



VIENNA UNIVERSITY OF TECHNOLOGY
DEPARTMENT OF GEODESY
AND GEOINFORMATION

GIA Effects on VLBI Scale Rate

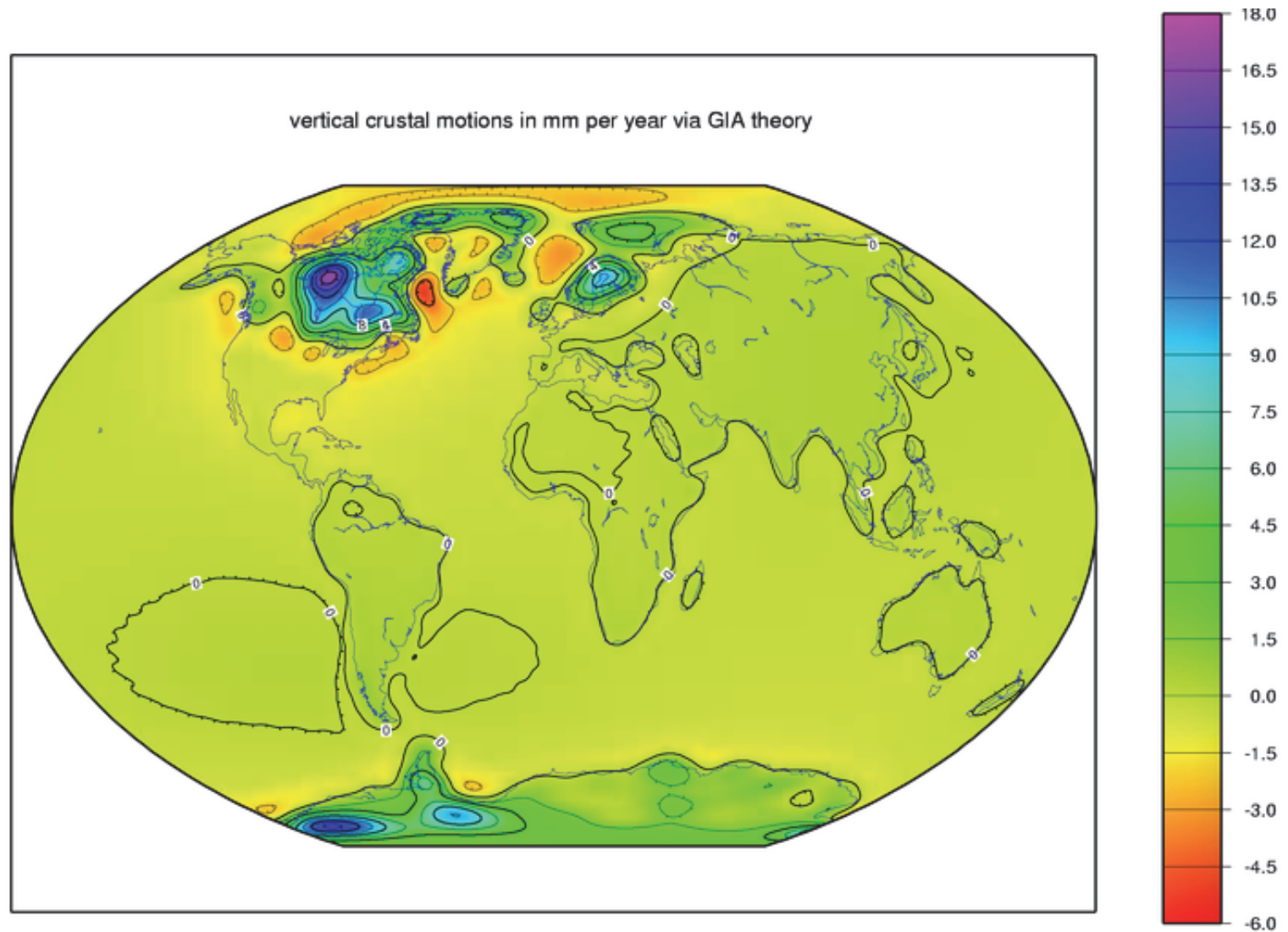
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UAW, Pasadena, 27/28 June 2014

Hypotheses

- VLBI sites in regions of Glacial Isostatic Adjustment (GIA) causes a positive VLBI scale rate if not corrected a priori
- If the distribution of SLR sites is different, this will cause a different scale rate for SLR

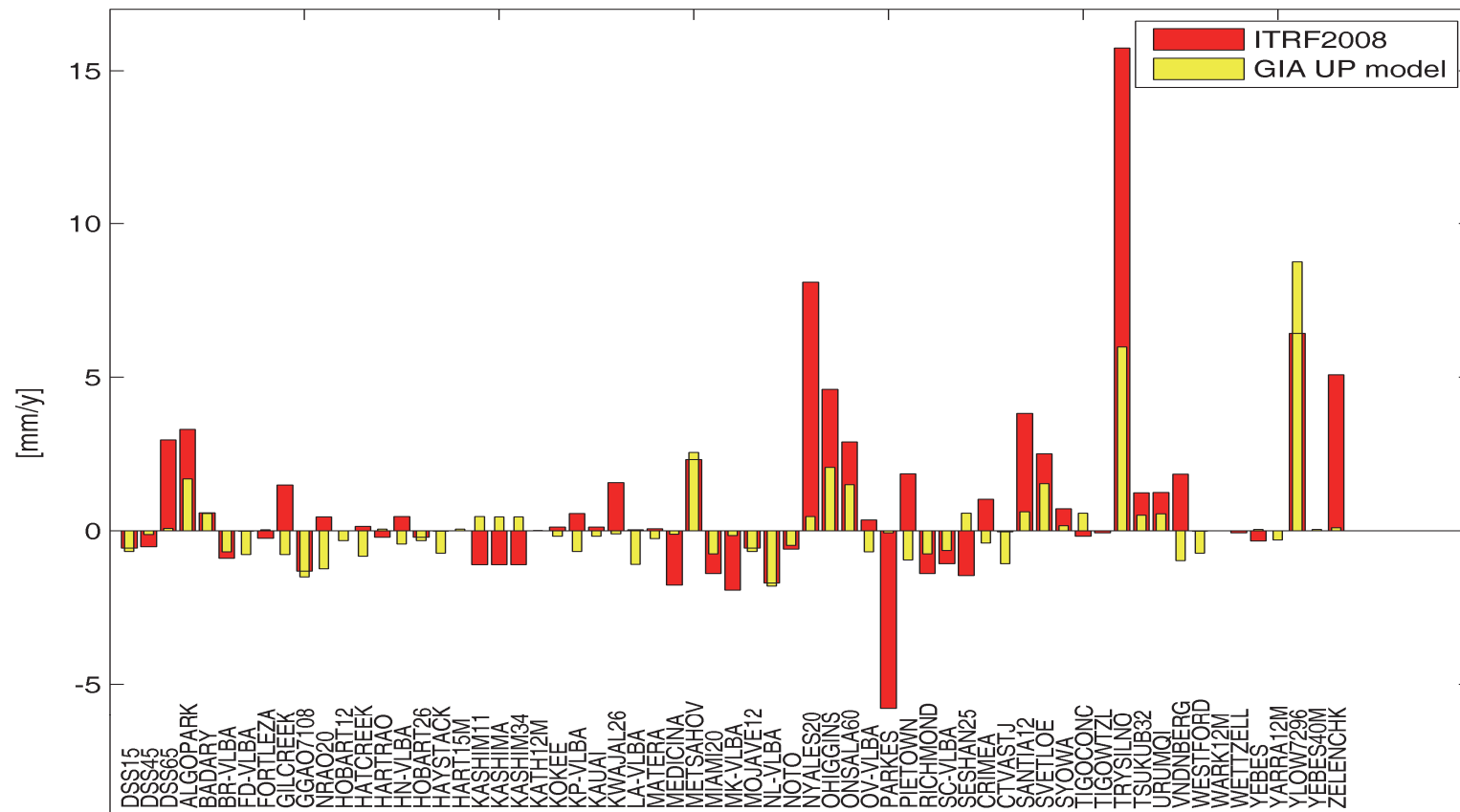
Vertical Crustal Motion



Paulson 2007

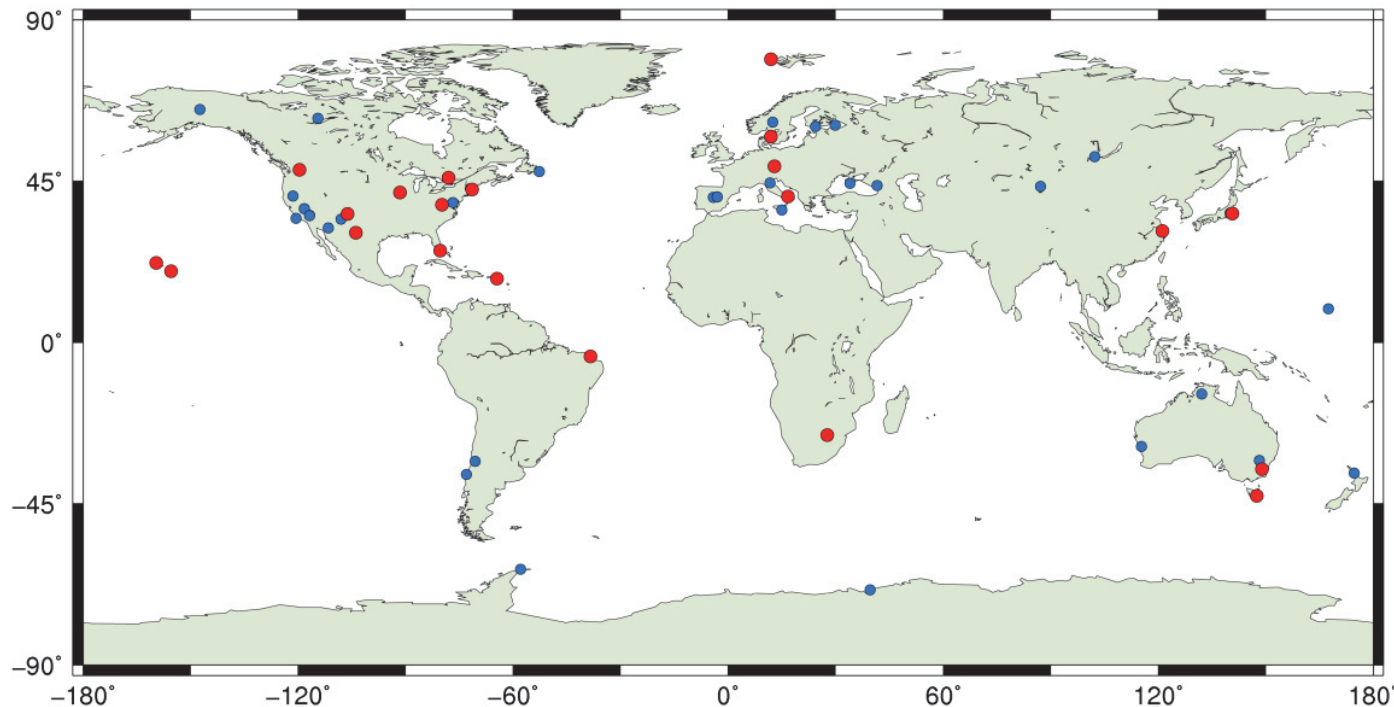
GIA uplift rates

- Vertical rates in ICE-5G VM2 (Dick Peltier, 2012) compared to ITRF2008 vertical rates



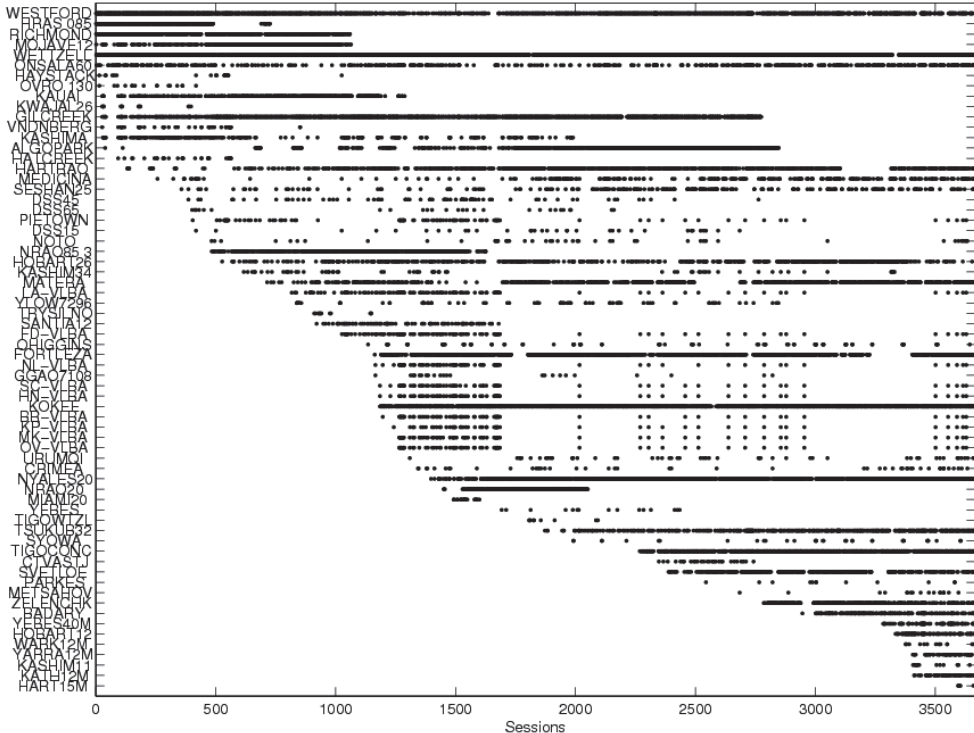
VLBI global solutions (TRF/CRF/EOP)

- 3700 sessions (1984-2013.3)
- 66 stations (22 datum stations)
- 871 sources (285 datum sources)



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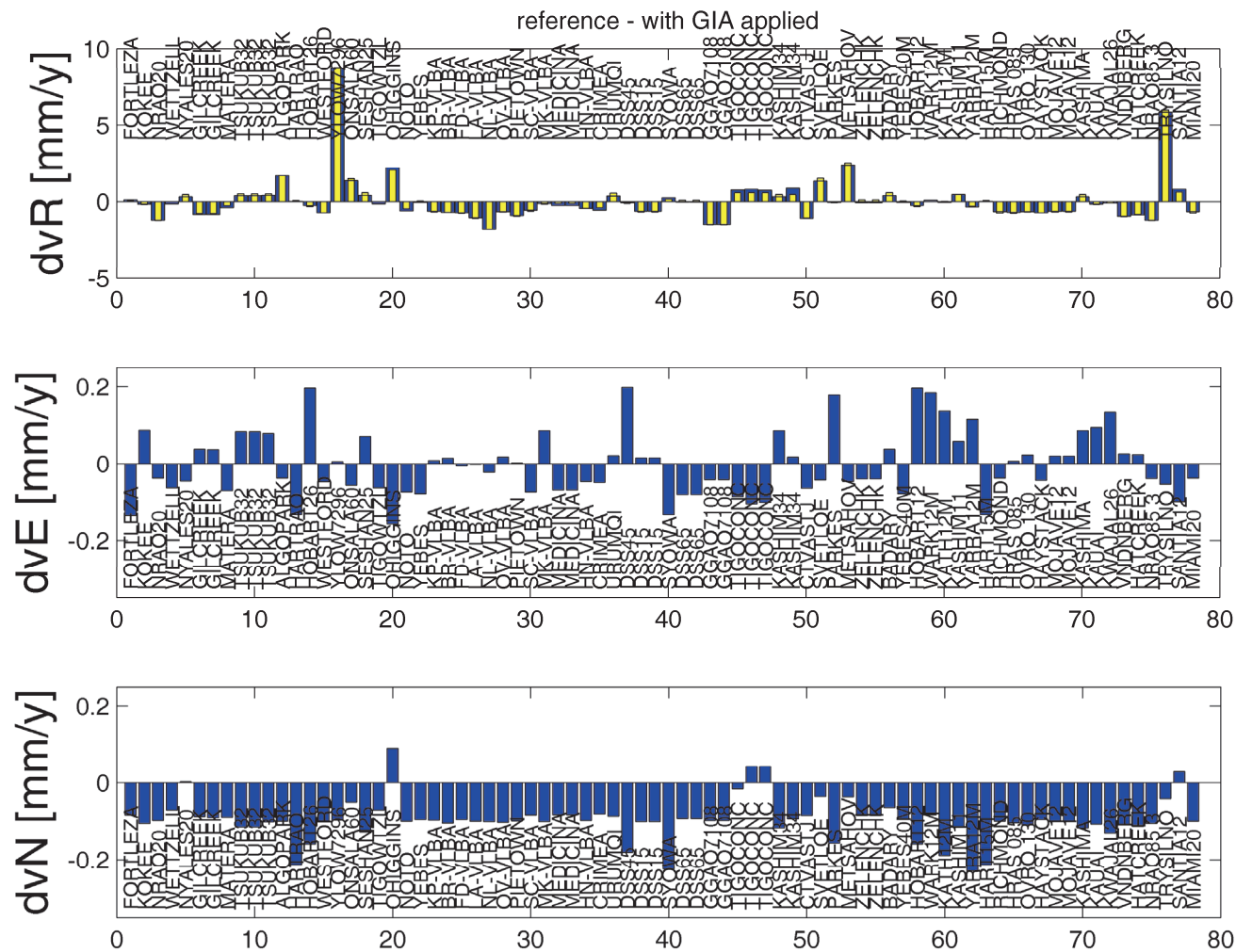
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VLBI global solutions (TRF/CRF/EOP)

- Solution 1: Usual parameterization
- Solution 2: GIA uplift rates were applied a priori: the reference epoch is the midpoint for each site

Difference in velocities (S1 - S2)



a priori GIA
rates

Helmert Parameters between S1 and S2

Tx	mm	0.74 ± 0.40
Ty	mm	-0.56 ± 0.40
Tz	mm	0.18 ± 0.38
Rx	mas	0.01 ± 0.02
Ry	mas	0.01 ± 0.02
Rz	mas	0.00 ± 0.01
scale	mm	-1.14 ± 0.38
dTx	mm/y	0.05 ± 0.40
dTy	mm/y	0.12 ± 0.40
dTz	mm/y	-0.09 ± 0.38
dRx	mas/y	-0.00 ± 0.02
dRy	mas/y	0.00 ± 0.02
dRz	mas/y	0.00 ± 0.01
dscale	mm/y	0.10 ± 0.38

- Difference in scale rate: 0.1 mm/year (= mean of applied uplift rates)
- Formal uncertainty: ± 0.38 mm/year driven by spatial sampling of vertical rates

Conclusions and Outlook

- (Neglected) GIA contributes to VLBI scale rate at the level of 0.1 mm/year
- What is the contribution for the SLR (and GNSS) scale rate?