Geophysical Research Abstracts
Vol. 16, EGU2014-7920-1, 2014
EGU General Assembly 2014

A Matlab-based Tool for the Analysis of Global Gravity Effects

Michal Mikolaj (1), Bruno Meurers (2), and Andreas Güntner (1)

(1) GFZ German Research Centre for Geosciences, Section Hydrology, Potsdam, Germany
(michal.mikolaj@gfz-potsdam.de), (2) University of Vienna, Department of Meteorology and Geophysics, Vienna, Austria

Major sources of gravity variations are related to atmospheric and hydrological mass variations. The gravity response to these variations must be considered at the regional to global scale despite the decreasing gravitational effect with the squared distance from the point of observation. Otherwise, a seasonal signal typical for large-scale variations remains in gravity residuals and may interfere with the local signal.

The presented Matlab-based tool for the analysis of global gravity effects, mGlobE, enables the computation of the global contribution of atmosphere, continental water storage and ocean variations to gravity variation (loading and attraction part). Global models of the atmosphere (ERA Interim), hydrological models (ERA Interim, all versions of GLDAS model or other models) and models of ocean bottom pressure (ECCO-JPL and $ECCO_2$) are used as input data sets. These models can be freely accessed through the providers' web servers and loaded/converted using mGlobE. The package for the atmospheric effect enables the computation of the global as well as the local contribution. Thereby, the gravity response to 3D structure of the atmosphere is calculated by a tesseroid approximation. The additional introduction of an admittance factor for the pressure difference between observed and modelled values leads to a reduction of the negative impact of low spatial and temporal resolution of the ERA Interim model.

The software package for the computation of continental water storage effect enables the inclusion of minimum five different models. Additionally, global hydrological models like WGHM or alternative ocean models such as OMCT can be implemented easily. Thus, the uncertainty estimation of gravity response to continental water storage and ocean bottom pressure variations is possible.

With mGlobE, all mentioned global gravity effects can be computed for arbitrary locations. Thus, they can serve for the analysis of gravity variations observed at sites with superconducting or absolute gravimeters. We show the results of mGlobE for the example of three gravimeter sites (Conrad, Vienna, Sutherland) and compare these results to data from other services (ATMACS, GGP/Strasbourg Loading service) and to GRACE-based mass variations (JPL GRACE Tellus).