Current status of publicly available atmospheric mass loading products

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Acknowledgements

- Data for this analysis provided by H. Kierluf (IERS/SBL), P. Gegout, L. Petrov, H.-G. Scherneck, and R. Ray
- GAMIT analysis P. Tregoning

Motivation I

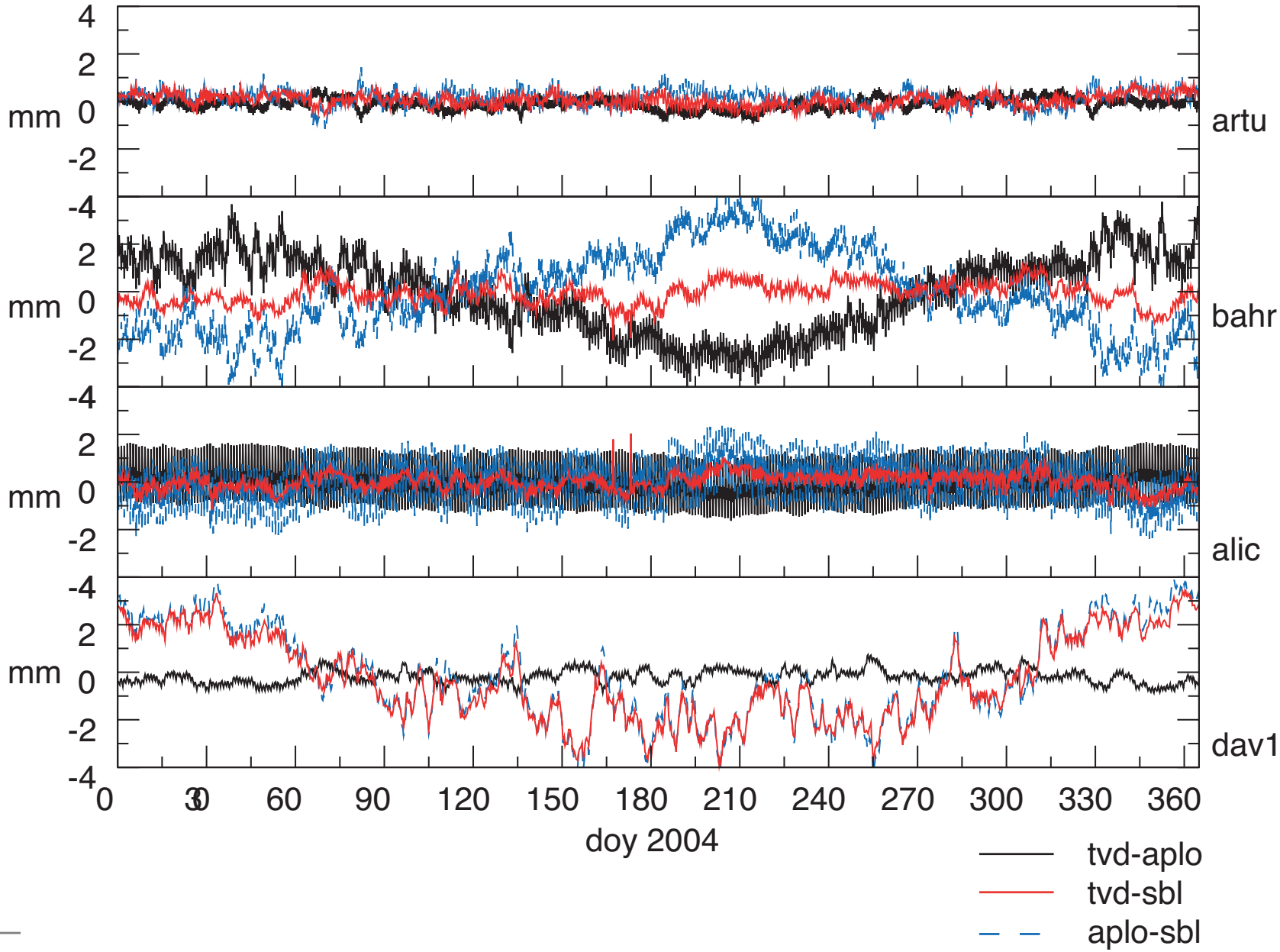
- ATML causes observable displacements of the earth's surface
- Presentation is simply a comparison of available ATML loading predictions
- No less than 5 sources available for obtaining predicted ATML
  - TVD
  - APLO (operational/near real time)
  - SBL (operational/near real time)
  - Pascal Gegout
  - Hans-Georg Scherneck

Motivation II

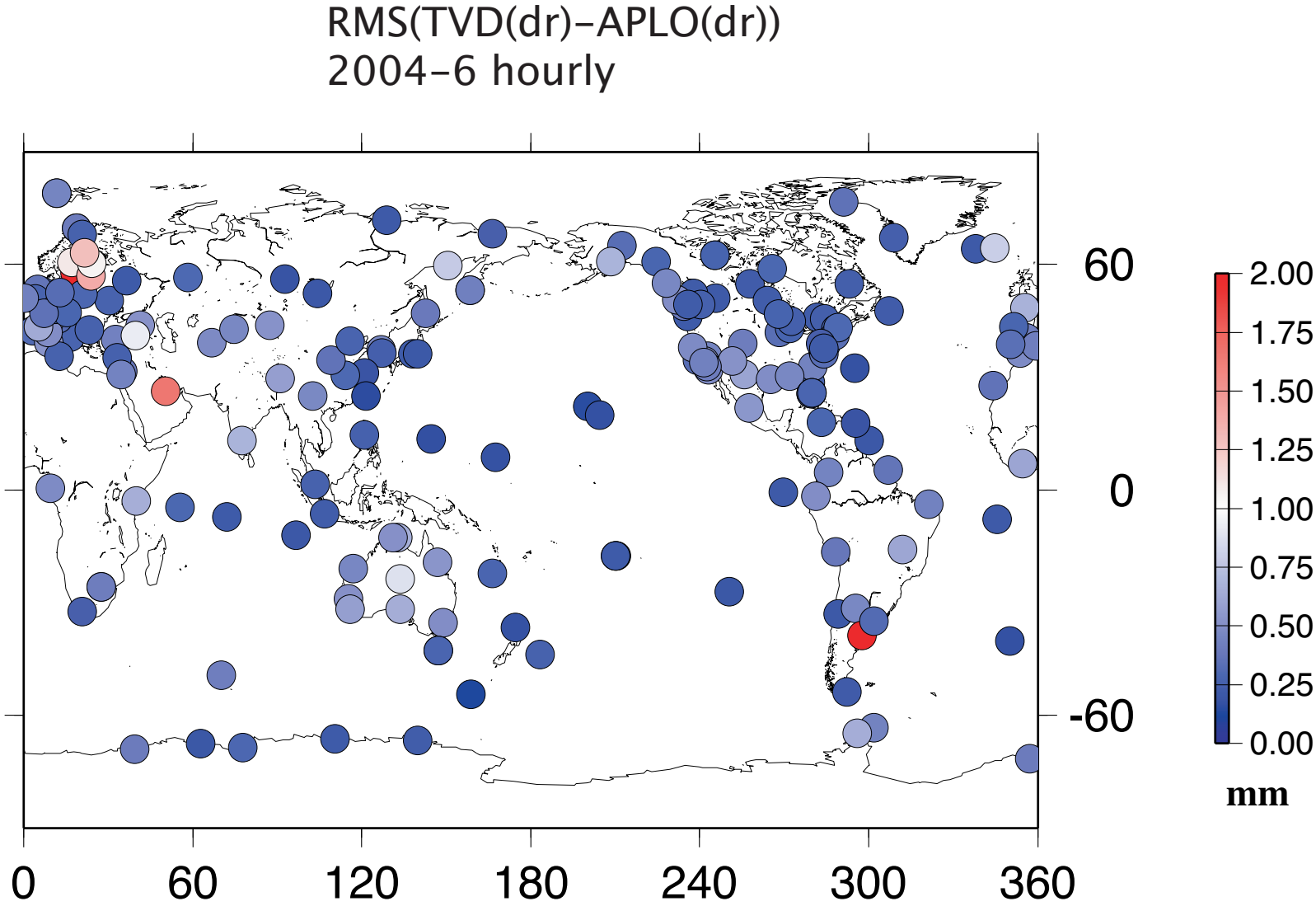
- Differences in products exist due to modeling and input data differences
- Which differences are really important?

Service	Time Series versus Grids	Pressure Data Set Resolution(deg)	Surface	Earth Model	Tides	Method
SBL-OP	GG and TS	ECMWF	SLP	G-B	N	GC
SBL-Res	TS	ECMWF	SLP	G-B	N	GC
APLO	TS	NCEPR($2.5°$)	SFCP	PREM	Y	GC
TVD	GG and TS	NCEPR ($2.5°$)	SFCP	G-B	Y/N	GC
PG	GG and TS	NCEPR/ ECMWF (l=512)	SFCP	PREM	N	SH
HGS	TS	ECMWF($1.0°$)	SFCP	G-B	N	GC

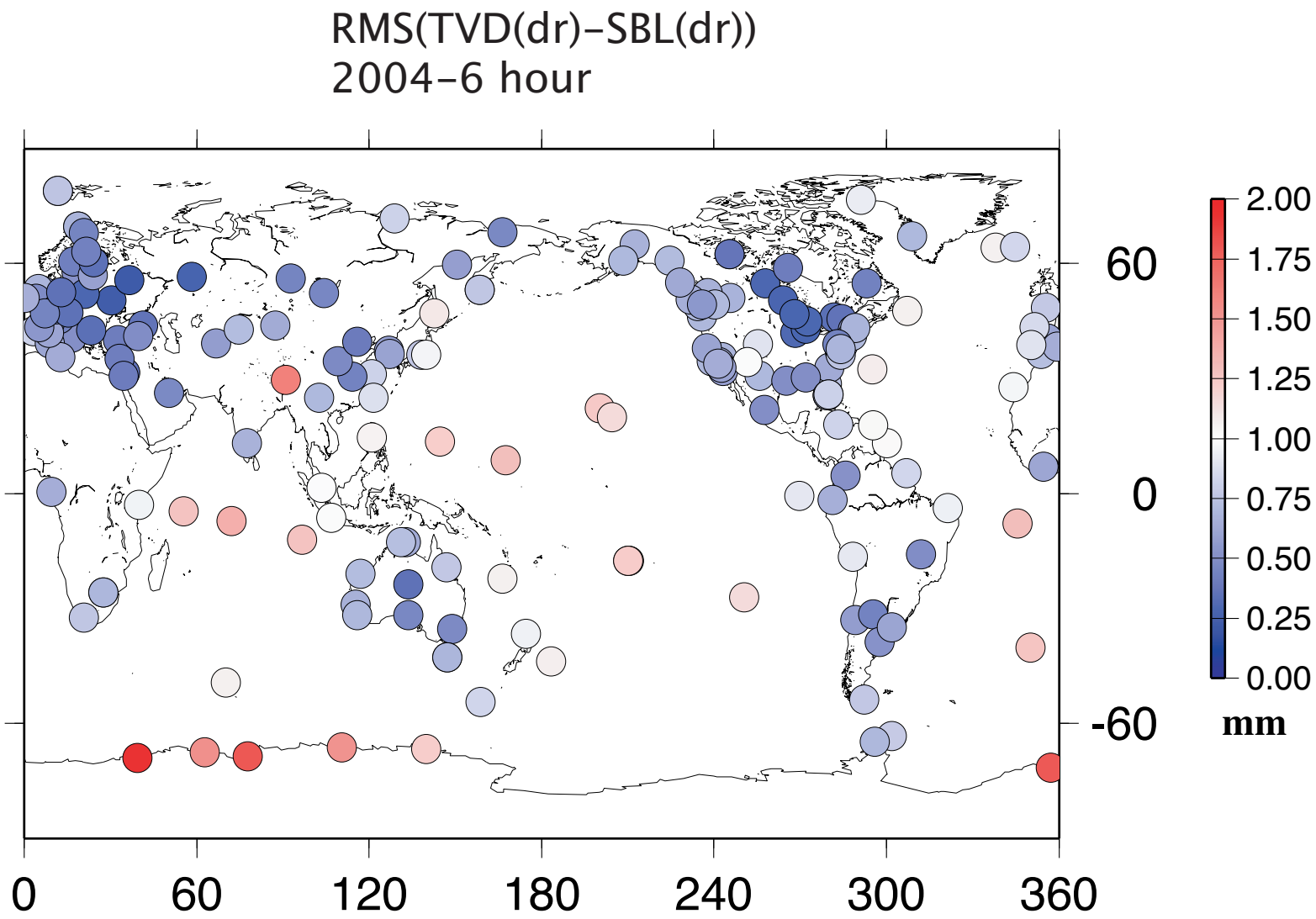
Example of height coordinate time series



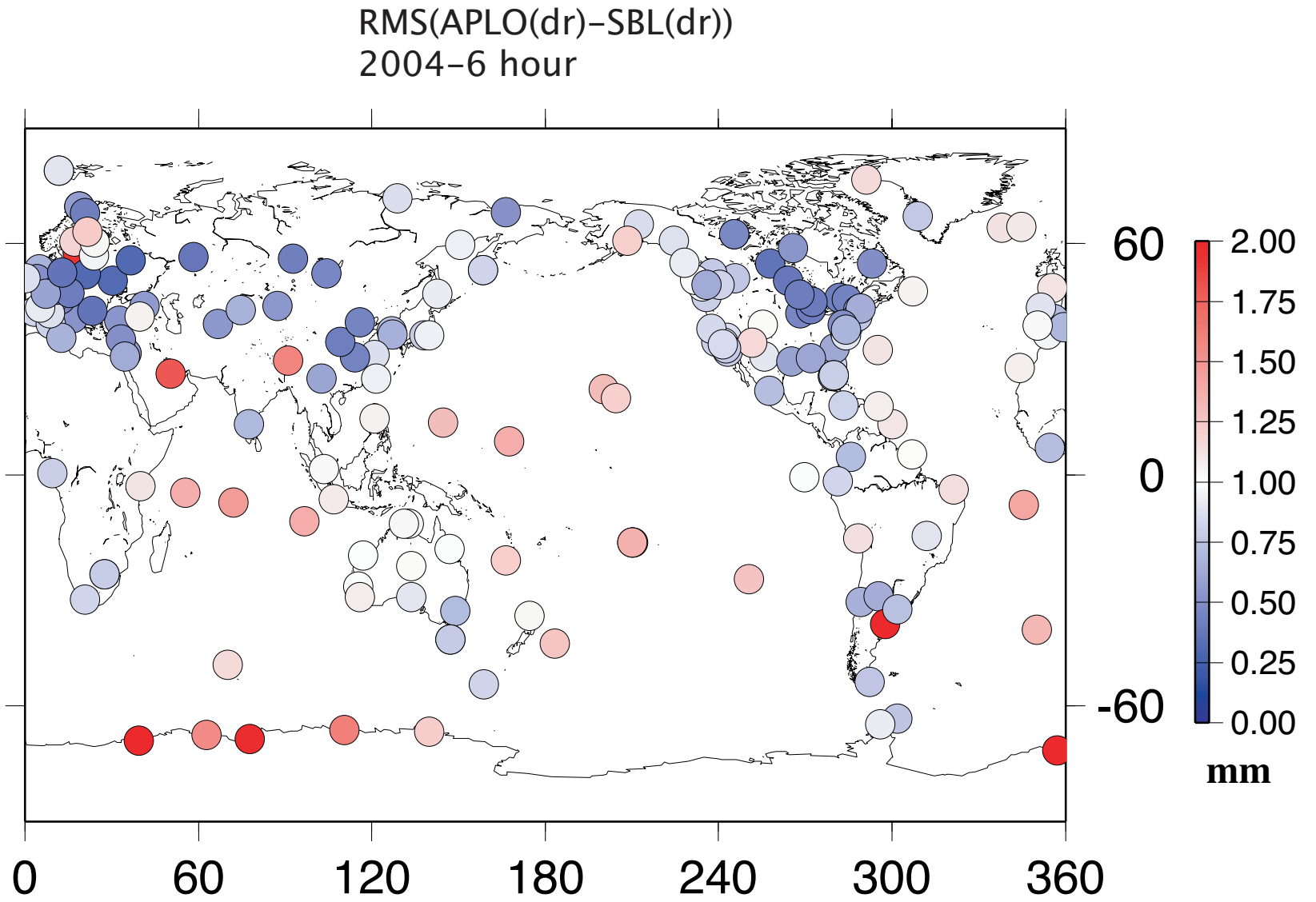
Observed Regional Variability RMS(dr)



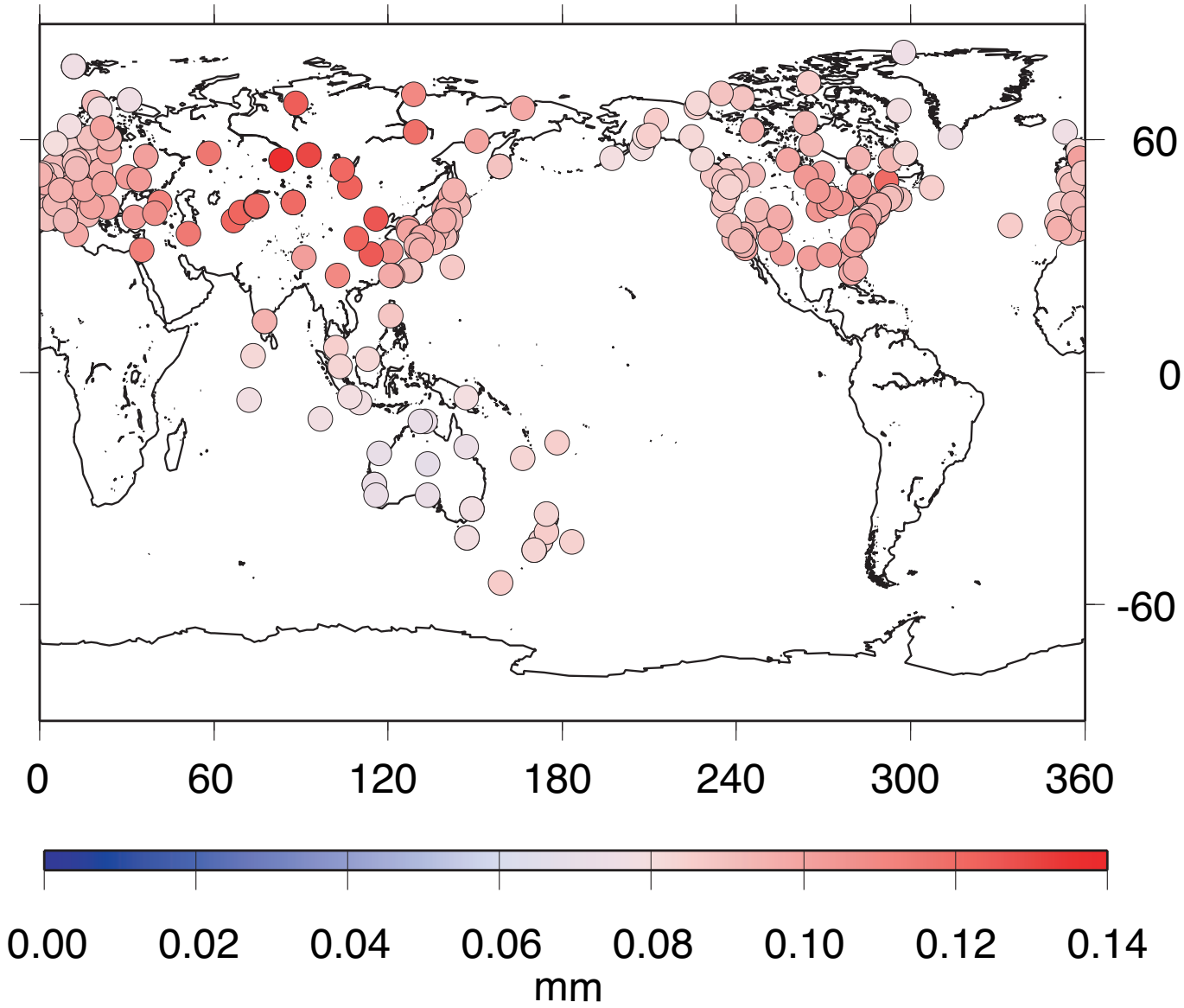
Observed Regional Variability RMS(dr)



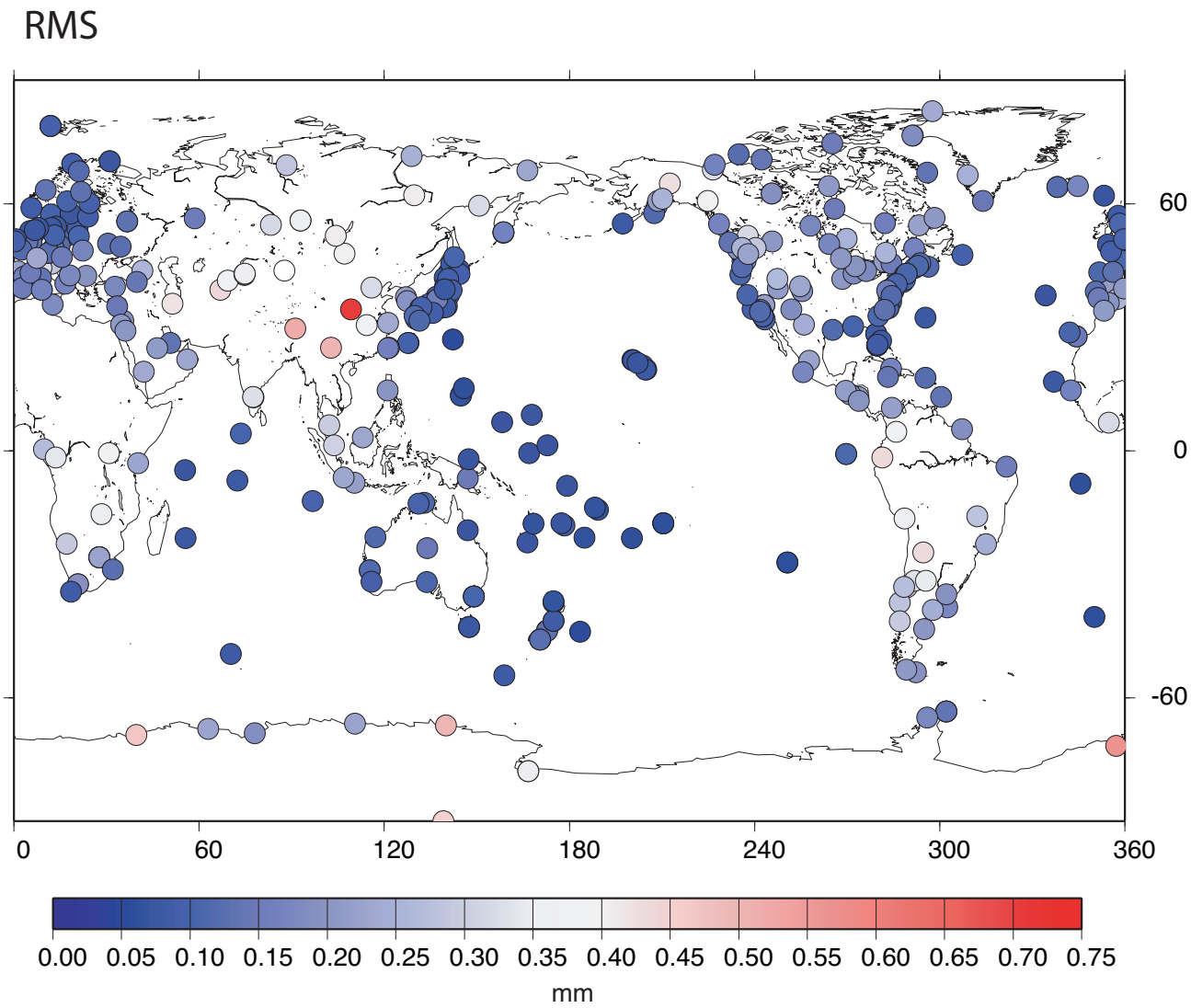
Observed Regional Variability RMS(dr)



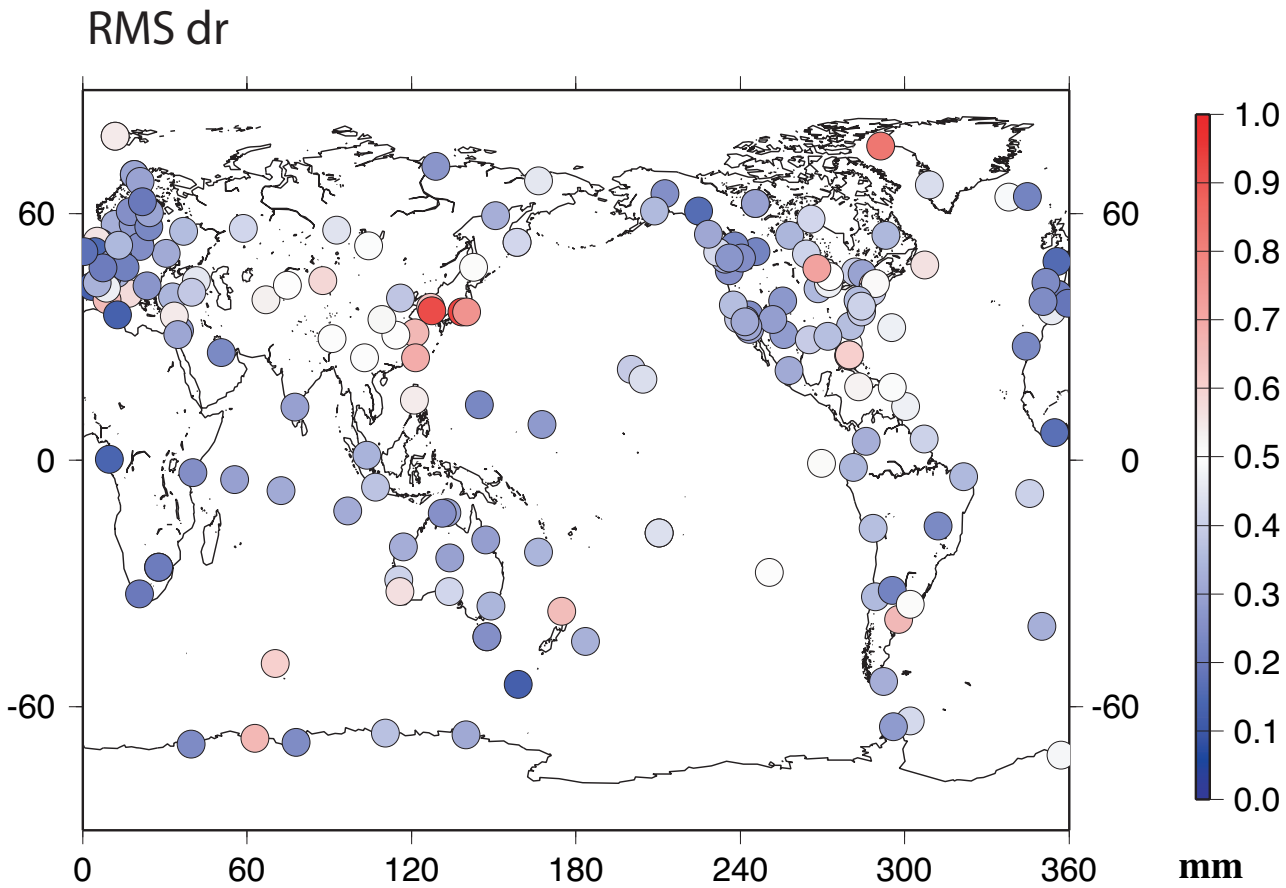
Earth Models (RMS(dr))



NCEPR versus ECMWF (dr)

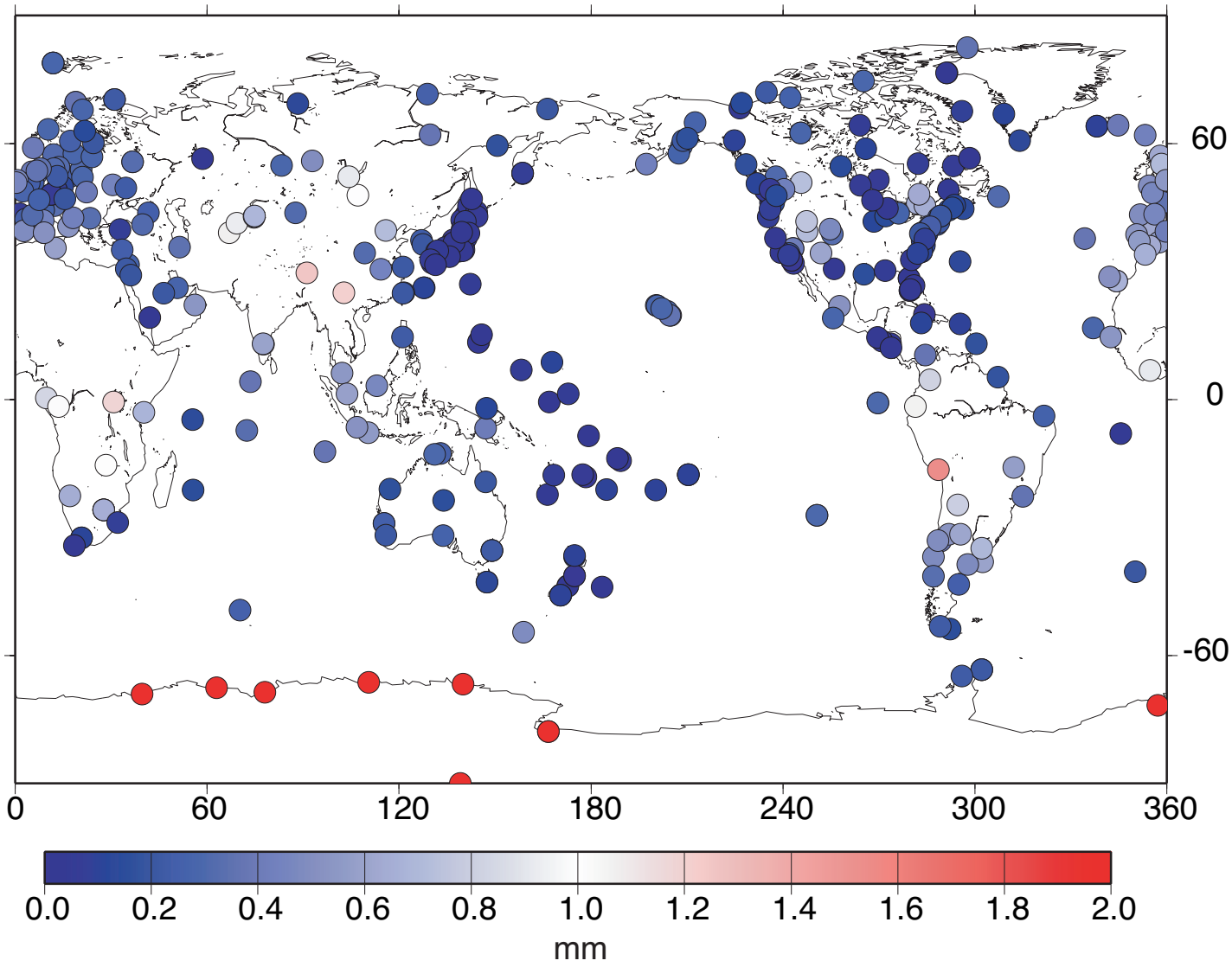


Green's Fcns. vs Love Numbers

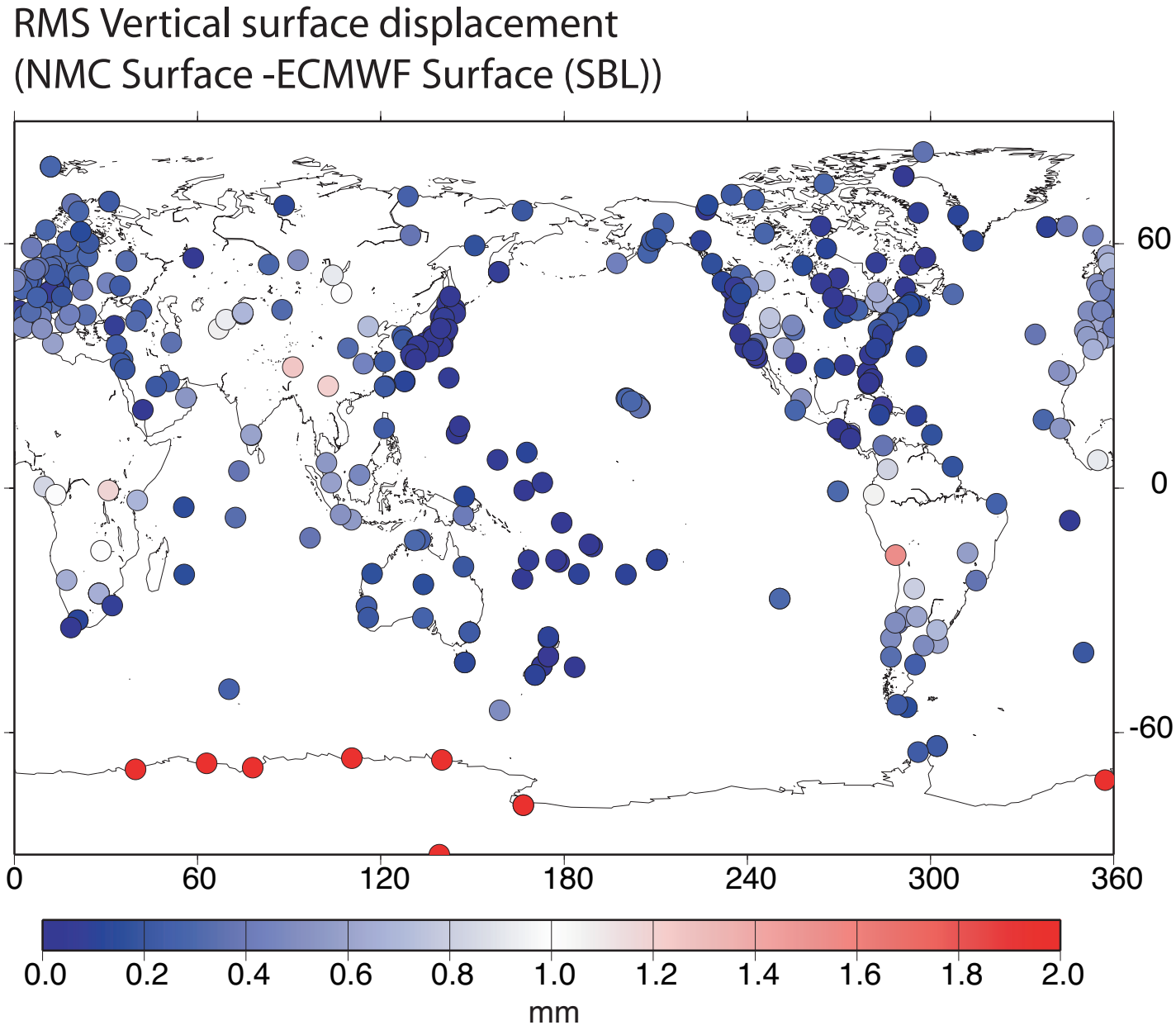


Surface versus Sea-level

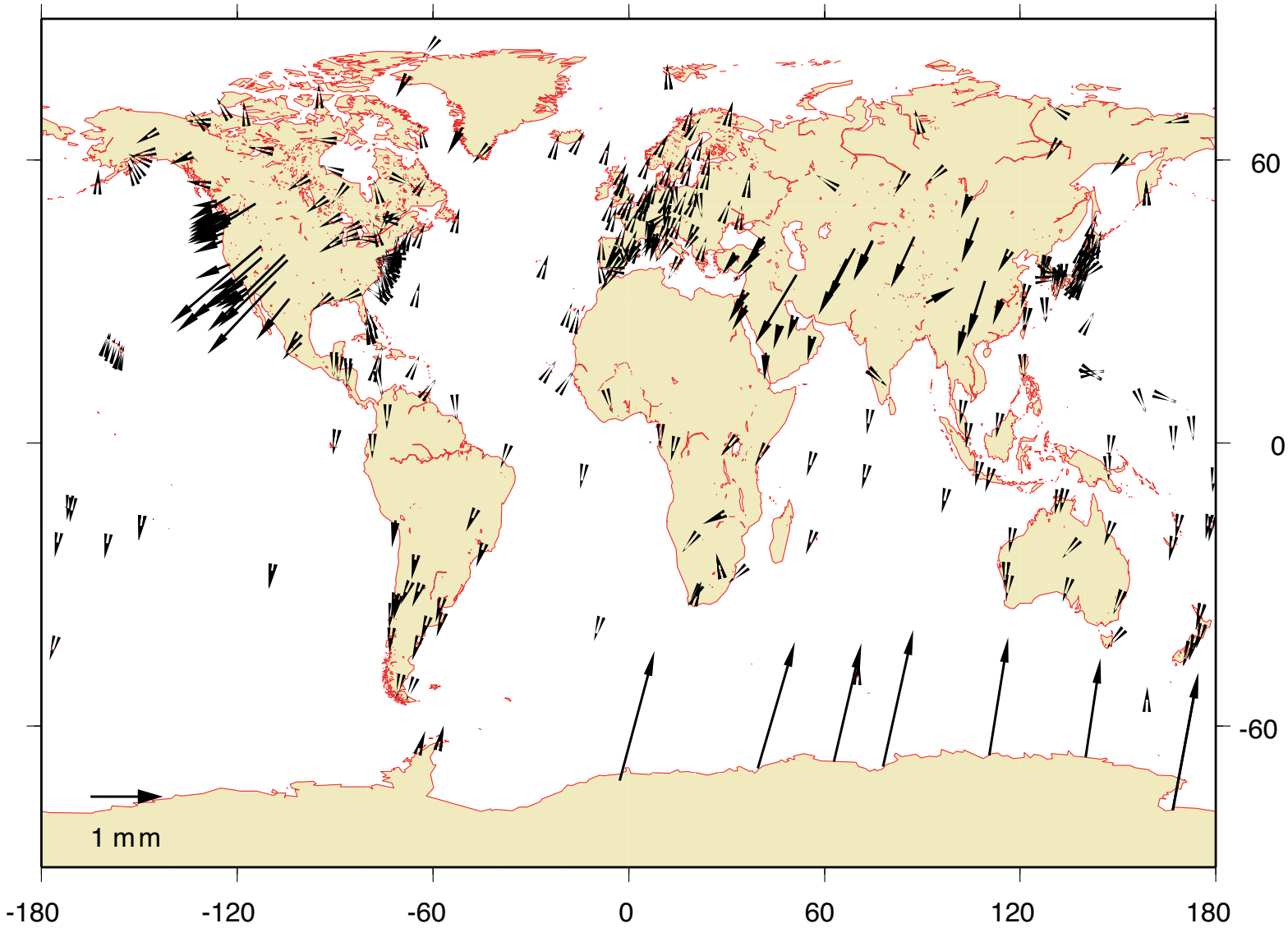
RMS Vertical surface displacement
(ECMWF Surface -ECMWF Surface (SBL))



Surface versus Sea-level



Induced Annual Signals



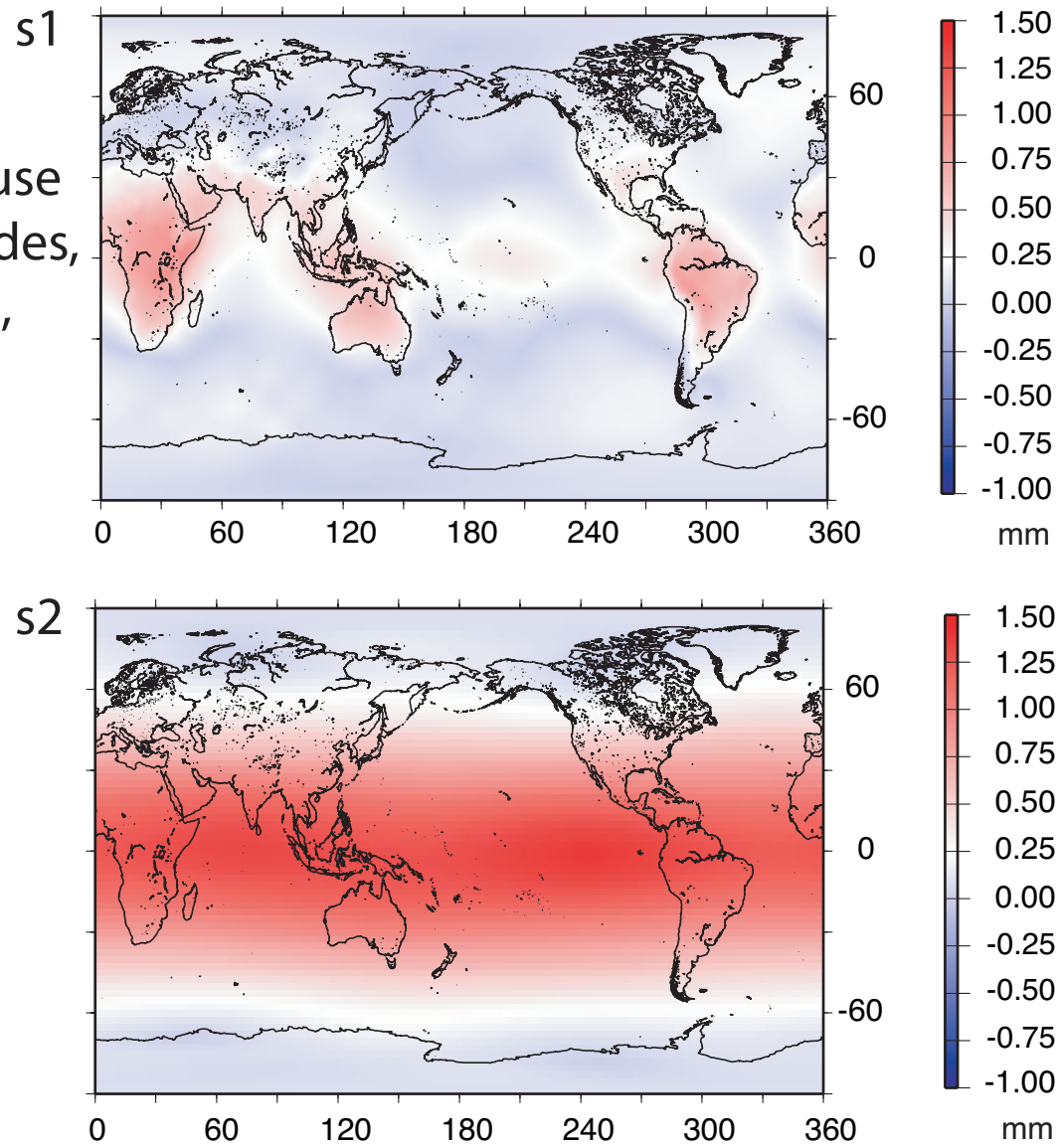
Conclusions I

- In some cases, the models are different but the effects are at the sum-mm RMS level:
  - NCEPR versus ECMWF
  - Earth Model
  - Love Number versus Green's function approach
  - In most cases, differences are less than technique noise and will not affect trends or estimates of annual amplitudes
- In the case of SFC pressure versus SLP converted to SFP
  - These differences WILL introduce trends and spurious annual signals between analysis centers using different models

Atmospheric tides (dr)

Amplitude (mm)

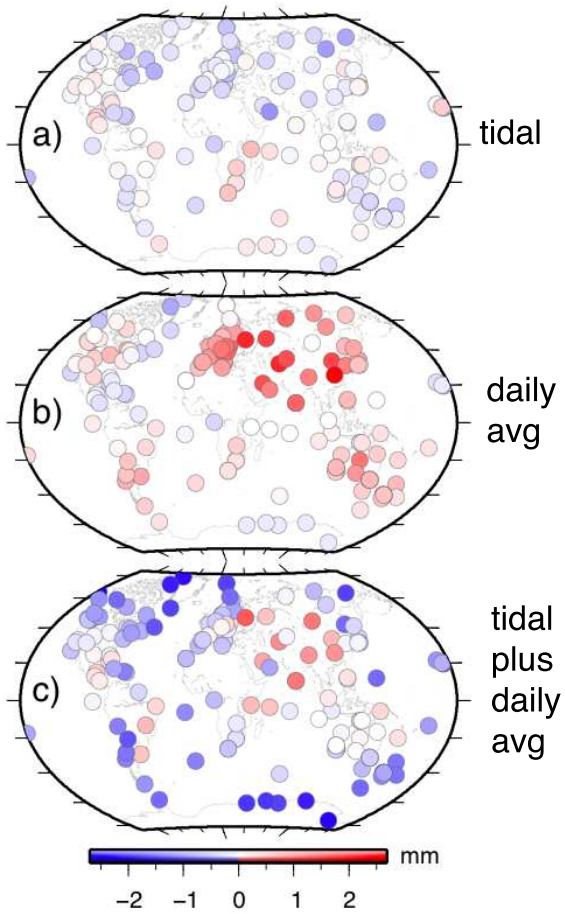
Tides are an issue because some groups remove tides, e.g. APLO, others do not, e.g. SBL



Tides at the operational level

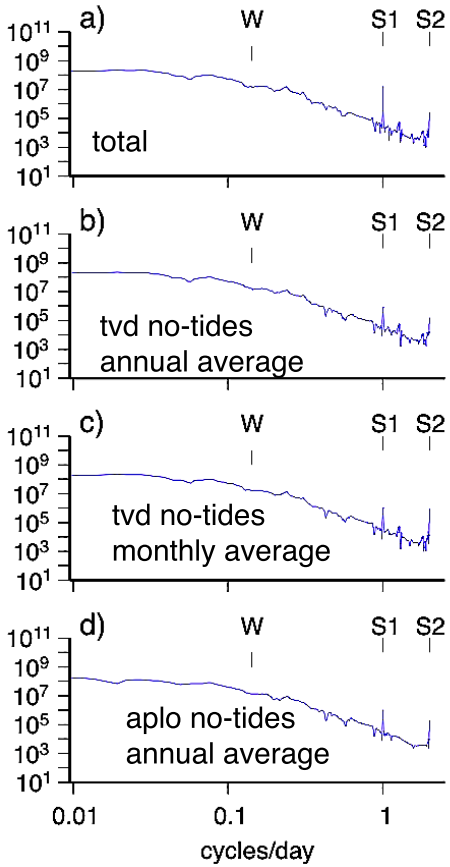
Ponte and Ray (GRL 2002) Recommend A=A'-M'+M

RMS change (dr)



Tides at the operational level

Are non-tidal models really non-tidal e.g. WTZR? Power (dr)



Conclusions II

- Atmospheric tides from the Ray and Ponte Model reduce the RMS at equatorial and tropical sites where the signal is the largest
- The model increases the RMS at the mid- to high-latitude sites where there is no signal
- If the IERS adopts a model for atmospheric tides to be included at the observation level, there are potential problems in mixing ’non-tidal models’ with the S1 and S2 model
- More analysis needs to be done along these lines to understand fully the implications