S1/S2 Loading Effects

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Tidal Loading Correction Models

- **GGFC (Tonie van Dam)**
  - Based on model by Ray and Ponte (2003; ECMWF operational analysis data, 6-hourly)
  - Strategy by van den Dool et al. (1997) for S2

[Image of a world map with color gradients indicating tidal loading correction values.]

van Dam and Ray (2010)

http://geophy.uni.lu/ggfc-atmosphere/tide-loading-calculator.html
Tidal Loading Correction Models

- GSFC (Goddard Space Flight Center)
  - based on Ponte and Ray (2003) model

http://gemini.gsfc.nasa.gov/aplo/
Tidal Loading Correction Models

- Vienna
  - derived from 3-hourly DCDA data of the ECMWF

- Biancale and Bode

- ...
S1 Tidal Loading

GSFC
GGFC
Vienna

CoM
non-IB
S1 Tidal Loading

GSFC
GGFC
Vienna
S2 Tidal Loading

GSFC
GGFC
Vienna
S2 Tidal Loading

GSFC
GGFC
Vienna
VLBI Analysis

- 3581 24h VLBI sessions w/wo Vienna corrections
- Comparison of post-fit residuals with vTPv/dof

<table>
<thead>
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<th></th>
<th>mean</th>
<th>median</th>
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<tbody>
<tr>
<td>without</td>
<td>1.068354</td>
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<td>with</td>
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<td>0.952856</td>
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<tr>
<td>difference</td>
<td>0.000095</td>
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</table>
• 3581 24h VLBI sessions
• No improvement in terms of baseline length and coordinate repeatabilities
Ongoing Work at TU Vienna

- S1 and S2 pressure tide components derived for 4202 land stations and 2924 ocean boxes (Intern. Surface Pressure Databank 1990-2010)
Ongoing Work at TU Vienna

• S1 and S2 estimates interpolated to global 1° degree grids

Schindelegger et al. 2014, subm.
Ongoing Work at TU Vienna

• Comparison against NWM (S2)
To be done

• Conversion to loading grids and application in (VLBI-) analysis
• Estimation of seasonal modulation of S1 and S2 and addition to loading grids
Conclusions

• Neglecting tidal loading in VLBI analysis does not impact station coordinates
• Tregoning and Watson (2011) found that modelling tidal loading reduces the semiannual draconitic signals in station coordinates
• Standard in gravity solutions
• Ongoing discussion
Figure 1. Stacked power spectra of the difference between time series with and without the atmospheric tidal loading deformation correctly accounted for. Note the peak corresponding to frequency of 2 cycles per draconic year (i.e., period ~174.5 days). All individual spectra across each component are normalized using a variance of 4 mm$^2$. 

Tregoning and Watson (2011)