System Earth: Project activities and future plans

Presentation: Michael Schindelegger

System Earth core issues:

- Geophysical fluid effects (atmosphere, oceans) on Earth rotation ...
- ... and station positions

Core personnel:

- Michael, Matthias, Sigrid (on leave) ... soon to be extended!
Continued project activities: GGOS Atmosphere (FWF)

- AAM (*Atmospheric Angular Momentum*) as GGFC provisional / operation product

**Index of ROTATION**

<table>
<thead>
<tr>
<th>Name</th>
<th>Last modified</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent Directory</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>AAM/</td>
<td>09-Aug-2013 00:38</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>AAM_FC/</td>
<td>30-Sep-2013 18:34</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MASSV/</td>
<td>01-Jan-2014 21:39</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Envisaged given the recent success of the torque approach: both types of excitation measures to be provided, 3-hourly

- Standard **Loading** Service: currently “cleaning”
Present project activities: SPOT Earth rotation, FWF (1)

- Turned out to be a HG/GFZ joint project (project leader Harald Schuh)
- Project end: May 2015
- Main target: development of a precise model for diurnal and sub-diurnal ERP variations induced by ocean tides
- Core task: Inversion of tidal heights from empirical model (EOT11a) towards velocities ...
- IERS PM/dUT1 model 20 yr of age
System Earth

**Present project activities: SPOT Earth rotation (2)**

“The conundrum of the shallow water equations”

- Coriolis term
- Bottom friction
- Loading calculation
- Tidal potential (phase)

Admittance & minor tides
Present project activities: SPOT Earth rotation (3)

Example of M2:
HAMTIDE “gauge”

Tidal heights [m]

Zonal currents [m/s] (?)
Present project activities: ASPIRE (1)

• “Atmosphere-induced short period variations of Earth rotation” (see PhD)

• FWF/DFG Joint project with project leaders J. Böhm and H. Dobslaw (GFZ)

• Until approx. 2017

• Positions: M. Schindelegger (PostDoc), D. Salstein (Visiting Scientist),

• 2 part-time PhD vacancies, filled mid/end 2014
Present project activities: ASPIRE (2)

Non-tidal high-frequency signals in Earth rotation ($S_1/S_2 +$ side lobes) from consistently coupled atmosphere-ocean model

- Both modeling approaches
- Large assembly of atmospheric datasets
- Baroclinic OMCT – barotropic split-off at HG?
Future project activities: ASPIRE and/or new proposal (?)

Considerable ground covered in my PhD, extensions to original project idea are welcome, e.g.:

- Excitation of nutation with 2\textsuperscript{nd}/3\textsuperscript{rd} generation atmospheric reanalyses

- Motivation: agreement of present-day datasets
- Towards improving MHB components ... (only S\textsubscript{1} Sun-synchronous effect)
Future project activities: ASPIRE and/or new proposal (?)

- Upgrading OMCT to be a state-of-the-art ocean tide model: data assimilation + grid refinement

OMCT (1.875°) vs. FES 2012

- Combined atm.-ocean forecast product for PM/dUT1 with barotropic module (3-hourly resolution)
Future project activities: ASPIRE and/or new proposal (?)

- Barometric air tides (in all EOP!) from in-situ observations
  - Independent crosscheck for circulation & climate models
  - MQ interpolation solution in collaboration with R. Ray underway
  - Can seasonal bands be resolved?
Future project activities: ASPIRE and/or new proposal (?)

- Leaving short periods for longer ones, angular momentum and torque approach should give similar results

AAM budget ok but OAM budget?

Follow one idea and write it up!
Interactions:

• Matthias – ocean tidal angular momentum & short period ERP variations

  Particular point of interest for both of us: shallow water equations & its constituents (he: inversion, me: forward integration with finite differences)

• Johannes – practically all my topics, especially intensive cooperation with regard to “product fundaments” on servers (delays, AAM, loading)

  Some contributions of mine to blind delay models …
Interactions:

• Gregor & Robert – tropospheric delays: viewpoint of global models, validation experiments
• Future interactions: to be intensified with VLBI group to access geophysical fluid effects not only via models but also via geodetic observations

Wishes:

• Stay where we are ...
• Upgrade of personal workstations
Thank you for your attention!

e-Mail: michael.schindelegger@tuwien.ac.at

“ASPIRE” (P25506-N29) is funded by the Austrian Science Fund (FWF)