PMSE spectral parameters from aperture synthesis radar imaging experiments with MAARSY

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Polar mesosphere summer echoes (PMSE) are strong radar signals received at VHF radar frequencies at altitudes between about 80 and 90 km at polar latitudes during summer. PMSE are caused by inhomogeneities in the electron density of the radar Bragg scale within the plasma of the cold summer mesopause region in the presence of negatively charged ice particles. The Middle Atmosphere Alomar Radar System (MAARSY) provides a very high flexibility of beam forming and beam steering in combination with multi receiver capability allowing beam swinging operation as well as the use of interferometric applications for improved studies of the Arctic atmosphere with high spatiotemporal resolution. The implementation of imaging algorithms such as Capon or Maximum Entropy on the multi-channel receiving system of MAARSY is suitable to discriminate space and time scattering ambiguities. We present PMSE spectral parameter estimations from MAARSY experiments using a narrow (3.6°) and a wide (12.6°) beam interleaved experiment in combination with a multi-receiver setup allocated to 15 subgroups of the MAARSY antenna array. The temporal variations of PMSE characteristics are discussed on the basis of spatial resolved structures of the derived parameters as e.g. signal strength, spectral width and radial velocity. Our preliminary results show that PMSE scattering is not homogeneous, improved turbulence estimation, and horizontal wind fields can be estimated.