

Radar Imaging of Anomalous Radar Echoes in Conjunction with High Resolution Optical Observations of Aurora

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At high latitudes anomalous radar echoes are at times observed with incoherent scatter radars when observing in the direction of the magnetic field. Auroral electron precipitation is observed simultaneously. The echoes have been tried to be explained by different models including streaming instabilities occurring in regions of electron precipitation. Observational evidence for a particular model has been elusive; however, observations indicate a beam-driven Langmuir turbulence scenario. The transient nature of the echoes, lifetime of the order of 1 s, and their extent in the direction perpendicular to the magnetic field, hundreds meters, make observations particularly difficult.

At the EISCAT Svalbard site three small array antennas have been installed in addition to the two radar dishes. By using radar imaging techniques the radar echoes are resolved at scales below the radar beam otherwise limiting the observational resolution. We present observations of the anomalous radar echoes with the radar interferometer. The radar observations are completed by high resolution optical measurements of the aurora. While the radar observations pin point the location of observed instability optical observations unveil the auroral morphology. Detailed analysis of the observations will give insight in the processes responsible for creating the anomalous echoes.