

Interactive comment on “The asymmetric geospace as displayed during the geomagnetic storm on August 17, 2001” by Nikolai Østgaard et al.

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First we would like to thank you and your group for taking time and effort to read and discuss this manuscript.

Here is our response:

1. Energy flux or Rayleigh versus counts. To derive energy flux from images is not a straightforward thing to do and require detailed modeling. Frey et al., 2003 have given us tools to do this for IMAGE, but there are no such tools for VIS camera. Converting to Rayleigh is just a multiplication of a constant which gives the impression of comparing

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similar images, but they are not. The cameras measure different emissions and different wavelength bands. We believe it is most honest to use counts and describe how we (as best we can) scale the images.

2. FOV of VIS in Figure 3A. We agree and this is also pointed out (page 9 line 8) and uncertainty is included in Figure 10

3. Our main argument for having lobe reconnection in the North is the auroral lobe spot seen at very high latitudes (Figure 13). In addition, Figure 14 shows sunward convection at high latitudes (now marked with red circle to clarify) in the same region as we see the spot. There are both green dots (SuperDARN line-of-sight) and brown arrows (SuperMAG) in this region.

4. Instead of expanding the text (in 4.4, 4.5 and 4.6) in an already long article we will repeat in the beginning of Section 4.4 the reference to Tenfjord et al., 2015: “For further details about how BY is induced in the closed magnetosphere we refer to Tenfjord et al. (2015) where this is explained in great detail, both theoretically and by showing MHD model results. ”

5. Time scales that are involved. We have explained the contradicting results about time scales for establishing an induced By component in the introduction (see page 2), and we will also included Browett et al. (2016) paper as another paper claiming 2 hours delay, or more. Since we do not have any IMF By-polarity changes during this magnetic storm, we cannot address how fast By is induced. However, as we point out on page 2, this has been shown by two papers by Tenfjord et al., (2017 and 2018). In the present paper we do think we have sufficient data to support that asymmetry is reduced by substorms due to increased reconnection. This is important and contradicts the idea that reconnection is the process by which asymmetry is introduced. Our group has just submitted a paper (to JGR) which addresses also the time scales involved in removing asymmetry due to increased reconnection. This paper by Ohma et al. will be published soon.

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6. We believe the term asymmetric geospace is rather accurate, because there is asymmetry in both reconnection locations on the magnetopause (dayside) - asymmetric magnetic pressure in the lobes, which creates asymmetric footprints of field lines and aurora, and there are asymmetric convection patterns in the two ionospheres. This means that all main regions of geospace are asymmetric.

7. Yes, Cluster was in the magnetosphere during this time and could have been used (see Echer et al., JGR113, A05209, doi:10.1029/2007JA012624). However, this is already a long paper with a lot of data, and we believe we have sufficient support for our main conclusions.

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