Dipolarization in the Inner Magnetosphere: Comparison between Geosynchronous Orbit and Further Inside

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The present study addresses the current system associated with dipolarization in the inner magnetosphere. *Ohtani et al.* [2018] examined dipolarization events observed by the Van Allen Probes (RBSP) satellites within 5.8 R_E from Earth, and by statistically comparing signatures at nearby RBSP or GOES satellites, they found that dipolarization signatures are often highly correlated (c.c. > 0.8) within 1 hr in MLT and 1 R_E in R_{XY}, and the dipolarization region expands earthward as well as azimuthally. In the present study we use, as a reference, the GOES geosynchronous satellites instead, and we examine how the magnetic field at the RBSP position changes responding to sharp dipolarizations at geosynchronous orbit. As expected from the aforementioned result, the two spacecraft occasionally observe similar dipolarization signatures with some time delay. It is, however, also found that in some events the magnetic field changes far less systematically at the RBSP probes, and in other events it barely changes or changes very gradually even if the RBSP probes are located very close to the GOES location in longitude (DMLT = 0.0 ~ 0.5 hr in MLT). By examining such variability with respect to the radial distance and magnetic latitude of the RBSP probes, we address the spatial structure of the associated current system. We also examine the variation of particle fluxes at the RBSP probes for each type of the magnetic response, and discuss the result in terms of the enhancement of local plasma pressure and the formation of a R2-sense field-aligned current system, which we suggest coexists along with the conventional substorm wedge current system.

Reference:

Ohtani, S., Motoba, T., Gkioulidou, M., Takahashi, K., & Singer, H. J. (2018). Spatial development of the dipolarization region in the inner magnetosphere. Journal of Geophysical Research: Space Physics, 123, 5452–5463. https://doi.org/10.1029/2018JA025443.

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