Annales
Geophysicae
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Interactive comment on "The asymmetric geospace as displayed during the geomagnetic storm on August 17, 2001" *by* Nikolai Østgaard et al.

M. Mooney

m.mooney.16@ucl.ac.uk

The comments summarise a discussion of this manuscript by the Space Plasma Physics Group at the Mullard Space Science Lab, UCL.

This manuscript aims to study the effect of the By component of the IMF on the Earth's magnetosphere, in particular the asymmetries observed in the magnetosphere during periods of high IMF By. The manuscript analyses a case study of a geomagnetic storm which occurred in August 2001 during which the magnetosphere was exposed to a strong IMF By component. To study this particular storm, many available data sources are utilised to build up a picture of the asymmetries observed in the magnetosphere.

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Discussion paper

Comments:

Two of these data sources IMAGE (SI13) and POLAR (VIS) are used to explore conjugacy in auroral features of the two hemispheres. In Figures 3 and 4, which present a comparison between the northern and southern auroral ovals, we suggest that the scales be converted into units of energy flux or Rayleighs rather than using counts. This may help to better illustrate the conjugacy in the auroral features. In addition, we noted that the displacement of the conjugacy observed in Figure 3A is difficult to ascertain, given the reduced field of view in the VIS data.

In Figure 11 we feel that there are too few data points used in the calculation of the convection patterns and thus does not provide strong enough evidence to conclude that reconnection is occurring in the northern lobe region.

In the discussion sections 4.4, 4.5 and 4.6 we feel that the clarity of the explanations provided could be improved through the use of schematic diagrams of the magnetospheric processes which are described. Figure 8 is a helpful illustration but could be described in more detail within the main text.

The description in section 4.6, might take into consideration the time scales involved for the effects of IMF By to propagate through the lobes, into the plasma sheet and create the asymmetries in the magnetosphere. This would help to place this discussion in the context of the time scales of By being induced and transported in the closed magnetosphere from the literature referenced in the introduction section (for example, Tenfjord et al. (2015, 2018), Motoba et al. (2010), Rong et al. (2015)). An additional reference which may be useful for this discussion or the introduction is Timescales for the penetration of IMF By into the Earth's magnetotail Browett et al. (2016).

We also suggest that more discussion on how a By component is induced in the magnetosphere could be included in the introduction section, especially given that one of the main findings presented in the manuscript provides evidence for tail reconnection reducing the induced By component in the magnetosphere.

A few smaller points that we note are that more detailed description might be added to the figure captions and the title of the manuscript might be considered for revising, in particular the term 'asymmetric geospace'.

As noted, many data sources are used in the manuscript to study this particular storm event. We suggest that another helpful data source might be the Cluster spacecraft which should be located in the magnetotail during this period and may provide direct measurements of the By component in the plasma sheet.

Overall, the manuscript is presented well and written in a logical order. We hope our feedback is helpful in the development of this manuscript.