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Interactive comment on "GREEN: A new Global Radiation Earth ENvironment model" *by* Angélica Sicard et al.

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Modifications compared to the first version of the paper are highlighted in red in the text.

Referee Number 1:

General Comments: This manuscript reviews the features of many previous radiation belt models including AE8/AP8, SLOT, OZONE, etc, as well as discusses about their advantages and draw-backs. Then they introduce a new comprehensive radiation belt model named GREEN (Global Radiation Earth ENvironment). This model is an integration of the previous models and also can be thought of as a correction to the AE8/AP8 models. GREEN selects the most suitable models for different regions and

particle species/energies and combine them, which helps save users' time and effort to select models for their studies. As a user of the ONERA library, I appreciate the authors' effort to build such a complete model and hopefully it will be released with a user friendly interface in the future. I think this work is definitely valuable and interesting, but some revisions need to be made before publication.

Specific Comments: The problem that bothers me most is the discontinuity between different regions where the boundary of two sub-models (the models that is used in GREEN, such as AE8 and SLOT) exists. The sharp boundary between AE8 correct and SLOT at about L*=2.5 in Figure 13 is an example. The authors have realized this problem and stated in the paper that this problem is to be solved in the next version. Could you please at least explain how you are going to do it or show some of the potential methods to solve this problem? I suggest to show some preliminary result even if you use very simple smoothing methods such doing running average on each dimensions and repeat it for a few times. Dealing with the boundaries is a critical step in the work of combing different things.

==>Yes, you're right, there are some discontinuities at the interface of the different models integrated in GREEN and this is a critical step in this work. In the paper I have added an example of results with a simple smoothing method (Figure 14 in the new version) and some comments about the discontinuities.

Another thing is that I didn't notice any clear statement in the paper that describes the input and output parameters. I believe for most of the users like me would like to get this kind of information quickly and directly. The first sentence in the abstract tells us the scope of the model but it doesn't say that the solar cycle variation is included too. I suggest to add some more descriptions on the input and output parameters as well as the scope of the model in the abstract.

==>The inputs and outputs are clearly described in Figure 1 and the solar cycle dependence is mentioned. However I add some more descriptions in the abstract.

Here are some more detailed questions and comments: Page 1/ line 29: asses -> assess

==>Ok, corrected

Page 4/ line 7-8: Did you interpolate in between the AE8 MAX and AE8 MIN and if so, how did you do it?

==>No interpolation is done between the AE8 MAX and AE8 MIN. On one solar cycle (11 years) with 0 the year of the minimum, if -2 ïĆč year <2, AE8 MIN is used, otherwise AE8 MAX is used.

Figure 3: In the paragraph above this figure, it is mentioned that AE8 corrected is applied for >1 MeV electrons. But in this figure, it looks that the correction starts at about 700 keV. Could you please clarify that in the text?

==>The correction of AE8 is for high energy electron, typically greater than about 1 MeV. But, actually this correction is applied for electron greater then few hundred of keV, depending on Lvalue. So I have modified it in the paragraph above Figure 3.

Page 5/ line 3: It is not clear just to say "a mean model". I suggest to change it to something like "a model that reflects the mean flux along the magnetic field lines".

==>I have modified the sentence in the text by "that reflects the mean flux at each point along the magnetic field lines".

Figure 5, 6 and many other figures: There are too many lines in the figure which makes it hard for the readers to see the data clearly. It would be nice if you could reduce the lines you plot on one figure. Figure 5 has a large blank at the top and I suggest to change the y axis range so that the data is shown more clearly. Also, L star is used in the paper, but in some of the figures it is shown as "L". It would be better if they are accurate and shown as "L*". For figure 6, there is no y axis for the F10.7 index and it is better if there is one on the right or just plot it as a separate panel.

==>Figure 5 and Figure 5 have been modified for a better readability.

Page 7/ line 5: provide->provides; maximum flux-> fluxes

==>ok

Page 8/ line 19: How is this extrapolation done? How did you choose the fluxes at the lower energy boundary.

==>After reflection, this extrapolation is not of great interest and does not bring anything. Moreover, this extrapolation should not be used in a specification model.

Page 9/ line 8: used also -> also used

==>ok

Page 10/ line 10: which lies "below" the general tendency of the curve.

==>ok

Figure 10, could you please shrink the y axis range to make the variation of the lines clearer. Same thing with Figure 11.

==>Figure 10 and Figure 11 have been re-plotted.

Page 12/ line 13: non trapped -> untrapped (to be consistent with the one on Page 11)

==>ok

Figure 16: Since NOAA satellite is at low altitude, it will only measure the particles with really small pitch angles at large L shells. But GREEN provides an average flux of all pitch angles. Most of the times, the pitch angle distribution peaks at 90 degree, so I would expect NOAA lines generally lie below the GREEN lines. But this is not the case especially for the >30 keV electrons. Could you please comment on this? I think there are some misunderstandings in Figure 16. First, you're right, NOAA spacecraft measure particles with small pitch angles at large L-shell. But, you misunderstood when you say that GREEN provides an average flux of all pitch angles. It is not the

case! GREEN provides flux for each pitch angle along the magnetic field line. It is not an average of all pitch angles. Fluxes provided by GREEN are higher at magnetic equator than for small pitch angles. Figure 16 plots electrons flux provided by GREEN at LEO orbit, so they can be directly compared to NOAA measurements. If GREEN model and NOAA data were perfect, fluxes from GREEN would be superposed with NOAA measurements on this plot.

==>Then, it is important to keep in mind than >30 keV electron fluxes come from AE8 in GREEN while higher energy fluxes come from Slot or OZONE models. So the big difference between NOAA measurements and GREEN fluxes for >30 keV electron come from AE8 model, which seems to underestimate fluxes for L*>4.

Page 17/ line 18: protons-> proton fluxes

==>ok

Page 17/ line 19: extend OPAL model at-> to higher altitude

==>ok

Please also note the supplement to this comment:
https://www.ann-geophys-discuss.net/angeo-2018-26/angeo-2018-26-AC1-supplement.pdf

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