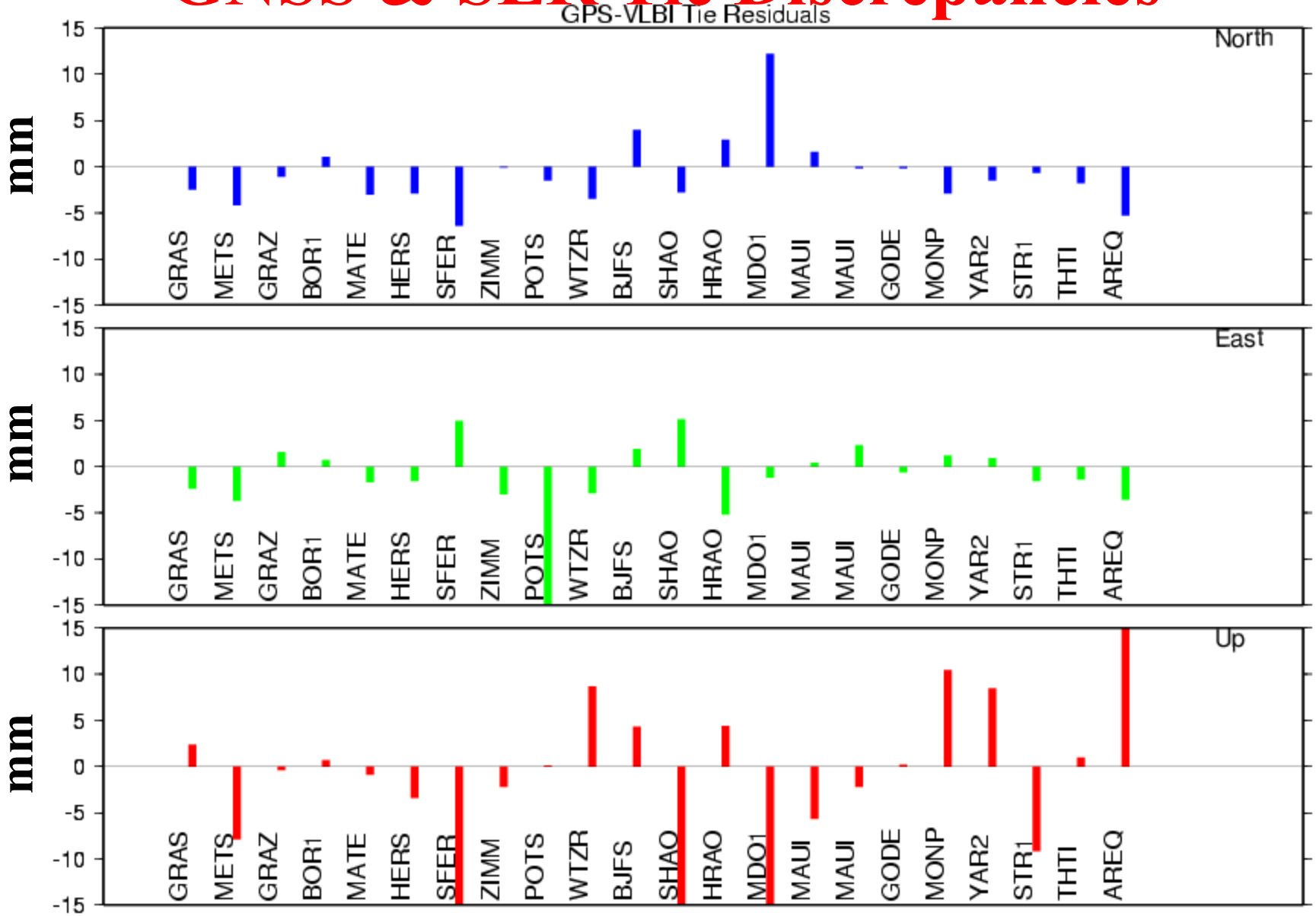


Horizontal Velocity Discrepancies between GNSS and SLR

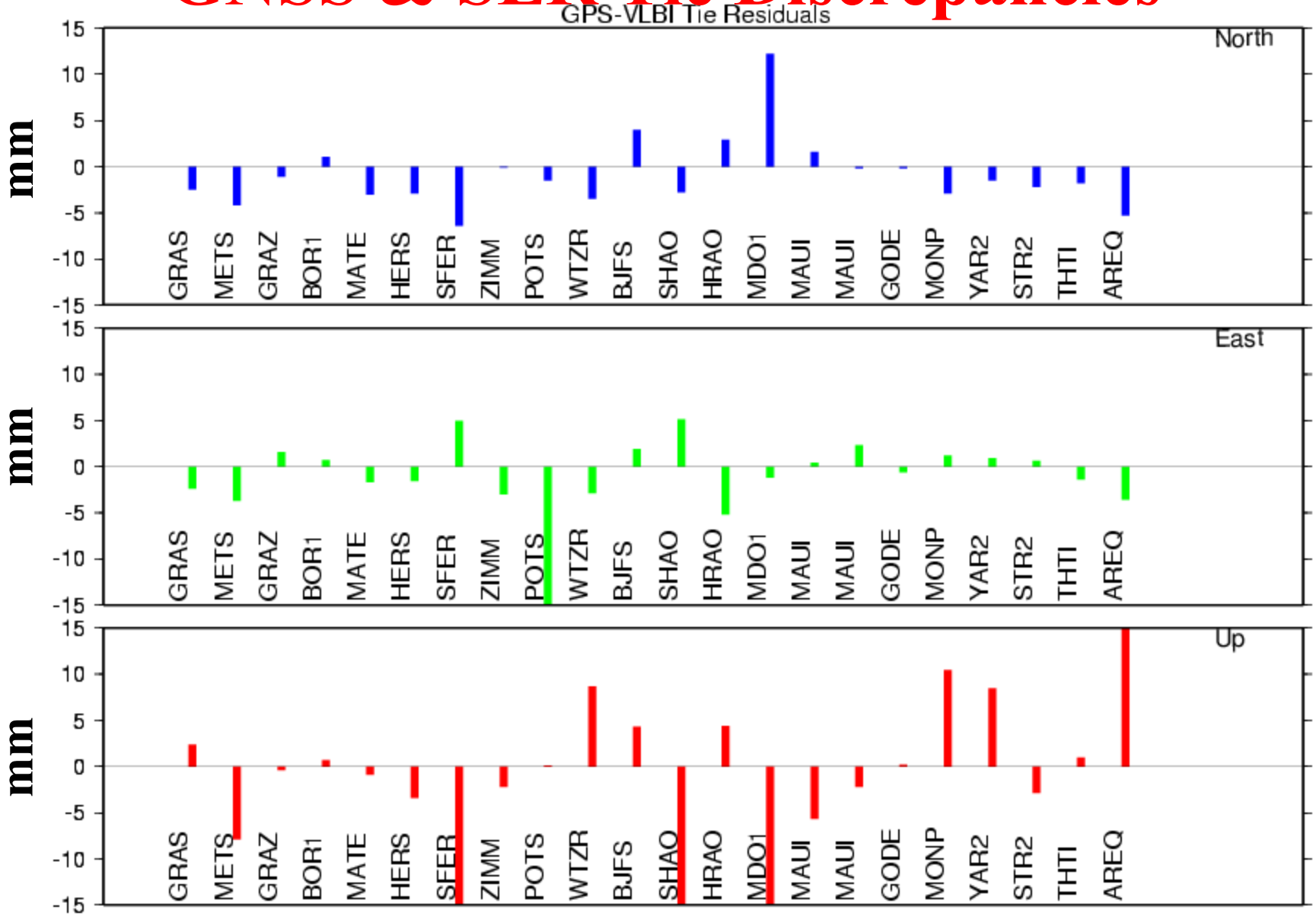
GNSS & VLBI Tie Discrepancies



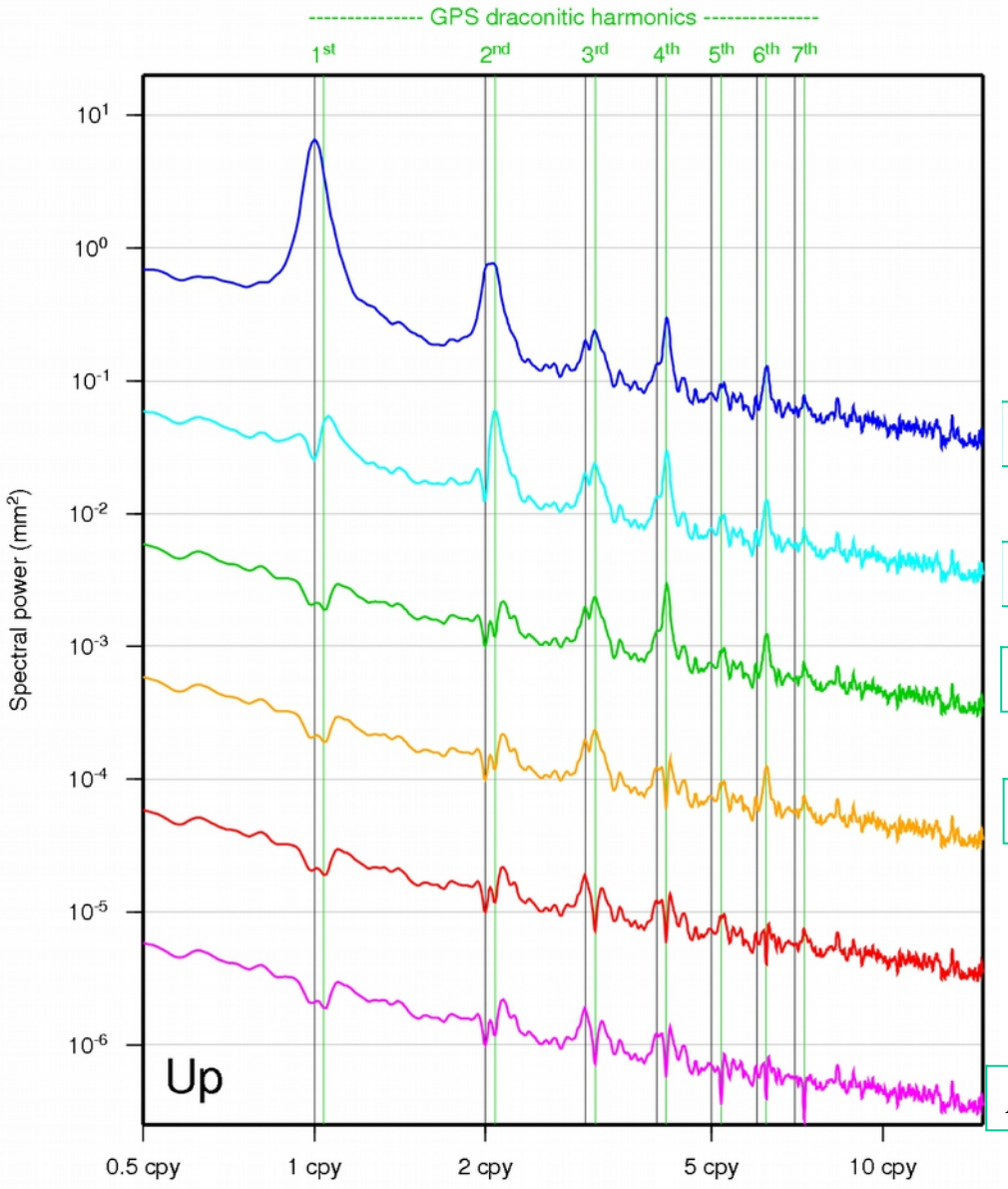
GNSS & SLR Tie Discrepancies



GNSS & SLR Tie Discrepancies



IGS station position Up residuals: stacked periodogram



Standard solution

Annual + SemiA

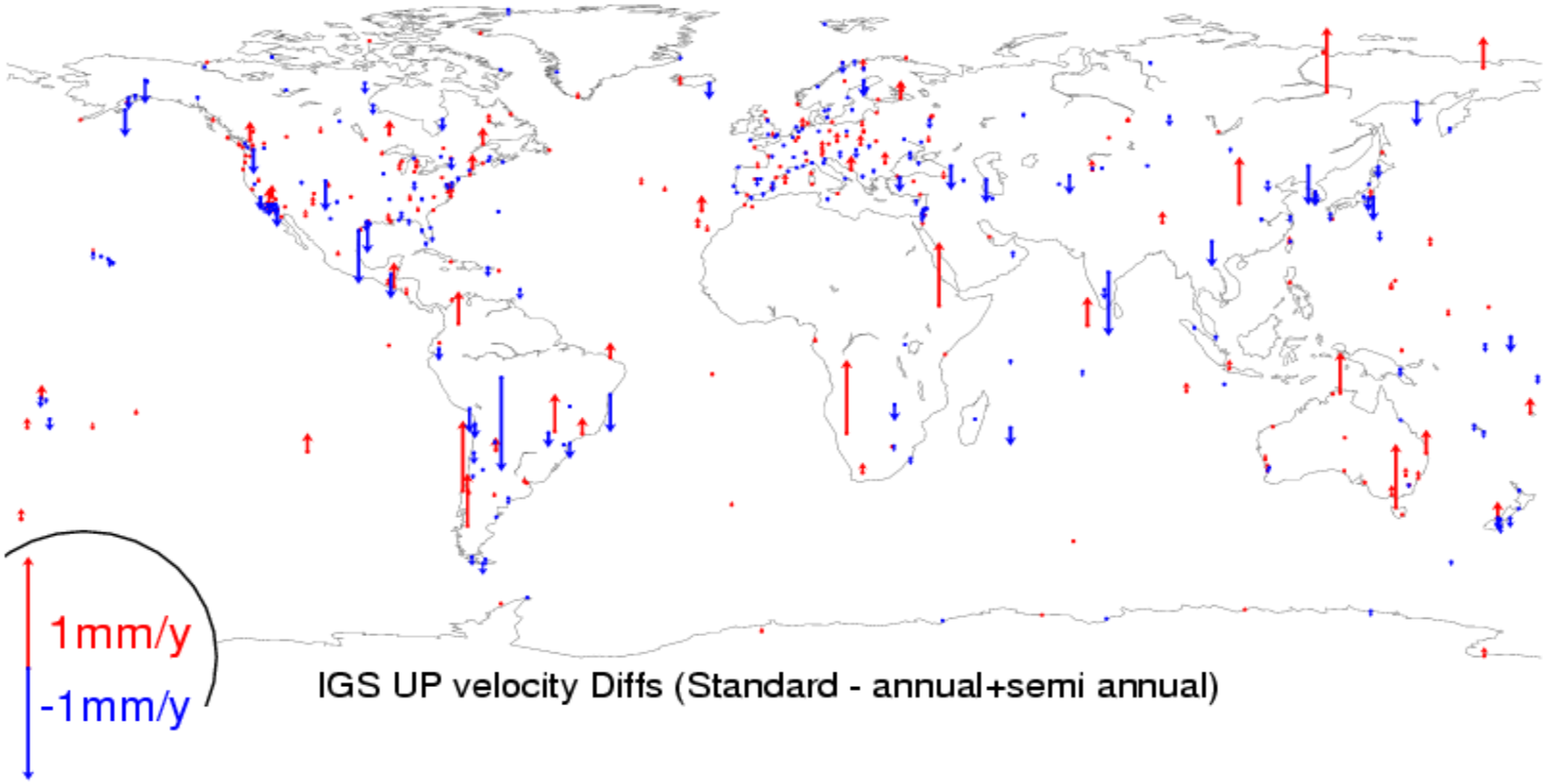
(+1st +2nd dracs)

(+1st +2nd +4th dracs)

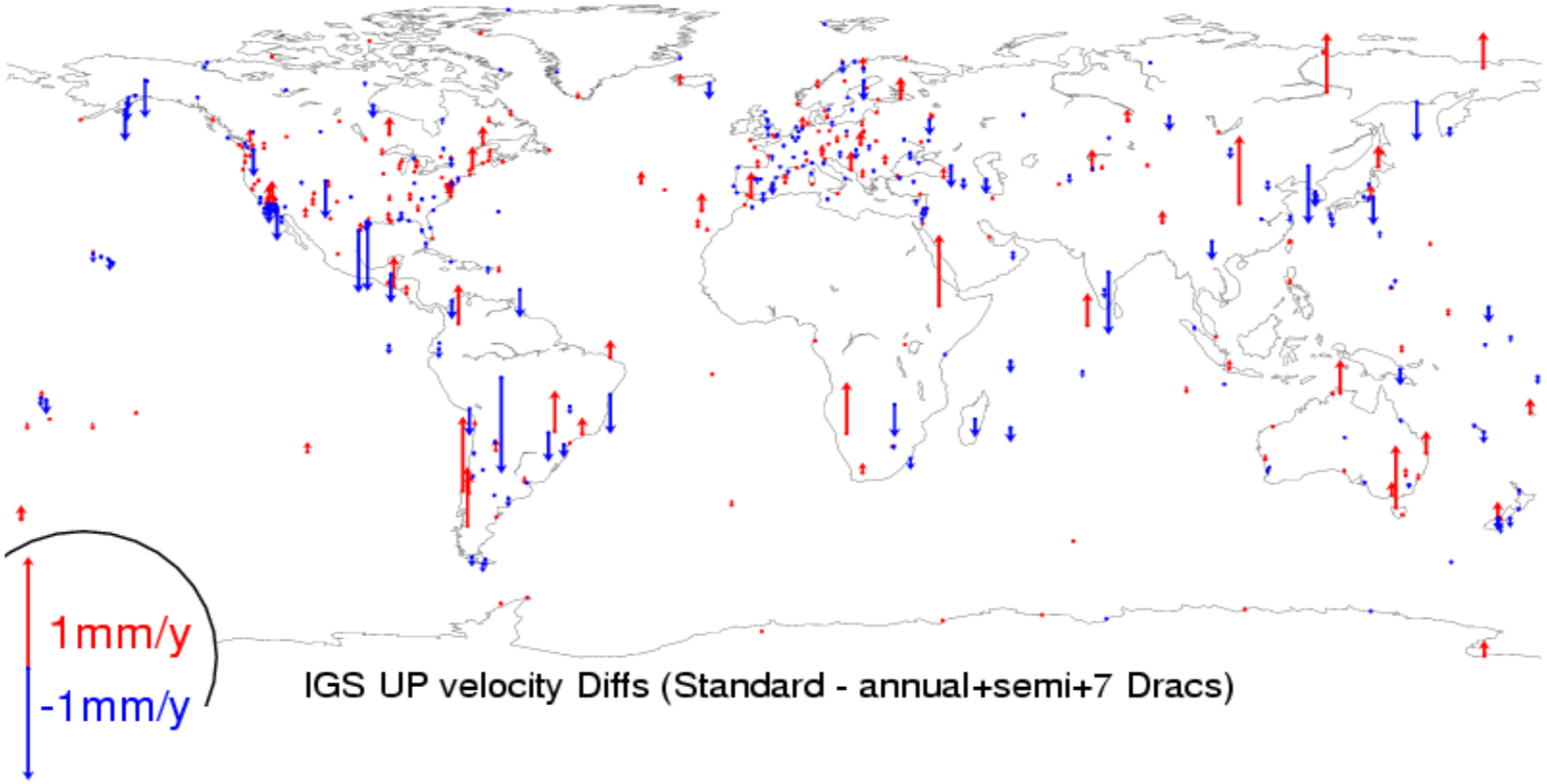
(+3rd+6th dracs)

Annual + SemiA + 7 dracs

IGS Vertical velocity differences (Standard – Annual+Semi-Annual)



IGS Vertical velocity differences
(Standard – Annual+Semi-A+ 7 dracs)



Parametric post seismic models

Parametric models for postseismic displacements :

$$\forall i \in \{E, N, U\}, X_i(t) =$$

$$\begin{cases} X_1(t_0) + V_1 \times (t - t_0) & , \quad t < t_{eq} \\ X_2(t_{eq}) + V_2 \times (t - t_{eq}) + D(t - t_{eq}), & t > t_{eq} \end{cases}$$

Parametric postseismic models use logarithmic or exponential functions :

$D(t - t_{eqk})$ with

$$D(t - t_{eqk}) = A \; log(1 + \frac{t - t_{eqk}}{\tau}) \tag{1}$$

or

$$D(t - t_{eqk}) = A \; (1 - e^{-\frac{t - t_{eqk}}{\tau}}) \tag{2}$$

[e.g. : Kreemer et al., 2006]

or

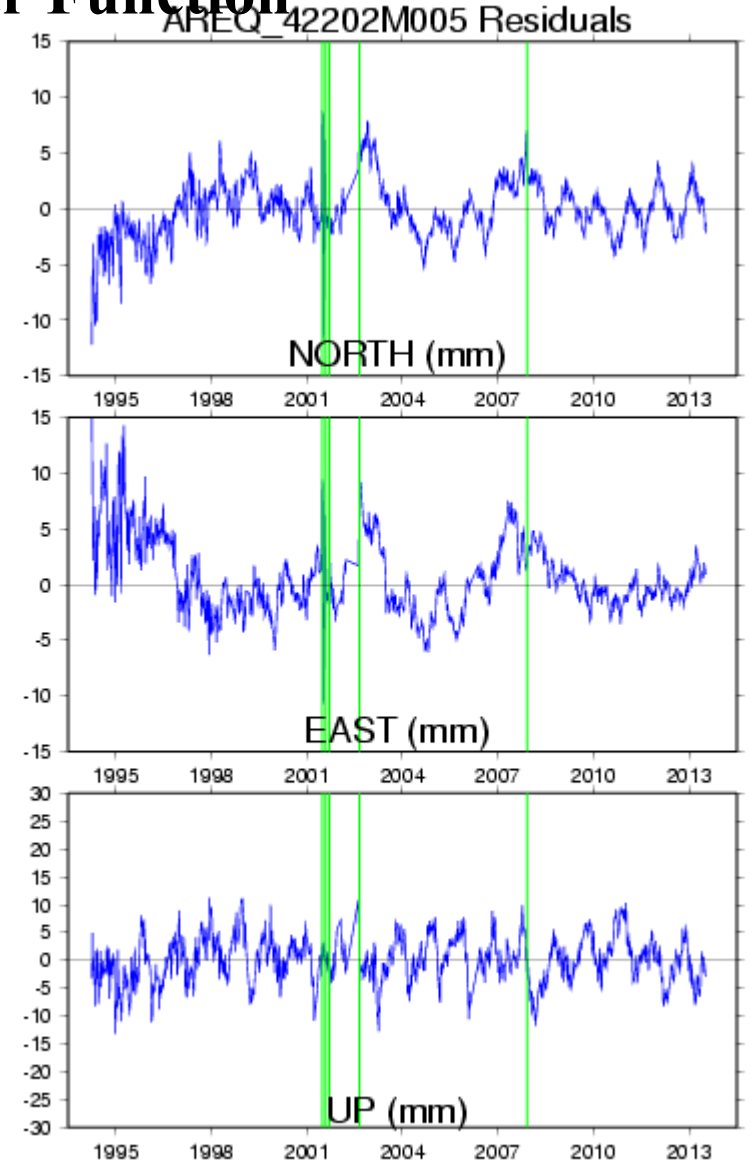
$$D(t - t_{eqk}) = A_1 \; log(1 + \frac{t - t_{eqk}}{\tau_1}) + A_2 \; (1 - e^{-\frac{t - t_{eqk}}{\tau_2}}) \tag{3}$$

or

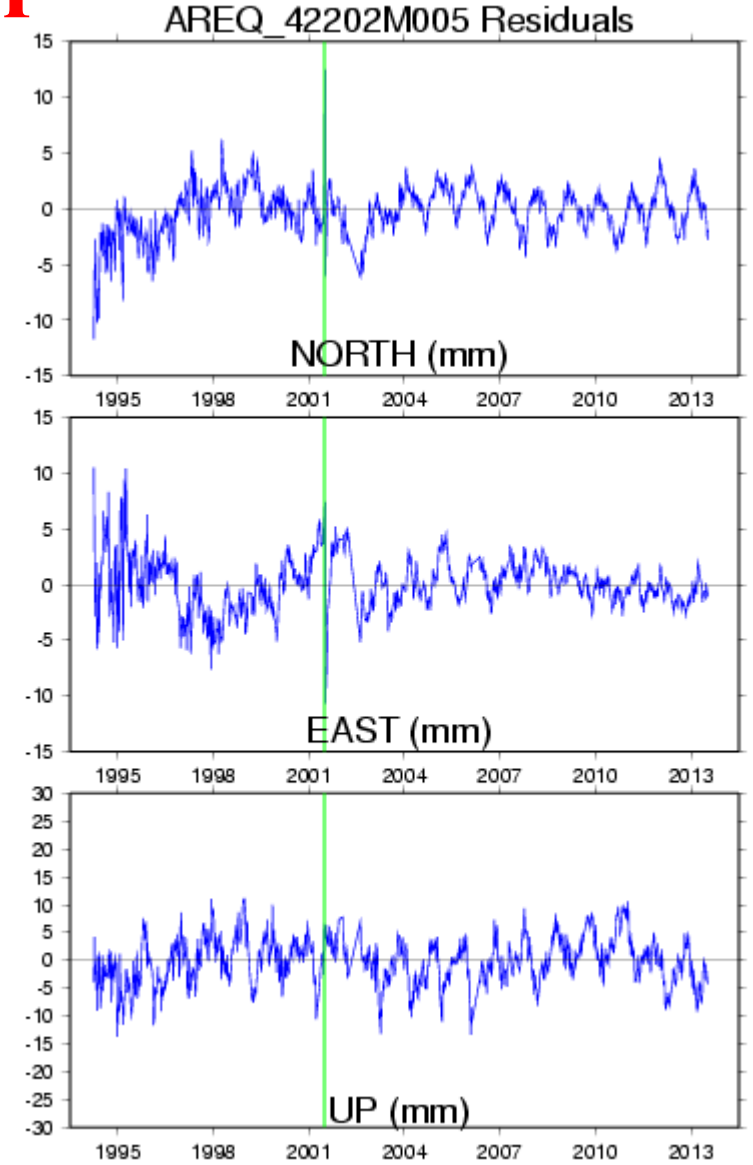
$$D(t - t_{eqk}) = A_1 \; (1 - e^{-\frac{t - t_{eqk}}{\tau_1}}) + A_2 \; (1 - e^{-\frac{t - t_{eqk}}{\tau_2}}) \tag{4}$$

Arequipa

Linear Function



Parametric Model



See Poster 16750 by Lercier et al.

Conclusion

Waiting for submissions to be complete!