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# Estimation of sensitive Earth parameters form an inverse dynamic model

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Highly and permanently improved Earth orientation parameters (EOP) are available for a time frame of several decades. Commonly EOP time series and their variations are interpreted regarding geophysical processes by a forward model based on the angular momentum balance of the Earth's subsystems. Polar motion, length-of-day (LOD) and/or nutation parameters are simulated. The concept of the forward modeling depends on geometric and physical Earth parameters (e.g. Love numbers), which are often weakly determined from observations or models.

Our research is integrated in a project performed in the framework of the German research unit on Earth Rotation and Global Dynamic Processes. We use precise geodetic observations for inverse modeling to estimate and improve physical Earth parameters, which have a strong influence on numerical model results for polar motion and LOD. The work is based on the results from the forward model DyMEG. These numerical results from DyMEG agree very well with the geodetic observations on a time scale from several days to several years, this was shown in previous studies. The mean goal of this project is to transform the forward model into an inverse model. The work is divided in three steps: At first a sensitivity analyses is performed due to study influences on polar motion and LOD. Also the correlations between the physical parameters are estimated. This is necessary for the inversion, because it exposes the sensitive physical parameters, which have to be estimated. In the following step an adequate theoretical model is formulated, which has to be implemented into DyMEG. Several different approaches will be tested (e.g. Kalman filter). The third step is to determine the selected physical Earth parameters. The external geophysical forcing (e.g. atmospheric and hydrologic angular momentum variations) and the precise observed time series are constraints for the inverse dynamic model. Due to the high accuracy of the observations a significant improvement of the physical Earth parameters is expected. There exists a direct cooperation with the Geodetic Institute of the Leibniz Universität Hannover and the German Geodetic Research Institute. From these project partners we will get improved geodetic observations and geophysical excitation functions, which will be used as input parameters for the inverse model. The paper presents the concept of the dynamical model, the sensitivity analyses and an outlook on the inverse model.