Ann. Geophys. Discuss.,
https://doi.org/10.5194/angeo-2018-82-RC1, 2018

Annales Geophysicae Discussions
Open Access
EGU

Interactive comment on "Analysis of Juno perijove 1 magnetic field data using the Jovian paraboloid magnetospheric model" *by* Ivan A. Pensionerov et al.

Anonymous Referee #1

Received and published: 14 September 2018

General comments

The paper adjusts the paraboloid Jovian magnetospheric magnetic field model from Alexeev & Belenkaya 2005 to magnetic field data recorded by Juno in the middle magnetosphere during its first perijove of august 2016. Two of the nine model parameters are constrained by the selected measurements (the magnetodisc inner radius R_DC2, and the magnetodisc field at its outer boundary B_DC), the other seven being fixed at their value deduced from the Ulysses flyby. The new values differ by resp. 14% and 26% from their Ulysses values, the error bars making the new R_DC2 value marginally consistent with the Ulysses one. The authors carefully discuss the selection of the 2

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Discussion paper

parameters to fit (while retaining the others at their Ulysses values) and the possible future improvements of the paraboloid model.

While the new values of B_DC and R_DC2 may be useful to colleagues working on the magnetosphere of Jupiter, I consider that a fit of 2 parameters from a single Juno perijove (out of 14 up to now) does not justify the publication of a regular article. With further work, there seems to be matter for a good regular article along two possible lines (not mutually exclusive): (1) analyzing many more Juno perijoves and studying the variability of the adjusted parameters, the fit quality, the possibility to constrain more parameters, to perform a global multi-perijove fit, etc. and/or (2) proceeding to some improvements of the paraboloid model (the most obvious one being to replace the infinitely thin disc by one of finite thickness) before applying it to Juno data.

Accordingly, I request a major revision of the present manuscript.

Specific comments

The scientific interest for determining a new fit of some parameters of the paraboloid model is not discussed.

It is not clear if inbound and outbound passes are considered separately in the plots only (e.g. Figs 2, 4, 5), or also for the adjustment. In the latter case, it should be justified and the values found for the 2 legs compared.

The covariance of B_DC and R_DC2 with the other 7 parameters could be better discussed. How are uncertainties likely to be affected ? Would this not imply that the present determinations of B_DC and R_DC2 are actually compatible with Ulysses data ? For example, you state that "deep and sharp field decreases due to the equatorial current sheet encounters continue to be observed on the Juno trajectory even at large radial distances r > 90RJ". May this imply that the Ulysses value of the outer radius of the magnetodisk RDC1 = 92RJ is actually underestimated ?

On p.8, you mention about the upstream solar wind "the limited information obtained

by computer modelling using data from near Earth orbit as input". But there are today very good models of solar wind propagation to Jupiter and beyond (mSWiM model of Zieger & Hansen 2008, or the model from Tao et al. 2005).

Technical corrections

I may be worth saying in the title which part of the magnetosphere is studied (e.g. the magnetodisc) rather than mentioning only the data and the model.

p.1 l.11: flybys OF Jupiter ? (NB: this is only a suggestion, the native english-speaking co-author is certainly more knowledgeable than me about the style)

p.1 l.16: what do you mean by "angular model".

p.2 l.23: a sketch illustrating the 9 parameters would be useful.

p.3 l.11: maybe precise that "negligible" means here "<10% of".

p.3, l.15: explain why "the use of averaged parameters is not adequate in this region", i.e. address the solar wind driven variability.

p.4, l.19: rather than discarding the use of the root-mean-square absolute deviation because it depend strongly on the position of the inner fitting interval boundary, could another option be to use both it (to perhaps better constrain R_DC2) and the relative deviation (for B_DC and R_DC2) ?

Caption of Fig. 4: the JRM09 model has not been subtracted from the residual magnetic field but from the observations.

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