
Effect of the tidal mass redistribution on the Earth secular changes in length of day

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Abstract

In the last years we have investigated the contributions of the redistribution tidal potential to the Earth rotation (Baenas et al. 2019, 2020, and 2021). Such potential stems from the tidal deformation exerted on the non-rigid Earth by the perturbing bodies and its response depends on the Earth structure; with a very significative role of the frequency-dependent Love numbers due to the solid and ocean tides.

The problem is worked out within a Hamiltonian framework for a two-layer deformable Earth model including dissipative effects at the core–mantle boundary. That canonical approach makes possible to derive in a unified way the effects of the tidal redistribution potential for all the aspects of Earth rotation like precession, nutation, or length of day.

In this communication we focus on the secular changes of length of day (Baenas et al. 2021, A&A 648, A89). We obtain the analytical expressions that allows its computation for different Earth rheological and oceanic models by means of frequency-dependent Love number formalism. Its evaluation for the Love number sets given by IERS Conventions (2010) -solid Earth- and Williams & Boggs (2016) -oceans- provides an increase of 2.418 ms/cy in the length of day, in very good agreement with recent observational values.

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