Geophysical Research Abstracts, Vol. 7, 05481, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05481

Length of day and polar motion, with respect to temporal variations of the Earth gravity field

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The masses distributions inside the Earth govern the behaviour of the rotation axis in the Earth (polar motion), as well as the Earth rotation rate (or equivalently, length of day). These masses distributions can be measured by space owing to artificial satellites, the orbitography of which provides the Earth gravity field determination. Then, the temporal variations of the Earth gravity field can be related to the variations of the Earth Orientation Parameters (EOP) (with the Inertia Tensor). Nowadays, owing to the satellite laser ranging (SLR) technique and to the new gravimetric satellite missions (as CHAMP or GRACE), the temporal variations of the low degree coefficients of the Earth gravity field (i.e. Stokes coefficients) can be determined. This paper is one of the first study using gravity variations data in the equations already established (e.g. Lambeck 1988, or Gross 2000) and linking the variations of the length of day and of the C20 Stokes coefficient (or, linking the polar motion and the C21 and S21 coefficients). This paper combines the Earth rotation data (mainly obtained from VLBI and GPS measurements) and the Earth gravity field variations ones (Lageos I and II data, or GRACE data), in order to complete and constrain the models of the Earth rotation. The goal is a better Earth global dynamics understanding, with possible application can be the constraint on the couplings into the Earth system (e.g. core-mantle couplings).