

Interactive comment on “Outer Van Allen belt trapped and precipitating electron flux responses to two interplanetary magnetic clouds of opposite polarity” by Harriet George et al.

Anonymous Referee #1

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General Comments:

This manuscript compares two events in which ICMEs impact Earth’s magnetosphere and cause responses in both trapped and precipitating radiation belt electrons. They qualitatively compare and contrast the timing, characteristics, and magnetospheric response during these two events, one of which has magnetic cloud orientation and rotation of B_z North to South, and the other South to North. They describe in detail both events, but as currently presented, it is difficult to directly compare the events or attribute their differences specifically to the ICME characteristics. I recommend the following specific comments be addressed to help clarify the manuscript and its findings.

C1

Specific Comments:

1. It is difficult to compare and contrast the two events directly as they are currently presented. Please consider incorporating some of the following potential suggestions to help the reader better identify the key take-aways from the two-event comparison:

- Combining Fig 1 and 3, 2 and 4 (as left and right panels, e.g.) would help the reader better look at the relative timing and magnitude of the magnetospheric response during these two events

- Including a summary table or figure in the discussion of the different key parameters that were investigated and their similarities/differences between events would also help, since there is a lot of detailed description and text in the discussion section to sift through.

2. Is there a reason the EMIC wave observations are taken from GOES rather than Van Allen Probes? Please include the MLT of both spacecraft during these observations, since this can have a large influence on which wave populations will be sampled. Additionally, summing the hiss and chorus wave power from the Van Allen Probes (as you’ve done for GOES Pc5 and EMIC measurements) in Fig 2 and 4 would make these plots easier to more quantitatively compare between the two events.

3. The plasmapause location might be more useful to show in the figures of radiation belt fluxes (5, 7) rather than solar wind data, so that the trapped fluxes inside and outside of the plasmasphere can be better identified in Van Allen Probes data.

4. POES data:

- was using the P6 channel considered, for comparison to the trapped MeV electron populations?

- line 501-503: Why is the precipitation enhancement here (as opposed to at other times) assumed to be due to a trapped flux enhancement? Some further justification of this is needed. This also raises the general question of how to interpret the POES

C2

data at it is presented, if enhancements can be due just as easily to enhancements in trapped fluxes as enhancements in precipitation. While the caveats of the current technique for presenting the POES data (equation 1 of the manuscript) are nicely mentioned, it is not clear how much better they are than presenting just the 0deg telescope measurements for the purposes of this event comparison.

Technical Corrections:

1. please double check the color bar axis units (e.g. Fig 5) – it looks like the REPT >3.4MeV fluxes are larger than those in MagEIS >346 and >1079 keV channels.
2. line 381 – typo: “decreases” should be “decreased” or “decreasing”
3. line 387 – depletion at “high L-shell” is discussed, but then referenced as “low latitude” – shouldn’t higher L shells map to higher latitudes?
4. line 400 – typo: “event 2 exhibits moderate level” -> “moderate levels”

Interactive comment on Ann. Geophys. Discuss., <https://doi.org/10.5194/angeo-2020-18>, 2020.