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Reply on RC1

Chrystal Moser et al.

Author comment on "High bandwidth measurements of auroral Langmuir waves with multiple antennas" by Chrystal Moser et al., Ann. Geophys. Discuss., https://doi.org/10.5194/angeo-2021-68-AC1, 2022

Response to Reviewer #1

"High bandwidth measurements of auroral Langmuir waves with multiple antennas" by C. Moser, J. LaBelle, and I. H. Cairns

Comment:

The authors present the analysis via Tables 1 and 2 where the readers may glean that the exact nature of the high-frequency fluctuations is uncertain. It appears that the main focus of Section 3 is on determining whether the measured high-frequency fluctuations are quasi-parallel Langmuir wave or quasi-perpendicular, or oblique, Z/upper-hybrid waves. If the authors can state this physical motivation at the very beginning of Section 3, then it would help readers understand the main thrust of Section 3 a bit more clearly. The authors do mention the motivation of this analysis, but almost at the end of Section 3, line 160, equations 1 & 2. It would be much more helpful for the readers if they mention the purpose of E_||/E_perp analysis at the beginning (in words) and rephrase in more quantitative details (through equations 1 & 2) at the end of Section 3, and further elaborated in subsequent subsections (as they are laid out herein).

Response:

Thank you for pointing this out. We have added a couple opening sentences to section 3 (lines 148-151) that explains the motivation for the section and why we decided to measure the E_||/E_perp, as well as a sentence at line 185-188 that explains why we calculated the theoretical energy to account for the observations of ratios that are < 1.

We state in the paper that the angles determined by these ratios agree with the theory of Z-mode wave propagation at the Z-infinity resonance angle (lines 217-222).

Comment:

One question that naturally arise is the following: In generating Figure 7 dispersion surfaces the authors have constructed the frequency, k_|| and k_perp. This means that the correspond E_||/E_perp for the Langmuir and diffuse fluctuations can also be computed theoretically. How do they match up with observations, as laid out in the two Tables? are they consistent?

Response:

To generate Figure 7, we assumed k_||/k_perp= E_||/E_perp (electrostatic waves). The WHAMP dispersion solver does calculate the theoretical electric field components, and the ratios from that are within 10-25% of the measure values, suggesting that although the waves are not entirely electrostatic, they are close enough for the assumption to be valid. This has been included in the paper at lines 259-264.