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Volume cross sections of auroral backscatter and amplitudes of electrostatic electrojet fluctuations inferred from joint STARE and EISCAT CP-1 measurements

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Norway and Finland STARE radar data are combined with CP-1 EISCAT measurements of the electron density and electric field vector in the ionosphere to investigate the variation of the auroral radar volume cross section (RVCS) with the flow angle of observations (radar look direction with respect to the ExB electron drift). Our statistics consists of $\sim$ 6000 points for flow angles of 40-85^o and electron drifts between 500 and 2000 m/s. The electron density data are used to estimate the effective electron density and thickness of the scattering layer. It is shown that the flow angle variation of the RVCS is significantly weaker than reported in the past (only $\sim$ 5 dB within the range of available flow angles) and it is not symmetric with respect to the direction of the electron drift. By adopting the inferred shape of the RVCS variation with the flow angle and using an assumed dependence of the RVCS upon wavelength (as reported in literature), the relative amplitude of electrostatic electrojet density fluctuations at all scales, $\left\langle (\delta N/N)^2 \right\rangle^{1/2}$, is estimated. The obtained values of several (up to 10) per cent are consistent with reported *in situ* rocket measurements. The RVCS and $\left\langle (\delta N/N)^2 \right\rangle^{1/2}$ values are also shown to depend almost linearly on the square of the electron drift velocity magnitude and the effective electron density.