COMBINED ELECTROMAGNETIC AND TOPOGRAPHIC CORE-MANTLE COUPLING AND THEIR INFLUENCE ON THE EARTH'S ROTATION

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In our study, we combine the geomagnetic field (poloidal and toroidal parts) at the core-mantle boundary (CMB), the related fluid-flow close to the CMB and the CMB topography to determine core-mantle coupling torques. This combined electromagnetic and topographic coupling torques are used to compute the related variations of Earth's orientation parameters (EOPs). Their comparison with observed EOPs is used to check conistency of input models with observations to select particular models (e.g. of CMB topography) accordingly. For the computation of the EM coupling torque, we have to calculate the poloidal and toroidal geomagnetic field at the CMB. We apply the non-harmonic downward continuation (Ballani et al., 2002; GJI 149) to the observed poloidal geomagnetic field for its computation at the CMB. For the determination of the toroidal geomagnetic field at the CMB, we need the fluid-flow velocity, which will be inferred from the poloidal geomagnetic field at the CMB by fluid flow inversion according to Wardinski (2005; GFZ STR 05/07). We solve the initial boundary value problem for the toroidal field and can determine the toroidal geomagnetic field in the whole conducting part of the Earth's mantle. Moreover, we investigate the influence of different electric conductivity models of the mantle on the geomagnetic field at the CMB and both coupling torques. Based on the time-dependent fluid-flow velocities, the TOP coupling torque is determined consistently. The combined coupling torques provide us the possibility to deduce equivalent excitation functions for the forward modelling of EOPs on the decadal time scale. Inconsistencies with the observed variation of length-of-day (LOD) rule out some combination of conductivity and CMB topography models.

Geomagnetic field at CMB, non-harmonic downward continuation, core-mantle coupling, variation of the earth's rotation

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