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Earth rotation excitation mechanisms derived from geodetic space observations

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Earth rotation variations are caused by mass displacements and motions in the subsystems of the Earth. Via the satellite Gravity and Climate Experiment (GRACE) gravity field variations can be identified which are caused by mass redistribution in the Earth system. Therefore time variable gravity field models (GFZ RL04, CSR RL04, JPL RL04, ITG-Grace03, GRGS, ...) can be used to derive different impacts on Earth rotation. Furthermore satellite altimetry provides accurate information on sea level anomalies (AVISO, DGFI) which are caused by mass and volume changes of seawater. Since Earth rotation is solely affected by mass variations and motions the volume (steric) effect has to be reduced from the altimetric observations in order to infer oceanic contributions to Earth rotation variations. Therefore the steric effect is estimated from physical ocean parameters such as temperature and salinity changes in the oceans (WOA05, Ishii). In this study specific individual geophysical contributions to Earth rotation variations are identified by means of a multitude of accurate geodetic space observations in combination with a realistic error propagation. It will be shown that due to adjustment of altimetric and/or gravimetric solutions the results for polar motion excitations can be improved.