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Interactive comment on "Turbulent Processes in the Earth's Magnetotail: Spectral and Statistical Research" *by* Liudmyla Kozak et al.

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Comments on "Turbulent Processes in the Earth's Magnetotail: Spectral and Statistical Research" by Kozak et al. The authors used Cluster data to investigate turbulent properteis before and during the dipolarization process in the near Earth's magnetotail. This work is interesting, but more work is needed to do. The comments below are helpful to improve this paper.

Q1. The authors used most of parts to introduce the sub-storm in the magnetotail, but just simply mentioned several works which are related with plasma turbulence in the magnetotail. However, there are a lot of important works which have investigated the turbulent process (such as spectral index, intermittence, multifractal etc.) associated

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Discussion paper

with BBF, magnetic reconnection, or dipoalrization in the magnetotail plasma sheet. I strongly suggest the authors to introduce the recent progress on this topic and compare with their results in this paper. Some related references are shown below: Vörös, Z., et al. (2003), MultiâĂŘscale magnetic field intermittence in the plasma sheet, Ann. Geophys., 21(9), 1955–1964. Vörös, Z., et al. (2004), Magnetic turbulence in the plasma sheet, J. Geo- phys. Res., 109, A11215, doi:10.1029/2004JA010404. Vörös, Z., W. Baumjohann, R. Nakamura, A. Runov, M. Volwerk, H. K. Schwarzl, A. Balogh, and H. Rème (2005), Dissipation scales in the Earth's plasma sheet estimated from Cluster measurements, Nonlinear Process. Geophys., 12(5), 725–732. Vörös, Z., W. Baumjohann, R. Nakamura, M. Volwerk, and A. Runov (2006), Bursty bulk flow driven turbulence in the Earth's plasma sheet, Space Sci. Rev., 122(1–4), 301–311, doi:10.1007/s11214-006-6987-7. Vörös, Z., W. Baumjohann, R. Nakamura, A. Runov, M. Volwerk, T. Takada, E. A. Lucek, and H. Reme (2007), Spatial structure of plasma flow associated turbulence in the Earth's plasma sheet, Ann. Geophys., 25 (1), 13–17. Huang, S. Y., M. Zhou, X. H. Deng, et al. (2012), Kinetic structure and wave properties associated with sharp dipolarization front observed by Cluster, Ann. Geophys., 30, 97-107. Klimas, A., V. Uritsky, and E. Donovan (2010), Multiscale auroral emission statistics as evidence of turbulent reconnection in Earth's midtail plasma sheet, J. Geophys. Res., 115, A06202, doi:10.1029/2009JA014995. Huang, S. Y., M. Zhou, F. Sahraoui, et al. (2010), Wave properties in the magnetic reconnection diffusion region with high β: Application of the k-filtering method to Cluster multispacecraft data, J. Geophys. Res., 115, A12211, doi:10.1029/2010JA015335. Huang, S. Y., M. Zhou, F. Sahraoui, A. Vaivads, X. H. Deng, M. André, J. He, H. Fu, H. M. Li, Z. Yuan, and D. D. Wang (2012), Observations of turbulence within reconnection jet in the presence of guide field, Geophys. Res. Lett., 39, L11104 doi:10.1029/ 2012GL052210. Weygand, J. M., et al. (2005), Plasma sheet turbulence observed by Cluster II, J. Geophys. Res., 110, A01205, doi:10.1029/2004JA010581. Weygand, J. M., M. G. Kivelson, K. K. Khurana, H. K. Schwarzl, R. J. Walker, A. Balogh, L. M. Kistler, and M. L. Goldstein (2006), NonâĂŘ selfâĂŘsimilar scaling of plasma sheet and solar wind

probability distribu- tion functions of magnetic field fluctuations, J. Geophys. Res., 111, A11209, doi:10.1029/2006JA011820.

Q2. Line #23 in Page 3, 3 events cannot cover from 2005 to 2015. After read the paper, one knows two events in 2005, one event in 2015. Thus, I suggest the authors to re-write this sentence to avoid the confusedness.

Q3. Line # 30-32 in Page 3 and Line #1-6 in Page 4, the authors describe three components and depolarization, but they didn't show any components in Figure 1. As a reader, I strongly suggest the authors present the components of magnetic field.

Q4. Table 1 in Page 5. The authors show the features of the depolarization front. The speed of the DF and thickness are estimated by timing analysis. However, the separation of four Cluster spacecraft is about 2 Re in 2005. This separation is able to compare with the dawn-dusk scale of DF (Fu et al., 2012; Huang et al., 2015), which leads to that the timing results may be not correct. One should be careful to perform timing analysis such situation. Fu, H. S., Y. V. Khotyaintsev, A. Vaivads, M. André, and S.Y. Huang (2012), Electric structure of dipolarization front at sub-proton scale, Geophys. Res. Lett., 39, L06105, doi:10.1029/ 2012GL051274. Huang, S. Y., et al. (2015) Dawn-dusk scale of dipolarization front in the Earth's magnetotail: multi-cases study, Astrophys Space Sci, 357, 22, doi:10.1007/s10509-015-2298-3

Q5. Table 3 in Page 8: Kink frequency? I can't see obvious kinks in the spectrum in Figure 3. Thus, I would like to use the frequency of breakpoint to replace it.

Q6. Line #12 in Page 10: Inverse and direct cascade. What's inverse and direct cascade? What's the definition of two cascades? How to identify two different cascades? I think such introduction will make the paper more clearlyz.

Q7. Line #8 in Page 13: It should be pointed out that spectral properties of the field are not sensitively affected by intermittency. Any references to support this?

Q9. Line #7-8 in Page 3: "This allows one to get an idea of the physical proper-

ties of plasma turbulence and a description of the transport processes in the turbulent regions in qualitative and quantitative term" There are also a lot of references to qualitatively and quantitatively investigate the turbulent in the magnetosheath or solar wind. Breuillard, H., Yordanova, E., Vaivads, A., et al. 2016, The Effects of Kinetic Instabilities on Small-scale Turbulence in Earth's Magnetosheath, ApJ, 829, 54 Huang, S. Y., F. Sahraoui, X. H. Deng, et al. (2014), kinetic turbulence in the terrestrial magnetosheath: cluster observations, Astrophys. J. Lett., 789, L28 Sahraoui, F. S., Huang, Y., De Patoul, J., et al. 2013, Scaling of the electron dissipation range of solar wind turbulence, ApJ, 777, 15âĂĺ He, J. S., Tu, C., Marsch, E., & Yao, S. 2012, Do oblique alfvén/ion-cyclotron or fast-mode/whistler waves dominate the dissipation of solar wind turbulence near the proton inertial length? ApJL, 745, L8âĂĺ Sahraoui, F., Belmont, G., Rezeau, L., et al. 2006, Anisotropic Turbulent Spectra in the Terrestrial Magnetosheath as Seen by the Cluster Spacecraft, PhRvL, 96, 075002 Huang, S. Y., L. Z. Hadid, F. Sahraoui, Z. G. Yuan, and X. H. Deng (2017), On the Existence of the Kolmogorov Inertial Range in the Terrestrial Magnetosheath Turbulence, Astrophys. J. Lett., 836, L10, doi.org/10.3847/2041-8213/836/1/L10

Q10. I suggest the authors compare their results with previous observations, and discuss them.

Q11. Some typos in the Line #12-13 in Page 1 and line #21-22 in Page 7: −2.20 Ãů −1.53, −2.89 Ãů −2.35 in Line #1-2 in Page 18: 0.20 Ãů 0.77 1.20 Ãů 1.77 in Line #17-18 in Page 18: -2.20 Ãů 1.53 2.89 Ãů 2.35

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