



Boundary layer dynamics in a small shallow valley near the Alps (ScaleX campaign)

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Mountainous terrain presents a challenge for the experimental determination of exchange processes. The Alps modulate synoptic flow and introduce circulation systems that reach into the forelands. In addition, the Prealpine landscape is heterogeneous itself, dominated by patches of forestry on the slopes and agriculture on flat areas. That combined complexity is manifest in atmospheric circulations at multiple scales. We investigated the diurnal evolution of the atmospheric boundary layer with focus on the connection between surface exchange processes and atmospheric circulations at the regional to local scale. The experiment is part of an ongoing, multi-disciplinary study on scale dependencies in the distribution of energy and matter (ScaleX) at the TERENO Prealpine observatory in Germany.

We observed vertical profiles of wind speed and air temperature up to 1000 m above ground during June and July 2015 in a small shallow Prealpine valley in Bavaria, Germany. Wind vectors and temperature were observed using ground-based optical, acoustic and radiometric remote sensing techniques. Spatial patterns in wind speed and direction were determined using eddy covariance systems, 3D Doppler LIDAR and acoustic sounding (RASS). Three Doppler LIDAR units were configured to form a virtual tower at the beam intersect. Temperature profiles were observed using radio-acoustic sounding (RASS) and a microwave radiometer (HATPRO). The temporal and spatial resolutions of the resulting vertical profiles were between 1–15 min and between 3–100 m, respectively.

The observed variability in wind vectors and stability shows evidence of the link between flow phenomena at micro- to mesoscale and local biosphere-atmosphere exchange processes. We present first results and discuss the predictability of the impact of local and regional (alpine) landscape features on flow and structures in the atmospheric boundary layer.