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Boundary Layer Measurements in Complex Terrain: Innsbruck-Box

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Planetary boundary layers in complex terrain remain one of the major challenges of today's boundary layer research. Our current knowledge of the characteristics of the turbulence structure and exchange processes in truly complex topography remains limited. Not only is there no suitable theory, it is not known if all the relevant processes such a theory should explain are accounted for. Meanwhile, the increasing resolution of both numerical weather prediction and regional climate models demands precisely such information for improving model performance. Except for a few recent field campaigns, limited both in time and focus, no measurement platform in highly complex terrain is available to date that would be able to provide a complete dataset of boundary layer information in sufficient complexity, resolution and covering all regimes of interest both for model validation and resolving the remaining scientific questions.

The Dynamic Meteorology Group of the Institute of Meteorology and Geophysics, University of Innsbruck is presently setting up such a 'reference box', which aims to fill in this gap. It will consist of a combination of high-resolution long-term turbulence observations in an area in the vicinity of Innsbruck (hence the 'Innsbruck-Box') and high-resolution numerical modeling. Whereas the data provided by measurements will allow for improvements in process understanding and model validation, the numerical modeling will be used to fill the data gaps in areas where no measurements are possible or the current measurement techniques are inadequate. Also, numerical experiments using idealized terrain or settings can be performed in order to test hypotheses deduced from the observations.

The Innsbruck-Box is designed to be a long-term reference platform for studying boundary layer processes in highly complex terrain with an integrated measurement approach. Sites are located in the Inn-Valley, an approximately East-West oriented valley in western Austria, characterized by very complex terrain with steep slopes, flat foothills, numerous side valleys, variable land use characteristics etc. The sites are chosen to be representative of the specific topographic features: valley bottom, slopes of different angles and orientation, in order to secure the universality of the obtained results.

The presentation will give a short outline of the 'philosophy' and approach of the Innsbruck Box followed by a discussion of expected results and project hypotheses based on previous experience.