

Seasonal Variation of turbulent Energy Dissipation Rates in the Polar Mesosphere

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Turbulent energy dissipation rates have been derived from the width of the observed signal spectra obtained with a narrow beam Doppler radar operated at 3.17 MHz in Andenes (69°N) using a computationally intensive correction method to remove contributions from non-turbulent processes. Vertical and oblique beams with a minimum half-power full-beam width of 6.6° are used. The radar provides estimates of turbulent energy dissipation rates in an altitude range from 50 to about 90 km with a time resolution of 1 h and a range resolution of 1 km since September 2003.

Turbulent energy dissipation rates based on radar observations vary in the order of 2-10 mW/kg around 70 km and between about 10 and 200 mW/kg around 85 km in dependence on season. During the occurrence of strong polar mesosphere winter echoes in January 2005 energy dissipation rates between 30 and about 100 mW/kg are observed at altitudes from 55 to 65 km.

The radar estimates of turbulent energy dissipation rates are in reasonable agreement with climatologically winter and summer data from previous rocket soundings at Andenes as well as with time-resolved results (1-h resolution) from the Kuehlungsborn Mechanistic General Circulation Model (KMCM) model for summer and winter conditions.