Galileo Terrestrial Reference Frame (GTRF)- Status

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on behalf of the GGSP Consortium
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The GTRF17v02 was obtained by accumulating (rigorously stacking) the 338 weekly GTRF combined solutions. Using minimum constrains approach, the GTRF17v02 solution is aligned to the IGS14 (ITRF2014) frame over a set of 83 IGS/ITRF stations, located in 63 sites (41 in the northern and 22 in the southern hemispheres, respectively).

During the GTRF17v02 combination process, we introduced two major innovations compared to the past GTRF releases:

1. annual and semi-annual signals present in the station position time series were estimated during the stacking, and
2. Post Deformation (PSD) parametric models were applied to the coordinates of stations that are subject to major earthquakes before stacking the time series.
Latest GTRF Realisation: GTRF17v02
red squares: ITRF/IGS stations
Green/blue: GSS/GESS sites
GTRF17v02 Velocity Field.
Red: IGS/ITRF site
Blue/Green: GESS/GSS site.
GTRF Releases in 2017

- GTRF17v01
  - Released January 2017
    - Alignment of GTRF16v01 to ITRF2014
    - Rigorously aligned to ITRF2014
- GTRF17v02
  - Released March 2017
    - Full release
- Next update is expected in 2018
Depth of coverage (Galileo)
GESS station time series - Examples
Orbit Combination (Final, full history)

- Orbit RMS agreement btw PFs and combined (co_) orbits for GPS satellites
  - Agreement mostly at the level of 5-10 mm
- COR is combined rapid product, IGF is IGS Final and IGR is IGS Rapid
Agreement for the clocks shows RMS of about 8 to 25 ps
- all biases subtracted
Difference between PF and co_ Galileo orbits are in the range of 50 to 150 mm (with outliers in case of data problems)

From week 1873: Improved modeling with ECOM2 (PF1 and PF3) and Box-Wing (PF2) significantly improved agreement to 10 to 60 mm level.
The SLR residuals are confirming the overall orbit accuracy (3D – 1 Sigma) of 10 – 20 cm. Notice improvement thanks to improved modelling starting week 1873.
Validation

- Validation is carried out on a weekly basis when the last reference product is available (in general, the IGS troposphere solution).
- Validation result is a weekly summary file (vf_www7.sum).
- Example from summary file (vf_19687.sum).
- High quality, demonstrated by the RMS of Helmert-transformation (see table below).

<table>
<thead>
<tr>
<th>Site</th>
<th>#sites</th>
<th>North [mm]</th>
<th>East [mm]</th>
<th>Up [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGS14 RMS / COMPONENT</td>
<td>73</td>
<td>2.76</td>
<td>2.38</td>
<td>5.75</td>
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<tr>
<td>IGS14week RMS / COMPONENT</td>
<td>117</td>
<td>2.04</td>
<td>1.60</td>
<td>4.30</td>
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<td>GTRF17V02 RMS / COMPONENT</td>
<td>112</td>
<td>2.08</td>
<td>1.88</td>
<td>5.19</td>
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</tbody>
</table>
THANK YOU

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