

## ***Interactive comment on “Aspect sensitivity of VHF echoes from field aligned irregularities in meteor trails and thin ionization layers” by Q. H. Zhou et al.***

**Q. H. Zhou et al.**

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Reviewer 2's major criticism of our paper is on the assumption that electron density can be represented by the superposition of various Fourier components. The reviewer stated that plasmas of a meteor trail or an ionospheric layer are random and irregular in nature and cannot be treated deterministically. The reviewer further suggested that there is no external forcing to compel the plasma to form a sinusoidal structure to justify our assumption. Although we appreciate the reviewer's discussion, we believe that the reviewer misunderstood the underlying scattering mechanism from the field aligned irregularities (FAI).

The reviewer's point of view applies to incoherent scattering or Thompson scattering. However, it does not apply to FAI due to either meteoric trails or ionospheric layers. The

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echo power of FAI comes from coherent scattering. What differentiates coherent from incoherent scattering is the echo power obtained from a single radar pulse. Meaningful echo power can be obtained from a single sample in the coherent scattering case. On the other hand, meaningful power cannot be obtained from a single sample no matter how much power is transmitted in the incoherent case. For incoherent scattering, meaningful power can only be obtained from an ensemble average.

FAI scattering due to meteoric trails or ionospheric layer is coherent in nature because very strong power is obtained from a single sample. We can treat the scattering mechanism in each radar pulse as a deterministic process although this process evolves as a function of time. Contrary to the reviewer's belief that "there is no external forcing applied to the plasmas of the meteor trail and ionosphere", external forcing, i.e., other than those responsible for diffusion and thermal motion, does exist and is responsible for the coherent nature of FAI echoes. The external forcing comes from the electric field associated with plasma instabilities. A discussion on the FAI formation can be found in Oppenheim et al. (2000, Geophys. Res. Lett. P. 3173.) and references therein.

Granted that FAI scattering is coherent and deterministic, one may still argue that it is an oversimplification to assume a sinusoidal electron density structure. In our paper, we have given a limit on the spatial periods that contribute significantly to the echo power.

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