

Operational estimates of transient hydrospheric effects on Earth rotation parameters

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Precise observations of the variable Earth's rotation represent the impact of a combination of various physical processes in the Earth's system, requiring independent models of certain processes in order to properly interpret and separate individual contributions.

Here, transient hydrospheric effects on the Earth's rotation are presented by means of a numerical model approach allowing mass and momentum fluxes among the sub-systems atmosphere, ocean and continental hydrology. Operational analysis data from ECMWF are used to force a hydrological discharge model and a global model for the ocean's baroclinic circulation and ephemeral tides. The unconstrained hydrology and ocean models are coupled via continental discharge in order to close the hydrological cycle.

Focussing on the period 2001 - 2006, individual contributions of atmosphere, ocean and continental hydrosphere including secondary processes as changes in total ocean mass are contrasted against ERP time-series. While establishing a reliable correspondence between model and observations, hydrospheric effects are removed from observations in order to assess the impact of other dynamical subsystems of the Earth and, thus, to contribute to a broad interpretation of observed ERP's.

Since atmospheric analyses from ECMWF are routinely available within 3 days of delay only, numerical estimates of Earth's rotation excitations caused by hydrospheric mass redistributions as presented here can be principally calculated on a near real-time basis.