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Combined Analysis and Validation of Earth Rotation Models and Observations

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Global dynamic processes cause changes in the Earth's rotation, gravity field and geometry. Thus, they can be traced in geodetic observations of these quantities. However, the sensitivity of the various geodetic observation techniques to specific processes in the Earth system differs. More meaningful conclusions with respect to contributions from individual Earth subsystems can be drawn from the combined analysis of highly precise and consistent parameter time series from heterogeneous observation types which carry partially redundant and partially complementary information. For the sake of a coordinated research in this field, the Research Unit FOR 584 "Earth Rotation and Global Dynamic Processes" is funded at present by the German Research Foundation (DFG). It is concerned with the refined and consistent modeling and data analysis.

One of the projects (P9) within this Research Unit addresses the combined analysis and validation of Earth rotation models and observations. In P9 three main topics are addressed: (1) the determination and mutual validation of reliable consistent time series for Earth rotation parameters and gravity field coefficients due to the consideration of their physical connection by the Earth's tensor of inertia, (2) the separation of individual Earth rotation excitation mechanisms by merging all available relevant data from recent satellite missions (GRACE, Jason-1, . . .) and geodetic space techniques (GNSS, SLR, VLBI, . . .) in a highly consistent way, (3) the estimation of fundamental physical Earth parameters (Love numbers, . . .) by an inverse model using the improved geodetic observation time series as constraints. Hence, this project provides significant and unique contributions to the field of Earth system science in general; it corresponds with the goals of the Global Geodetic Observing System (GGOS). In this paper project P9 is introduced, the goals are summarized and a status report including a presentation and discussion of intermediate results is given.