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Interactive comment on "On the Approximation of Spatial Structures of Global Tidal Magnetic Field Models" *by* Roger Telschow et al.

Anonymous Referee #1

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General comments:

The paper describes a new approach for the extraction of (M2) tidally induced magnetic fields from satellite magnetometer observations. The proposed method uses spatial constrains in addition to the usually used frequency constrains during the M2 extraction. Variants of the new method and the traditional approach are discussed and compared. The paper is well written and the topic itself is very interesting. It is about time to go beyond the traditional tidal extraction methods by including additional information. Successful application of the described methods to real observational data would be valuable to the community. The presentation of the results has to be improved.

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Discussion paper

Specific comments:

As for now, the authors demonstrate (by hard to read figures) that their method can give comparable results to the traditional (spherical harmonic) approach. At least over the ocean. At least the figures should be improved and enforced with some numbers, e.g., the performance of the approaches are indistinguishable over the ocean (fig. 67, see also technical corrections).

Consequently, the paper would improve greatly if the authors could demonstrate the main purpose of their physical trial-functions: to separate between oceanic contributions and artifacts from land. The authors claim several times that their method could be used to remove undesired terrestrial contributions. I would recommend to add such contributions to their observations (B_{oc}^{CM5}, B_{oc}^{X3DG}) and (re)apply their method to prove that claim.

Technical corrections:

Since this is a physical journal it would help to point out mathematical defined terms that are not so common in this community: e.g., trial function, greedy algorithm, foundation (=basis?), dictionary and so on. Either ad a "so called" in front of them, use italic font or apostrophes.

Signals on the continents should be clearly distinguishable from oceanic contributions: Please add visible coastal lines to all plots and unify the plotted range where applicable.

Fig. 6-7: It would make sense to plot also the differences of the residuals. For example, keep the D1 residuals and plot the D2-D1 and D3-D1 residuals. The influence of the dictionaries on the oceanic residuals is not visible in the plots! At least give numbers (rms) for the residuals from all dictionaries and discuss them in the text. It would be a good idea to calculate separate rms for land and ocean. Please, unify the scales(!)

and add visible coastlines.

page 2, line 2: add reference for "greedy algorithms" page 7: remove eq. 9 page 7, line 16: how is 'best localized' determined? Based on the eigenvalue's proximity to 1? page 8, line 17: add reference for TPXO.

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