Reply to RC2

We would like to thank the reviewer, Dhananjay Ravat, for his detailed feedback and helpful suggestions.

In the following we reply to the reviewer's comments and present the respective modifications made to the manuscript. All lines refer to the initially submitted version.

- Page 1 lines 11, 21 and page 17 line 26

  Following his advice, we rephrased all sentences started with "Thanks to".

- Page 1, first paragraph

  We implemented the suggestions.

- Page 2, line 1

  We corrected the reference Korhonen et al., 2007.

- Page 2, line 23

  We added at the end of the sentence "for modeling the lithospheric magnetic field."

- Page 2, line 28

  Corrected.

- Page 3, concerning the question about the X component of SM coordinates

  We added the phrase "the Sun-Earth line lies on the xz plane" (so, yes, the X SM points towards the Sun) and added the reference of Laundal and Richmond, 2017, where different coordinate systems are explained.

- Page 3, lines 31-32

  We do not use along-track gradients, neither of CHAMP nor of Swarm. We use vector magnetic field measurements of CHAMP and across-track differences of Swarm.

  In line 31 we added the phrase: (hereafter called "across-track differences").

  We added the reference of Kotsiaros and Olsen, 2012 in line 32.

- Page 4, line 19

  We changed "outlying results" to "outliers", as suggested.

- Page 5, Table 1

  We have used differences between the measurements (vector and scalar) of Swarm Alpha and Swarm Charlie. We call these differences "across-track differences". We introduce now this term in page 3, line 31.

- Page 7, line 4

  Concerning the choice of the constant of the Huber weighting we added "following Sabaka et al., 2015".

- Page 7, line 6

  Yes, the value of 2 nT applies to all components. We clarify this now both for the ground data and the satellite data.

- Page 7, line 8-9

  The lower and upper surfaces are taken slightly below and slightly above, respectively, the data level. We added the phrase "in order to avoid artifacts due to edge effects".

- Page 7, line 26

  Corrected.

- Page 8, line 3

  Here we do not wish to say that the amplitude of the residuals is small but rather that the residuals are comprised of short wavelengths. We rephrased as follows: "The residuals...are of short wavelengths and reflect..".

- Page 8, line 5-7

  The gaps at the eastern off-shore region are particularly large (see Figure 2, Lesur et al., 2016). Leaving these regions void of data would create much probably important artifacts.

- Page 11, Figure 4

  The small scale oscillations observed over the north-western part of our maps are caused by the contrast between regions with good and poor near-surface measurements coverage. In particular, as pointed out by the reviewer, no near-surface measurements are available over Angola and some of the adjacent regions. Unfortunately, Gibbs effect cannot be completely avoided through regularization. On the contrary, regularization would cause an artificial smoothing of genuine structures where the near-surface information is available and would jeopardize the subsequent quantitative estimate of the model's power spectrum by artificially changing its slope.

  To better guide the reader and to avoid a possible overinterpretation of the affected structures, we now cover the respective region in grey shade in Figures 4 and 5 and we explain shortly in the manuscript this problem by stating after the first two sentences of paragraph 4.2 the following:

"The results over Angola and adjacent regions, up to 50 km altitude, are shaded with grey because WDMAM does not include there near-surface data and is filled in only with the values of the satellite-based model GRIMM_L120 (Lesur et al. (2013), Lesur et al. (2016)). Such a contrast in the spectral content of the available magnetic field measurements introduces artificial small-scale oscillations, an effect known as ringing. In order to avoid a possible overinterpretation of these structures we exclude them from our model."

- Page 13, line 9

  Corrected.

- Page 14, line 8

  Corrected.

- Page 16, line 4

  Corrected.

- Page 17, lines 5-8

  We think these particular structures are better outlined looking at the Y component rather than at the Z.

  We erased the sentence about their origin.