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Interactive comment on "A statistical study of spatial distribution and source region size of chorus waves using Van Allen Probes data" *by* Shangchun Teng et al.

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We thank the reviewer for these comments.

1. A number of studies have adopted AE* (the maximum or average value of AE in previous hour) to investigate the geomagnetic activity dependence. Please justify or discuss the adoption of AE for such an analysis.

We re-analyzed our data using AE* and it does not make a significant difference. We understand that some studies used AE* and some used AE. We mainly followed the Meredith-2003 method.

Meredith N, Horne R, Thorne R, Anderson R (2003) Favored regions for chorus-driven electron acceleration to relativistic energies in the Earth's outer radiation belt. Geophys Res Lett 30:1871. https://doi. org/10.1029/2003GL017698

We have added a reference to this paper.

2. Figure 5 shows very interesting results of the chorus wave source region size and the good agreement between observations and theories. What is the error bar associated with the average observational results? Please clarify. By the way, for L = 4.5 on the bottom panel, is one blue line on the right missing (or overlapping)?

This is indeed a very good suggestion. But unfortunately we cannot put a good estimate of the error bar here, since errors of some factors cannot be estimated; e.g.,the error from the background magnetic field model used in this work to determine the geomagnetic equator and MLAT. The bottom line here is this study uses a large amount of data mainly to provide a lowest order estimate of the source region size. There are lots of factors we do not consider in this work; e.g., the move of the source region along a field line, which is only possible to identify using simultaneous observations from multiple closely spaced spacecraft.

For L = 4.5 on the bottom panel, the blue line on the right is overlapping with the red line. We have added a sentence in the caption to clarify this.

3. Also about the source region sizes of rising tone and falling tone chorus. The presented results show a clear dependence on the chorus spectral shape. Say, at L = 4.5 and 5, the former is statistically larger than the latter; and vice versa at L = 5.5 and 6. Is there any explanation for this feature? Please give some discussions.

We do not think the small difference (about 300-400 km) between the source region size of rising and falling tones is large enough to be considered important. As we stated in our manuscript, this is mainly to provide a statistical analysis of the rough source region size. Falling tone chorus is so poorly understood from the theoretical

point of view that we really cannot provide an explanation for the difference about the source region size of rising tone and falling tone chorus. We will continue investigating the generation of falling tone chorus.

4. Lines 19 – 20: Please add the following references about chorus-driven diffuse auroral precipitation Ni, B., R. M. Thorne, Y. Y. Shprits, and J. Bortnik (2008), Resonant scattering of plasma sheet electrons by whistler-mode chorus: Contribution to diffuse auroral precipitation, Geophys. Res. Lett., 35, L11106, doi:10.1029/2008GL034032. Ni, B., R. M. Thorne, X. Zhang, J. Bortnik, Z. Pu, L. Xie, Z.-J. Hu, D. Han, R. Shi, C. Zhou, and X. Gu (2016), Origins of the Earth's diffuse auroral precipitation, Space Sci. Rev., 200(1), 205-259, doi:10.1007/s11214-016-0234-7.

Thanks for pointing these references out. They have been added in the revised manuscript.

Minor: Page 1: Lines 6-7: better read as "at lower L-shells and higher magnetic latitudes" Line 10: the observations Page 3: Line 12: better remove "conditions" Page 4: Line 4: using the quasilinear theory Page 9: Line 23: better read "during periods of different geomagnetic activities" and "at the dayside sector" Line 27: at higher geomagnetic latitudes Line 28: between the equator and higher latitudes (< 10ËĘo)

These corrections have been made. Thanks.

We thank the reviewer again for these helpful comments.

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