On the Strategy of Simulating a GGOS Network

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The ground station networks of all space geodetic techniques are selected according to their current performance. New stations can then be incorporated according to their planned performance figures.

The state-of-the-art networks consist of 30 VLBI, 50 SLR, 124 GNSS and 103 DORIS ground stations globally distributed, cf. the following figures.

**The Networks**

- **VLBI**
- **SLR**
- **GNSS**
- **DORIS**

**The Performance**

The performance was evaluated by the number of observations (in case of VLBI those available with a certain quality or in all other cases those accepted in Precise Orbit Determination (POD)) and by the accuracy (in terms of RMS values) of the selected ground stations in the time span 2008-2014 where applicable.

<table>
<thead>
<tr>
<th>Number of Observations</th>
<th>Formal error of the delay in mm</th>
<th>Orbital fit of SLR ranges in cm</th>
<th>Orbital fit of phases in cm</th>
<th>Orbital fit of Doppler in cm/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of of scans (number of sources observed by the stations)</td>
<td>Number of normal points accepted in POD</td>
<td>Number of phase observations accepted in POD</td>
<td>Number of Doppler observations accepted in POD</td>
<td></td>
</tr>
</tbody>
</table>

**Resume**

- Few stations with constant observation performance
- Most of the stations with homogeneous accuracy; only a few exceptions
- Doubling of sampling rate starting in 2010

**Strategy**

- Number of observations individually for each station from reality
- Accuracy of observations individually for each station from reality
- No systematic effects
- No discontinuities
- Time span: 2008-2014

**References**

Project website of GGOS-SIM

www.ggos-sim.de

**Simulation strategy**

- Simulation of observations according real world data
  - VLBI: RMS of white noise process for each station according formal error of delay and real station performance
  - SLR: RMS of white noise process and percentage of possible observations according to performance figures
  - GNSS dto.
  - DORIS dto.
- Consistent state of the art modeling of troposphere, station displacements (no non-tidal loading)
- Parameterization of station coordinates and velocities, Earth rotation parameters as piece-wise linear functions

**Outlet**

- Determination of technique-wise TRF and comparison
- Simulation of local sites as additional observations in comparison to real local surveys
- Determination of a simulated TRF from a combination of the technique-wise datum-free normal equation systems and comparison
- Investigations of the impact on the TRF in case of changes in the ground and space segments and technical developments

**Acknowledgement**

We would like to thank the German Research Foundation (DFG) for the support of project GGOS-SIM (Schu 1103/8-1).

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