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GNSS-based validation of GFZ atmospheric and hydrospheric surface loading deformation products: First results

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Time-dependent mass variations of near-surface geophysical fluids in atmosphere, oceans and the continental hydrosphere lead to significant and systematic load-induced deformations of the Earth's crust. Based on reprocessed GNSS station coordinate time series it is possible to assess the impact of time-dependent mass variations on the Earth's surface geometry and, thus, to validate models providing deformation corrections for these loadings.

GNSS-based validation results for the atmospheric and hydrospheric surface loading deformation products provided by ESMGFZ will be presented. These products contain vertical and horizontal crust deformations imposed by surface loading of geophysical fluids in atmosphere, oceans and the continental hydrosphere with a spatial resolution of 0.5° and a temporal sampling of down to 3 hours (Dill and Dobslaw, 2013). GNSS observations from more than 200 globally distributed stations and more than 10 years were reprocessed in order to derive reliable validation results. Periodic signals in the time series, but also transformation parameters will be estimated to determine the level of agreement between the model-based deformations and the geodetically determined station deformations. In addition, the impact of predicted surface loading corrections based on ECMWF medium-range forecasts on GNSS orbits and Earth rotation parameters will be assessed in the framework of typical IGS-rapid solutions.

Dill, R. and H. Dobslaw (2013), Numerical simulations of global-scale high-resolution hydrological crustal deformations, J. Geophys. Res. Solid earth 118, doi:10.1002/jgrb.50353.