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Implications of second order nutation terms in IAU2000 framework

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IAU2000 (Mathews et al. 2002) incorporates some second order terms in the sense of perturbation theories in its formulation. In particular, the second order Poisson amplitudes independent of the Earth structure. They are borrowed from the rigid Earth theory REN2000 by Souchay et al. (1999). Their inclusion, however, is inconsistent (Escapa et al. 2020) since they are convolved with the MHB2000 transfer function, rendering them Earth dependent.

In that IAU2000 scheme, second order contributions depending on the Earth structure are totally ignored, as it is the case in the rigid Earth theory (Souchay et al. 1999). That structure dependent terms affect both a part of Poisson second order amplitudes and all the Oppolzer ones. Getino et al. (2021) have shown that the numerical contribution of the ignored Poisson terms is not negligible. In addition, the dependence of the respective amplitudes on the fluid core present quite different features from those of first order terms.

These facts pose some significant problems in the application of IAU2000 transfer function and the estimation of basic Earth parameters when second order terms are included, which are discussed in this communication.