

The Cryosphere Discuss., referee comment RC2
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Comment on tc-2021-358

Anonymous Referee #2

Referee comment on "Coherent backscatter enhancement in bistatic Ku- and X-band radar observations of dry snow" by Marcel Stefko et al., The Cryosphere Discuss.,
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Coherent Backscattering enhancement for volume scattering and rough surface scattering have been known for a long time. The experiments for volume scattering were first observed in Kuga and Ishimaru (JOSA 1984), and for rough surface by Phu et al, Radio Science (1994)

The enhancement has a maximum of 3dB which is significant for remote sensing applications. The validations have been exclusively from laboratory optical and microwave experiments where accurate bistatic measurements can be made within a fraction of a degree from the backscattering direction. However, it has largely been neglected in applications in microwave remote sensing of snow because of the difficulty of bistatics measurements to within a fraction of a degree from the backscattering direction

The authors in this experiment have made a good effort in measuring accurate bistatic measurements with Ku band for ground measurements and Tandem X of X band for satellites. The paper is a good step towards experiment validation of CBOE in remote sensing applications and the possible inclusion in modeling X band and Ku band volume scattering in snow. I have a few minor comments

- For Ku band for volume scattering of snow, cross polarizations are usually strong. In laboratory experiments cross polarization enhancement are more conspicuous than co-polarization for both volume scattering (Kuga et al JOSA A, 1985) and surface scattering (Johnson et al IEEE Transactions on Antennas and Propagation 1994) . What are the reasons for non-observations in this paper. How about deeper snow?
- The optical thickness can indicate the order of multiple scattering. Please discuss the optical thicknesses τ in the measurements at X band and Ku band

- For X band at Tandem X, the soil surface below the snow have significant contributions. What is the magnitude of surface scattering of the snow/soil interface below the snow layer?
- Will there be coherent backscattering due to rough soil surface below the snow at X band?