

Interactive comment on “LANL* V1.0: a radiation belt drift shell model suitable for real-time and reanalysis applications” by J. Koller et al.

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General comments

We would like to thank the reviewer for taking the time to comment on our paper. We are glad that the reviewer was able to compile and test the supplemented code without any problems. We have further validated the neural network and specified the validity of the model as a function of distance to the training region in form of a figure which we will add to the manuscript.

Specific comments

We provide a response to each comment below. The reviewer's comments are paraphrased and summarized in italics.

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1. *For what regions is the model valid and usable?*

As the reviewer pointed out, the neural network degrades when used to extrapolate to regions that were not part of the training data set. We have calculated the average error of the neural network as a function of distance to the training region. We find that the neural network will provide similar performance between $5.8 < r < 7.3$ in units of Earth radii R_E although the training region was very limited to $[6.6, 6.7]R_E$. A plot will be added to the manuscript. We will also add a plot describing how the error increases towards lower pitch angle. This should provide the user with a good sense of where the model is valid and the degree of uncertainty.

2. *Leap-frog method:*

The first reviewer made a similar point about the description of the method to find the last closed drift shell. We agree that a better technical term for the method used is "bisection search algorithm". We will change the manuscript accordingly. The last closed drift shell was found by gradually testing the L^* values while stepping outwards in radial direction on the midnight line. Once an L^* is not defined, we step back in and out, similar to the bisection search algorithm, until sufficient accuracy is achieved. We also find the last closed drift shell as a function of pitch angles. The training region, which we described earlier, does not apply to this particular part of the neural network since it defines the global value of a last closed drift shell.

Technical corrections

1. *References to DREAM and Salamambo:*

We will add references to the manuscript.

2. *Difference between TSK03 and T01-storm*

It is our understanding that Tsyganenko [2002a,b] developed a magnetic field

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model based on a variety of solar wind conditions. It uses the parameterizations G1 and G2. On Tsyganenko's website <http://geo.phys.spbu.ru/tsyganenko/modeling.html> this model is called T02. Inside the source code, this model is called T01_1. Further, this model is called T01-quiet in the ONERA library using option 9.

Later, Tsyganenko, Singer & Kasper [2003] redid the same model but using storm-time data with $Dst < -65$ nT. In contrast to the previous model, it uses the parameters G2 and G3. The model is called from the ONERA library with option 10 and is referred to T01-storm. We call it TSK03 to make the proper connection to the paper. Since both (i) option 10 in the ONERA library and (ii) the paper by Tsyganenko, Singer & Kasper [2003] use the parameters G2 and G3, we believe these models are in fact the same.

3. ONERA-DESP library changed to IRBEM-LIB:

It is true that the newer version of the ONERA-DESP library is now called IRBEM-LIB. We have used version V4.1 for our effort when it was still under the old name. We will add a few words in the manuscript to note the change in names.

References

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