

Ann. Geophys. Discuss., referee comment RC2
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Comment on angeo-2021-55

Anonymous Referee #2

Referee comment on "Statistical study and corresponding evolution of plasmaspheric plumes under different levels of geomagnetic storms" by Haimeng Li et al., Ann. Geophys. Discuss., <https://doi.org/10.5194/angeo-2021-55-RC2>, 2021

Plasmaspheric plumes play important roles in the inner magnetosphere. The current study statistically investigates the plumes observed by Van Allen Probes. Furthermore, it explains the difference of the observed features of plumes by Van Allen Probes and Cluster by performing test particle simulations. The simulation results explain well these different features. This is an interesting study and contributes to our understanding about plasmaspheric plumes. I suggest this preprint be published after minor revisions and list my comments and suggestions as follows:

A general question: during these intervals under study, where were Cluster satellites? Since authors compare observation results from Cluster and Van Allen Probes, is it possible to compare their observations during the same time intervals?

Line 55: 'In this paper', in situ measurements from Van Allen Probes are used to...

Line 73: what is the criteria for this 'sharply'?

Line 102: But the time interval of them are shorter. Could you please normalize them and compare the occurrence rate rather than simple number of events?

Line 114: It would be interesting to add MLT-L dependence. Maybe authors can plot 'dial

' figures like in Figure 7, but color-code occurrence rate in different MLT-L bins.

Line 115: How about storms with Dst lower than -70 nT?

Line 125: delete 'disparity' after 'rates'

Line 127: test particle simulation's'

Line 146: is the 5cc set up for the initial condition?

Line 166: I suggest add labels indicating some L values in the figure

Line 168: remove 'in' after 'on'

Line 169: be lose □ lost

Line 177: 40th hr (not shown)

Lines 179-182: This sentence is too long. I suggest authors to finish a sentence after 'complicated' on line 181 and to start a new sentence afterwards.

Line 203: 'The initial distribution of electron density' is set up in the same way as ... on 30 April, and is shown ...

Line 212: loss 'to' the magnetopause

Line 213: Is the upflow of electrons also stronger in strong storms? This can be an uncertainty in your simulation studies since you don't have the upflow process included in your simulations but they can be different for storms of different levels.

Line 226: Again, I suggest calculating occurrence rates, instead of simply comparing number of events.

Line 232: remove 'appears' after 'plume'

Line 257: lost 'to' the magnetopause

Lines 279: 'these two' factors make 'the Van Allen Probes'

Figure 1: Considering this is a study related with storm/non-storm periods, I suggest authors to add panels in this figure to show related geomagnetic indices (e.g., Dst, Kp, AU, AL, AE), and to add vertical lines indicating storm phases and the start of the storm if this is a storm period.

Figure 7 caption: line 449: on □ above