Geophysical Research Abstracts, Vol. 8, 05381, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05381

Constraints of Global Time Variable Gravity Measurements on Global Continental Hydrology Models

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The Earth is a dynamic system - it has a fluid, mobile atmosphere and oceans, a continually changing distribution of ice, snow, and groundwater, a fluid core undergoing hydromagnetic motion, a mantle undergoing both thermal convection and rebound from glacial loading of the last ice age, and mobile tectonic plates. These processes affect the distribution of mass in the Earth and produce variations in the Earth's rotation and its gravitational field on a variety of spatial and temporal scales. While we have mature models of the mass distribution of the atmosphere and ocean, the hydrology models are less well determined. Observations of the Earth's time variable gravity field can place constraints on the hydrology models and help validate their results. The models we have been investigating are the hydrology fields from the National Centers for Environmental Prediction (NCEP) and the European Centre for Medium-Range Weather Forecasts (ECMWF) reanalyses, the Land Dynamics (LaD) model, the Variable Infiltration Capacity model (VIC), the NOAA Climate Prediction Center (CPC) soil moisture model, the International Satellite Land-Surface Climatology Project (ISLSCP) snow climatology, and the Global Land Data Assimilation System (GLDAS) model. We will present comparisons of geodetic observations of gravity to the climate forcing estimates and discuss the implications for evaluating hydrology models.