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Discussions

Interactive comment on "Statistical study of ULF waves in the magnetotail by THEMIS observations" *by* Shuai Zhang et al.

Anonymous Referee #2

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This paper presents a statistical analysis of ULF waves in the nightside magnetosphere including the tail region up to geocentric distances of 32 Re. The wave events are identified using plasma bulk velocity data to capture fundamental field line oscillations. The wave events are classified into radial and azimuthal type and standing and nonstanding modes. The most important result is the finding that standing waves are hardly detected beyond 16 Re. I find this result to be very interesting and significant. I recommend publication of the manuscript after the authors have considered minor comments listed below.

Line 78. Please change "Susumu Kokubun" to "Kokubun"

Line 136. "quasi monochromatic" Is this judgement made by visual inspection of the time series data? If so, it may explain some discrepancies between the present and

previous studies (see my comment on line 267 below).

Line 169, Figure 2. I recommend using a common amplitude scale for the components of each vector quantity. It makes easier to visually grasp the amplitude difference between the toroidal and poloidal components.

Line 171. The Ez component is not zero. This should be pointed out in the main text and explained in relation to how you define the field line coordinate system.

Line 232. The phase difference can be $\sim$-90 degrees, depending on the magnetic latitude (or distance from the tail midplane where Bx = 0). I hope that events exhibiting this phase delay are also included.

Line 239. I guess that this probability means the probability that a given azimuthal or radial wave event shows signatures of a standing wave, not the probability that you find a standing wave at a given time. Please clarify.

Line 240. Change "deep" to something like "dark"

Line 259. "fundamental eigenmode". You can justify this mode identification by examining the relationship between the sign of the Er-Ba phase difference and the magnetic latitude of the spacecraft. You can also identify second harmonic from the phase difference. Have you found any second harmonic waves? Second harmonic poloidal (radial) waves have been reported at R < 10 (e.g., Hughes et al., 1979), and I wonder if you have encountered any at R > 10.

Hughes, W. J., McPherron, R. I., Barfield, J. N., & Mauk, B. H. (1979). A compressional Pc4 pulsation observed by three satellites in geostationary orbit near local midnight. Planetary and Space Science, 27(6), 821-840. doi:10.1016/0032-0633(79)90010-2

Line 267. This is different from the Geotail result obtained by Kokubun (2013, Figure 15) and Takahashi et al. (2014, doi:10.1002/2014ja020274, Figure 5). Please comment on this difference and offer explanation if possible.

Line 287. "Poulters" means "Allan and Poulter?"

Line 298, "Highly stretched field lines". Is it possible that some events are observed on open field lines?

Line 331. Figure 8. It would be better if the vertical axis shows the probability of detecting a wave event (instead of the number of events) in each bin for the solar wind velocity and AE index.

C3