Karlsruhe Institute of Technology

TERENO TERRESTRIAL ENVIRONMENTAL OBSERVATORIES

Federal Ministr of Education and Research

HELMHOLTZ ASSOCIATION

Campus-Alpin IMK-IFU: Atmosphärische Umweltforschung

Temporal variation of atmospheric boundary layer features from ground-based remote sensing

Available instruments at IMK-IFU and examplary applications

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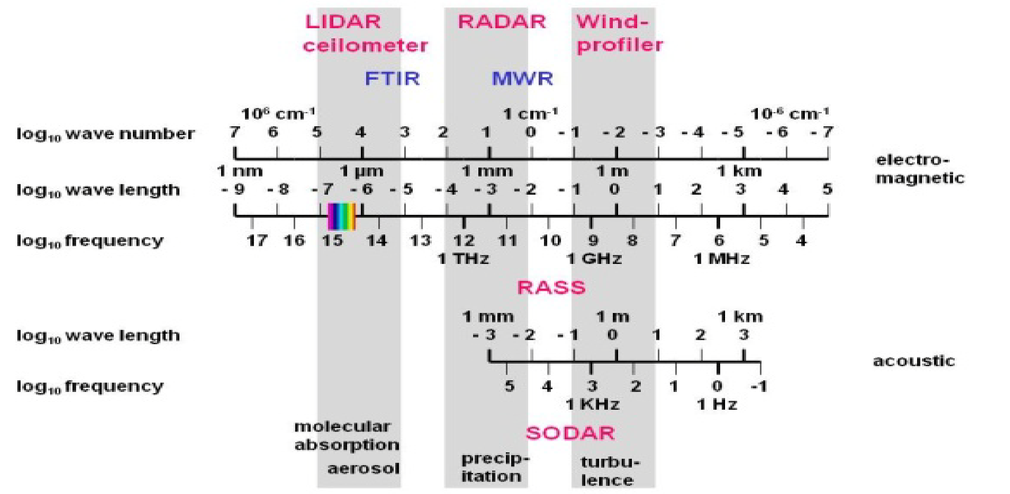
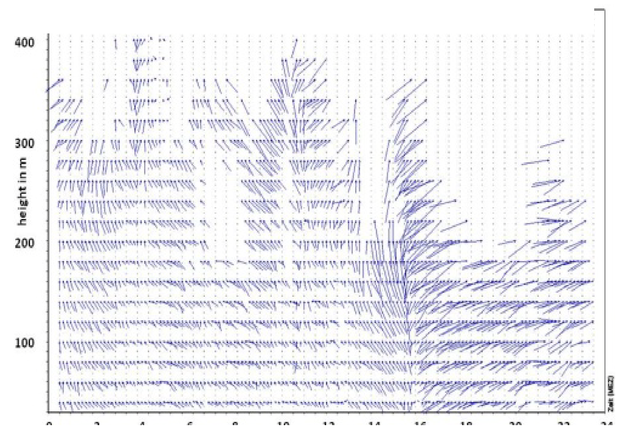
Continuous profiling of the vertical structure of the atmospheric boundary layer is a prerequisite for surface-atmosphere exchange studies, air quality studies and the assessment of the applicability of methods for the generation of renewable energies. Such profiling can be made using acoustic, optical and radar waves.



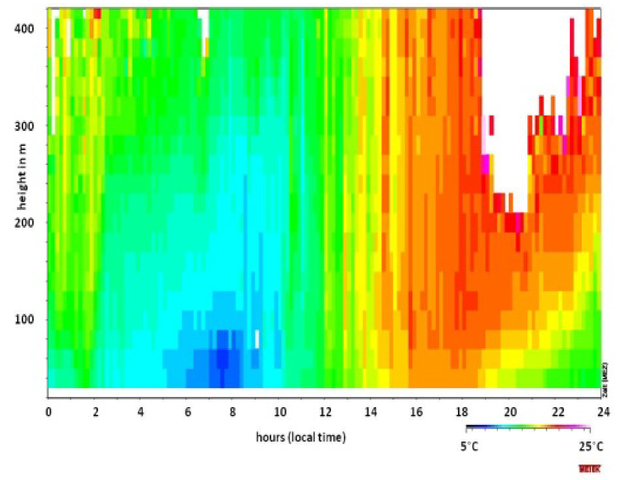
Active acoustic sounding with a Doppler-SODAR delivers vertical wind and turbulence profiles and mixing-layer height up to about 1000 m (10 to 20 m vertical resolution)

Sample acoustic sounding result: diurnal variation of wind profile showing a cold front passage in the afternoon in Augsburg / Höglwald.



Active acoustic plus electro-magnetic sounding with a SODAR-RASS delivers vertical wind, turbulence and temperature profiles and mixing-layer height up to about 600 m (10 to 20 m vertical resolution)

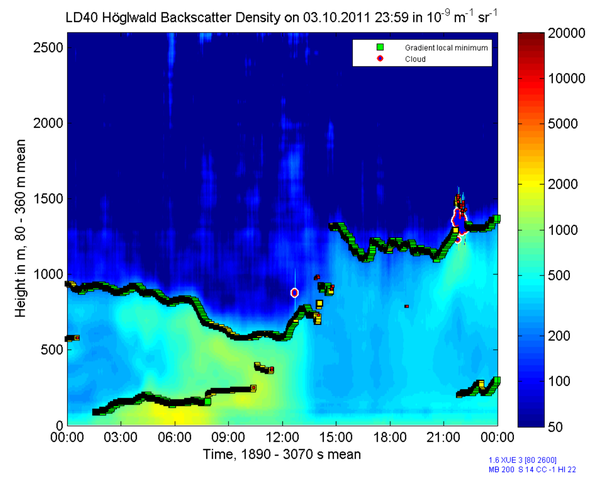
Sample acoustic-electro-magnetic sounding result: diurnal variation of temperature profile showing a strong diurnal variation (white area in the upper right indicates a low-level jet) in Augsburg / Höglwald.



Active optical sounding with a small backscatter LIDAR (ceilometer) delivers vertical aerosol profiles and mixing-layer height up to several 1000 m (10 to 20 m vertical resolution)

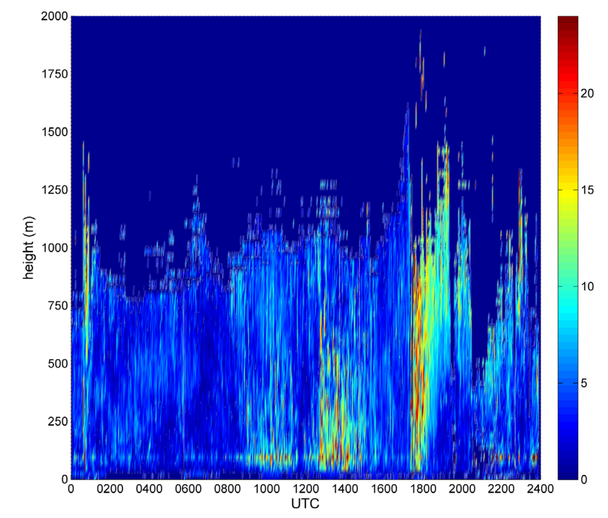
(in cooperation with VAISALA)

Sample optical sounding result: diurnal variation of aerosol distribution profiles indicating a stable nocturnal boundary layer (lower left) and a convective boundary layer (right) at the TERENO site Höglwald.



Active optical sounding with a small Doppler-LIDAR delivers vertical wind, turbulence and aerosol profiles and mixing-layer height up to several 1000 m (10 to 20 m vertical resolution)

Sample optical Doppler sounding result: diurnal variation of horizontal wind velocity (m s^{-1}) in the atmospheric boundary layer from June 22nd, 2011 in Garmisch-Partenkirchen.



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