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First results of combined Fe-lidar/Radar measurements at Davis, 69° S.

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The mobile scanning Fe-lidar of the IAP-Kühlungsborn was moved to Davis, Antarctica, 69° S, 78° E during November 2010. This location was chosen because PMSE/NLC observations by MST-radar/RMR-lidar have been performed since 2003/2001 by the Australian Antarctic Division. Davis is the only station in Antarctica where comparable long-term observations to Alomar, 69° N are available. A comparison of both locations allows a detailed comparison of differences or similarities between the northern (NH) / southern hemisphere (SH) at mesopause altitudes.

The Fe-lidar is a two wavelength system which measures Doppler temperature/vertical wind and iron densities by resonance scattering at 386 nm. The fundamental wavelength at 772 nm is used for aerosol measurements from the stratosphere to the mesosphere including NLC in summer or PSC in winter. Measurements are almost background free which allows year round operation independent of sunlight.

At Davis the lidar was in operation 24% of the first year (2150 hours) which has not been achieved elsewhere with a mesospheric lidar. This unusual and already largest lidar data base of Antarctica shows the thermal structure of the mesopause region and the iron layer in great detail. Strong tides throughout the year have been observed and a link of the early part of the PMSE season to the stratospheric vortex has been found. More than 700 hours of temperature observation during the PMSE-season are compared with common volume PMSE/NLC observations. For the first time temperature and vertical wind measurements through PMSE and NLC have been achieved by a lidar showing that the SH in particular in December/January differs significantly from the NH in June/July. The temperature measurements near 86 km altitude show that the summer mesopause is surprisingly similar to the NH at PMSE altitudes but differs significantly at higher altitudes. Unlike the NH the southern mesopause altitude changes throughout the season by several kilometres. Depending on altitude temperatures can be warmer but also much colder than at the NH causing a change in PMSE altitude over the season.