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Approximating $\triangle$LOD by CMB fluid velocities - case studies and sensitivities

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Temporally variable parts of the core flow can have a net relative coreangular momentum (CAM) which is balanced by variations of the mantle rotation. An approximative prediction of the axial part of the CAM and the associated length-of-day variations $\triangle$LOD is possible, if special constraints are put on the flow of the whole core, the density of the core and its structure (Jault et al.,1988).

In this paper, we discuss firstly the theoretical dependence of the CAM on the core flow. Second, we re-examine numerical estimates of the core flow. We infer it from the radial component of the magnetic field that is re-determined at the CMB by a non-harmonic continuation of the geomagnetic surface field through a mantle with a highly electrically conducting lowermost part. For the geomagnetic field at the earth surface, we use a new approximatin by spherical harmonics supported by satellite measurements. Third, we determine the LOD variations that are associated with the toroidal zonal core flow, and compare them with observed values. Of particular interest will be the dependence of the zonal flow modes and the associated $\triangle$LOD on (i) the degree of used harmonic expansions of the geomagnetic field and (ii) the assumed mantle conductivity (comparing harmonic with non-harmonic downward continuations). The equator symmetry of the core flow, which is an important assumption for the formalism used to determine $\triangle$LOD, will be checked.