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Interactive comment on "Invariants of the Spatial-Energy Structure and Modeling of the Earth's Ion Radiation Belts" *by* Alexander S. Kovtyukh

Anonymous Referee #1

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General comments

This paper presents a parametric model for the density of various ion species in the Earth radiation belts. This model describes the global structure of the radiation belts for protons, helium, and for ions of the CNO group. Based on extensive satellite data, the parameters of the models have been fitted, independently for the proton populations and for the other ions. The validity of the model is discussed, species by species, by comparison with in-flight data. The solar cycle dependency is presented. Finally, a physical interpretation of the model is detailed.

Overall, the paper is difficult to understand. Firstly, the English is very poor (see tech-

nical corrections hereafter), and difficult to grasp. Secondly, the model is not appropriately explained, as the author refers to previously published literature, which could not be accessed by this reviewer. Thirdly, as described in the specific comments, the figures are not very clear and supportive of the arguments developed in this paper.

Specific comments

Section 2 of this paper presents the model parameters and their measured values, but not the model itself, which is only suggested by the description of the parameters. A detailed and self-sufficient description of the model should be given in this section.

On section 3, numerous similar figures are presented. It is not clear how these figures were obtained from the data. In particular, these figures present iso-lines on power of tens, with most satellite data points placed on the iso-lines, which suggest some interpolation was done on the satellite data. Section 3 should detail how this figures were made.

The conclusions of the comparison of figures 1 to 4 proposed at line 269 are not clearly apparent in the figures. Similarly, the low-altitude effects described at line 352 cannot be clearly seen on the figures, because the transformation B/Beq to altitude is not straightforward (for instance, the 1000 km altitude line could be drawn on figure 7-9 to support the arguments of this paragraph).

A reference should be provided at line 347 for the dependency of the radial diffusion rate on B/Beq.

A figure supporting the information at line 362-364 about the CNO group data could be provided.

Technical corrections

Numerous English errors have been found, for instance on lines 21, 24, 34, 48, 63, 67, 69, 79, 118, 132, 134, 137, 161, 163, 166, 173, 185, 193, 201, 215, 220, 226, 239, 271, 290, 314, 338, 379, 387, 389, 398, 403, 469.

In the figure legends, the MeV unit is displayed in Cyrillic. Moreover, the model lines on the figures are not described in the legends.

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