**Geoscientific
Model Development
Discussions**

Interactive comment on "Verification of SpacePy's radial diffusion radiation belt model" *by* D. T. Welling et al.

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We would like to thank the reviewer for his or her time and are happy to see that they found our manuscript has met most of the criteria for publication as laid out by GMD. The reviewer listed four items that should be clarified; each is addressed below. Finally, we would like to point out to the reviewer that the source code for the model used in this study can be found at http://spacepy.lanl.gov.

1) Concerning the use of the Tsyganenko 2001 (T01) model: T01 was only used to create the empirical relationship between DST and Lmax (Equation 2), which is location of the last closed drift shell in L* (simply L in this work) space. The RadBelt model works only in L space, so it does not require a magnetic field model unless the results are to be mapped to another coordinate system. Hence, T01 is not used in the rest of the

calculations.

2) Concerning the interface between Python and C: Native C code is compiled into a shared object library. Such libraries can be loaded into python as modules; simple variables such as floats and arrays can be passed to the module functions via the Ctypes module. Ctypes merely converts python data types to C data types. There are many ways to interface Python with C, but we found this to be the best method for our needs. We have included a synopsis of this information in the revised text.

3) The term "false positive" has now been defined in the text.

4) The dips in error are spurious points that only occur in the region where the time step or grid size is not proper for the problem being investigated. Had the error vs. resolution plots been expanded to the right (e.g. the domain where grid size/time step is larger), the error would oscillate wildly and more of these points would manifest. It is likely that many of them are the result of the time step or grid size harmonizing with the frequencies of the manufactured solution (i.e., we solve the code when QMMS(L, t)=0 so little or no source is applied to the solution and the code gets a low-error result by chance only.) Additionally, for large time steps, only one or two steps are taken to complete the whole simulation resulting in very little accumulation of error. While all of these causes are playing a role in creating the low-error spikes, the bottom line is that these spikes occur outside of the linear regime and therefore are artifacts of a clearly under resolved solution. We have added this discussion to the text (Section 3.1, Paragraph 2) for completeness.