

# ***Interactive comment on “Influence of the Earth’s ring current strength on the Størmer’s allowed and forbidden regions of charged particles motion” by Alexander S. Lavrukhan et al.***

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We would like to post a new, more full answer to the first referee. We have done changes in the paper according to the comments and attach a new pdf file of an article with highlighted changes (in yellow color).

Page 1, line 17 – Please, correct “one have to. . .” -> “one has to. . .”

Thank you, corrected.

Page 2, line 18 – “enable” -> “enables”

Corrected.

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Page 3, line 20 – here and below I would suggest to rephrase the “south IMF” and “north IMF” to more correct version of this term, for instant, “southward oriented IMF”.

At this point and below the phrases containing the orientation of IMF are corrected.

Page 3, line 22 – “this phenomena” -> “this phenomenon”

Corrected.

Page 3, line 26 (and the entire chapter 3) – when you mention the index Dst for the first time, please introduce in clearly. The same comment goes to all other variables and parameters used in the paper, especially in the chapter 3: beta, c, m, etc. Some authors prefer to make the list of variables separately in the end of the paper, for example.

Dst index is introduced “Dst index (axisymmetric component of the disturbed magnetic field relative to the geomagnetic dipole)”, and also other parameters: “Z is the charge of a particle in units of an electron charge, m is the mass of a particle, c - speed of light.”

Page 3, lines 26, 30, page 4, line 25 – here and below sometimes you write “storm-time ring current”, and sometimes “stormtime ring current”. Please, use one version.

Corrected, version storm-time is used.

Page 3, line 27 – please, rephrase the sentence, which contains “After the IMF is rotated to the north. . .”

The sentence is rephrased: “After the IMF changes its direction from southward to the northward, the recovery phase begins. . .”

Page 4, line 28 – please, rephrase the sentence, which contains “. . .and the sudden rotation of the IMF to the north. . .”

The sentence is rephrased: “and the sudden change of the IMF direction to the northward”

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Page 5, line 5 – please, remove the parentheses

The reference is changed: “is given by Landau et al. (1982):”

Page 7, line 19 / p.8 l.20 – “can not” -> “cannot”

Corrected.

Page 8, line 10 – “definition” -> “definition”

Corrected.

Page 9, line 15 – “appears” -> “appear”

Corrected.

Page 16 – Figure 9 is absolutely identical to Figure 8 and does not correspond to the text below and the values in the table 2, probably it is a technical error and another figure should be here?

Figure 8 and 9 are very similar, but different. The spatial extent of the allowed region of motion is larger at fig. 8a than at 9a. The difference also exists for fig. 8c and 9c. This is now mentioned in the text after figure 9: “One can see, that figures 9 and 10 are quite similar. Increase of the external field  $b_z$  leads to the same result as the decrease of the ring current radius  $a$ - and to the stronger trapping of particles (Fig. 9a, 10a). Decrease of  $b_z$  (Fig. 9c) leads to the break of the trapping region, the same happens, when the radius  $a$  of the ring current increases (Fig. 9c). As the field inside the current ring decreases, and outside increases, we see a logical result in the Fig. 9a-c. For  $a=4$  RE (Fig. 10b), particles will be in the region of a stronger field (ring current field plus dipole) than for  $a=5$  RE (Fig. 10 c) - in this case the field at  $L=8$ RE is weaker.”

Page 16, lines 11-13 – here you state that the Dst index strongly depends on  $b_z$  and the radius of the ring, and on page 18, lines 3-4 you state, that this radius has almost no effect. Please, be consistent and rephrase those sentences and the corresponding text between on pages 16-17.

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The sentences about the effects of the ring current radius and external field on the Dst index are corrected. “Therefore, the larger the radius of the model ring with current, the faster the particles at the edge of the real ring current get the opportunity to leave the trapping region. Conversely, when the radius of the current ring decreases (Fig. 10a), the field magnitude beyond the distance  $a$  becomes larger and the particles are trapped stronger by the magnetic field. Thus, the topology of the allowed-forbidden regions of motion and the critical value of Dst index in our problem also strongly depends on the radius  $a$  of the ring with the current.”

Page 17 - here you provide two tables, but you don't discuss them in the text. I would suggest to add some comments on those tables.

Comments on the Tables 1 and 2 are added to the text.

Page 18, line 21-22 – Please, rephrase the sentence “for At a certain current strength magnitude . . .”

“For” is deleted.

We would like to thank referee again for his opinion about the article and his comments.

Please also note the supplement to this comment:

<https://www.ann-geophys-discuss.net/angeo-2018-104/angeo-2018-104-AC3-supplement.pdf>

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Interactive comment on Ann. Geophys. Discuss., <https://doi.org/10.5194/angeo-2018-104>, 2018.

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