

Near-Surface Turbulence in Complex Terrain Example of the Mountain-top Site Arbeser Kogel

Abstract

Little is known concerning the boundary layer structure and turbulence characteristics over complex mountainous terrain.

Much effort and dedicated studies have been started in the last decades, and the i-Box project is one of the long-term and most comprehensive project on surface layer turbulence over complex terrain.

This MSc Thesis work is the first insight on a particular station of this project: Arbeser Kogel.

This station is located at a mountain-top (2015 m a.s.l.), almost at the upper border of a conventional valley boundary layer. It is also set in a harsh environment where the data-collection is quite difficult.

Here an accurate analysis with different methods and thresholds compared to other stations is done.

In this first part of the study the attention is focused on particular patterns of wind, radiation, humidity and temperature, that are analysed starting from standard meteorological measurements.

From this data-pool a classification of most significant days was done, the attention was particularly focused on thermally driven days, which are selected by a Clear Day Algorithm. A comparison within thermally driven flow theories in mountainous terrain and wind behaviour at Arbeser was done.

The results partially agree with the theories and in some days the valley wind circulation arrives up to Arbeser, but a prevalent wind direction is found and not fully understood in this frame.

In the second part the turbulence data of those thermally driven days is studied. In particular the theories for the surface layer over horizontal homogeneous and flat terrain are compared with the measurements at Arbeser.

The results partially agree with other experiments settled in complex terrain, but on the other side, some discrepancies with respect to flat terrain are found.