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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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Dear Dr. Agapitov,

Thanks for pointing this out.

First, we agree with you that the displacement of the local minimum B position could affect the location of the generation region location. Their effect should be similar to the moving of the source region along a field line as discussed in the manuscript. These two effects should be best investigated using simultaneous observations from multiple spacecraft as discussed in the comment. Since the current study is superposing a

large number of single point measurements, the size of the source region defined here cannot eliminate the effects of a moving source or the displacement of minimum B. This is certainly a limitation of this work, whose aim is to provide the lowest order estimate of the source region size.

Second, it is difficult for us to understand physically why the generation region of chorus should correspond to a step like change in the Poynting flux direction. This kind of behavior of Poynting flux direction change should indicate a very sharp boundary of the generation region. Could this be caused by the observation itself? We think more investigation is needed to understand this point in your comment.

But in any case, we agree that the moving of the source region or the displacement of B could cause a spreading of intermediate value of <S>, making the boundary of <S> less sharp than it should be.

The physics related to the definition of <S> is based on that, in the generation region of chorus, background noise from which whistler waves are amplified from should have equal probability to propagate in both directions, because most chorus is driven unstable by a distribution with temperature anisotropy instead of a uni-directional electron beam. Therefore, the Poynting flux direction should have equal probability in both directions in the center of the generation region. This is what our definition of <S> is based on and why we define the source region based on <S> and its probability interpretation in Equation (3).

We have added a paragraph discussing the above points related to the limitation of the statistical approach raised by the comment. Thanks for pointing out these studies.

For the minor revision: 1. Thanks. We have changed the referred paper as suggested. 2. We apologize for missing the mentioned papers, which use a variable similar to <S>. Note that our <S> is obtained from three values (+1,-1, and 0), while the mentioned papers effectively used two (+1 and -1). The use of the three values allow us to give <S> an interpretation about the probability of S at a given location, which is the basis

for our definition of the boundary of the generation region. We have added these references .

We thank you again for these helpful comments.

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