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Simulation of Earth rotation parameters with atmospheric and oceanic GCMs

T. Winkelnkemper (1), X. Chen (2), F. Seitz (4), C.Walter (3), A.Hense (1)

(1) Meteorological Institute. University of Bonn. Germany (2) Institute of Oceanography. University of Hamburg. Germany (3) Institute for planetary Geodesy. Dresden University of Technology. Germany (4) German geodaetic research Institute Munich (DFGI)

Global circulation models are able to simulate mass movements and mass concentrations on a global scale in a realistic way. Due to enormous mass displacements and relative movements (to the rotating Earth) the atmosphere and oceanic hydrosphere have an important impact on Earth rotation parameters. On a subdaily to decadal scale the atmosphere and the oceanic hydrosphere explain nearly all variance of Earth rotation parameters.

An Earth system model has been developed by our interdisciplinary project group which has realized an entire coupling of the subsystems atmosphere, ocean and continental hydrosphere with respect to conservation of mass, energy and momentum. Tides are implemented as well. The coupled model consists of the ECHAM 5.3 GCM, OMCT 3.0 ocean model and HDM hydrospheric dispersion model.

To distinguish between oceanic, hydrospheric and atmospheric impacts an atmospheric standalone run has been carried out additionally. One detailed structure analysis of observed and simulated Earth rotation parameters and atmospheric forcing factors like solar variability, ENSO or greenhouse gas will be presented. A spectral analysis of simulated Earth rotation parameters with time series of ENSO and solar variability has already been performed and shows interesting results.

To examine a possible future increase in the length of day associated with a decrease in Earth angular velocity, future trends have been calculated under a climate change scenario.