

About the inhomogeneity of MF/HF radar echoes and its application improving the estimation of mesospheric winds

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The Leibniz-Institute of Atmospheric Physics operates partial reflection pulse radars at middle and high northern latitudes to monitor dynamics and structure of the middle atmosphere since 2003. Given that sufficient ionization and accordingly electron density is present the systems provide continuous observations from about 60 to 95km altitude with typically 2km range resolution. Main objectives of these radars are the estimation of temporally resolved winds and of height profiles of electron number density. For this purpose experiments with vertically directed and interleaved oblique beams with multiple directions are performed.

The aim of this study is the determination of the dominant scattering positions for the chosen beam pointing directions by angle of arrival estimations (AoA). The averaged beam positions are used to validate the system performance to detect flaws in the transceiver and antenna phases, but more importantly, to study on the aspect sensitivity of the scattering structures. With data about the effective pointing angles we are able to improve the vertical and horizontal winds derived from the measured the radial velocities assuming the nominal beam pointing angles by the Doppler Beam Swinging method. In addition, the AoA results are compared to pattern scale parameters as provided by the Full Correlation Analysis (FCA) technique for different altitude ranges and seasons.

Preferred session: M6 – middle atmosphere dynamics and structure