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# Observations of tropospheric structure over the complex terrain of SW Slovenia with scanning lidars and radiosonde

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Observations of tropospheric structure over complex terrain are very important to understand the impact of topography on air physics and dynamics, especially turbulent fluxes of heat and particulate matter. Location of a particular interest is the southwestern part of Slovenia, including Vipava valley and Karst plateau, where within the distance of about 30 km the altitude drops from around 1500 m to the sea level in the Bay of Trieste. Atmospheric processes over this region, which is known on some specific weather phenomena such as Bora wind, have not yet been fully investigated.

A preliminary study of the tropospheric structure over the southwest region of Slovenia was performed on 12 October 2011 from 17:00-20:00 CET using simultaneously two long-range scanning Mie lidars with their lines of sight crossing above Vipava valley. The one set up at Nova Gorica operated in infrared range (1064 nm) and the one at Otlica in ultraviolet range (355 nm). Throughout the study the devices provided Range Height Indicator (RHI) scans in 8 minute intervals. Radiosonde was launched at the intersection point of the two lidar traces at 19:00 CET. On the day of the study the sky was overcast with thick clouds at 9 km. The winds were very weak (about 5 m/s) below 1.5 km and rapidly intensified to about 30 m/s above 3 km which enabled simultaneous radiosonde measurement at the altitudes probed by the lidars.

As a result of the present study we obtained multi-dimensional structure of the lower troposphere, which can be used to investigate flow dynamics and wind formation processes. The obtained RHI scans were found to be in a very good agreement with the radiosonde data. Some noticeable temporal variations of the boundary layer structure over time can be observed during the scanning period. A two-layer aerosol structure is visible by both lidars, with the boundary layer reaching about 1.1 km above the sea level and the elevated layer at about 1.5 km. The thermodynamical structure of the atmosphere also shows stable boundary layer extending up to 1.1 km and a second strong inversion at about 1.5 km, which corresponds to the peak positions of the lidar return signals in the RHI plots. We found that stable boundary layer was built only after sunset, when both the boundary layer and the free troposphere can be considered horizontally homogeneous. It is expected that a similar approach for wind remote sensing could be used in the future to investigate the behavior Bora wind which is an important meteorological phenomenon in this region.