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Interactive comment on "The increase of curvature radius of geomagnetic field lines preceding a classical dipolarization" *by* Osuke Saka

Anonymous Referee #2

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The author proposed an interesting hypothesis to assemble terrestrial magnetic dipolarization, initiated from the geosynchronous altitudes. To the referee's understanding, what drivers magnetic dipolarization is very complicated, so far there have been many proposed scenarios in driving dipolarization process. After numerous measurements in Earth's magnetosphere, it is generally believed that many fundamental processes are involved in driving magnetic dipolarization. The proposed mechanism in this paper is likely over simplified. It looks too speculative to the referee, especially there is no any support from in situ observations. Therefore the referee could not recommend this paper for a publication. However, if the hypothesis could be supported by some case study, it would make much more sense and shall have potential for a publication.

1. Why ballooning instability could develop in geosynchronous orbit? Comparison

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Discussion paper

between the scale of pressure gradient and curvature radius is necessary.

2. Substorm onset is usually believed triggered at ∼10 Re, and the auroral beads which manifest ballooning instability is also believed to map to ∼10 Re but not at geosynchronous orbit. The geosynchronous orbit initiation of dipolarization is not supported by observations.

3.Why the hypothesis must be applied in geosynchronous but not 10Re? The magnetic stretching process is also clearly shown in 10Re region, for example, the substorm event shown in Sergeev et al. 2011, doi:10.1029/2010JA015689.

4. The dawn dusk stretching flux tube is a common feature ahead of dipolarization front, (e.g., Figure 4 in Yao et al. 2013 doi:10.1002/2013JA019290 and Figure 6 in Liu et al. 2013 doi:10.1002/jgra.50092).

5. It has been reported that BBFs decelerate dramatically when they propagate towards the Earth [Shiokawa et al., 1997]. And It could be hardly for DFs arrival at geosynchromous. Thus, the hypothesis that westward electric fields on DFs trigger instability at geosynchromous should be not universal. The author needs to discuss in which conditions the proposed scenarios could be applied.

line 100: It requires more explanation for Eq. 1.

line 258-262: it is unclear why the change of curvature radius of field lines is different from the flux pileup dipolarization. Both are caused by current disruption, can we distinguish between them in observations?

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