



Interactive comment on “Verification of SpacePy’s radial diffusion radiation belt model” by D. T. Welling et al.

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We thank the reviewer for his time and attention. He makes many salient points concerning the manuscript; here we address each individually. Any typo corrections have been fixed in the revised manuscript without further comment.

- 1) Concerning our description of the 3rd invariant: we agree with the reviewer; the manuscript has been amended.
- 2) Concerning the additional citations: the suggested references have been included.
- 3) Concerning the source term: The default source term was chosen to give RadBelt some default source function; outside of the KP dependence, it has little physical basis. The parameters are chosen arbitrarily at present. New source terms are being

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developed to replace the current default.

4) Concerning loss mechanisms: two explicit loss processes are implemented and discussed in the same paragraph that the reviewer references (magnetopause shadowing and plasmaspheric hiss). However, the paragraph is poorly organized such that it does not logically follow that the two loss mechanisms are indeed implemented. We have clarified this section in the current revision to remove confusion.

5) Concerning T01s versus other magnetic field models: T01s was chosen because it balances accuracy, run speed, and availability of required input values. The latter two points cannot be disregarded when a large number of T01s calculations (in this case, 6 months * 5 minute resolution = ~53,000 calculations) are required. We have added this information to the manuscript.

6) Concerning Figure 1 and the description of the results: the outer boundary is $L=10$; the lifetime outside of the last closed drift shell, LMAX, is very short. Thus, while there is diffusion across this boundary, the PSD decays very rapidly compared to the length of the simulation (about 47 days). When LMAX expands during less active periods, particles diffuse outward to fill up the now-closed shells. Initial conditions are empty belts that fill up quickly due to the default source term; the boundary is Dirichlet with PSD set to zero. The limited activity and high PSD values in the results are a result of the simple default source term. All of this information is now included in the text as suggested.

7) Concerning the plausibility of Figure 3: the bottom panel of Figure 3 is not a solution but a source term. A strong source of PSD at the upper boundary is added to offset strong diffusion towards higher L, thus maintaining the boundary condition. This paragraph has been clarified in the revised manuscript.

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