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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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The manuscript "A statistical study of spatial distribution and source region size of chorus waves using Van Allen Probes data" by Shangchun Teng, Xin Tao, Wen Li, Yi Qi, Xinliang Gao, Lei Dai, Quanming Lu, and Shui Wang is dedicated to the study of the chorus source size along the magnetic field. The study is based on unprecedented big VLF waveform database from the 3 years Van Allen Probes measurements. The separated processing of rising and falling tones provides an interesting information about chorus properties in the outer radiation belt. I think a couple of points in the manuscript might be presented with more details that improves the material presented.



The local minimum of the background magnetic field can be displaced from the geomagnetic equator up to 2-3 degrees at L=4-6. Also, the local minimum can be shifted by large amplitude magnetic field perturbations. This correspondingly shifts the generation region location (see Santolik et al., PSS2004; Kozelov et al., JGR2008; Vaivads et al., GRL2010), which actually looks as a step-like change of the Pointing flux direction in the continuous record (Santolik et al., PSS2004; Agapitov et al., JGR2011). Statistically, this shift is seen as spreading of the Poynting flux predominant direction and intermediate value of <S>, which is discussed in the manuscript as the "source size". Thus, the presented results more likely could provide the distribution of the local magnetic field minimum than the chorus source size estimation. I would suggest to discuss this in the text and to provide the physics-based definition for the "source region".

Minor Comments:

P3L5: "The characteristic spatial correlation scale size transverse to the local magnetic field is estimated to be in the 2800−3000 km range (Agapitov et al., 2010), and for lower-band chorus it is about 100 km (Santolík and Gurnett, 2003)." - The source scale in (Agapitov et al., 2010) is determined from THEMIS measurements at L∼11, so, is not relevant here. I suggest citing (Agapitov et al., JGR2011) and (Agapitov et al., GRL2017) instead, where the transverse correlation scale was found to be ∼600-800 km in the outer radiation belt.

The similar statistical value as <S> in Eq.(3) based on the Poynting flux direction was processed in (Agapitov et al., GRL2011,2012).

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