Ann. Geophys. Discuss.,
https://doi.org/10.5194/angeo-2018-27-RC1, 2018

Annales Geophysicae Discussions
Open Access
EGU

Interactive comment on "Estimating ocean tide model uncertainties for electromagnetic inversion studies" *by* Jan Saynisch et al.

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Received and published: 16 May 2018

The paper compares the numerical predictions of magnetic fields tidally induced in the Earth's oceans at the satellite altitude suitable for Swarm observations. In particular, it concentrates on the differences in the magnetic field calculated for M2 tides for five different state-of-the-art tidal models: purely physical baroclinic models OMCT and STORMTIDE, and three assimilative barotropic models: HAMTIDE, TPXO8-atlas, and FES2014. The EM fields were calculated using the integral-equation approach (X3DG) at 1x1 degree resolution with a quasi-realistic 2-D distribution of electrical conductivity in the oceans and continents. While the relative differences between the physical models reach up to 100% of amplitude, the predictions of assimilative models are more tightly clustered with relative differences of about 30%.

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Discussion paper

I find this study useful for future reinterpretation of satellite-observed tidal magnetic signals in terms of ocean or lithosphere/astenosphere conductivity, and possible evaluation of individual ocean models based on the match of the predicted and observed magnetic fields.

I have two major points that the authors should address to improve the manuscript.

1) All tidal flow models were regridded to 1x1 degree resolution prior the calculation of the magnetic field. Most of the ocean models provide the tidal flows at higher resolution, and from my experience, this can have significant effect on the predicted magnetic field, since we are dealing with the global source term internal to the computational domain, and interacting with electromagnetically strongly heterogeneous background (the lateral conductivity contrast being three orders of magnitude or more). I'd suggest to recalculate the induced fields at a higher resolution (0.5 degree should be still manageable by X3DG) and check the consistency of the conclusions.

2) The OMCT and STORMTIDE models include the wind-driven global ocean circulation that can bias the prediction of M2 tides obtained by fitting selected frequency into data. Could you provide a direct comparison of OMCT predictions for a purely tidal run, forced by ephemerides only? This would provide a direct insight at the importance of the bias.

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