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Penetration and Interruption of Alpine Foehn (PIANO): Overview and highlights of the 2017 field experiment

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Alpine foehn is one of the world's most intensively studied downslope windstorms. However, previous research has primarily focused on the well-developed stage rather than the complex initial and final stages of foehn. Hence, we still poorly understand the mechanisms of foehn penetration, interruption and associated foehn/cold-pool interactions in valleys. Potential processes responsible for the breakthrough and breakdown of foehn include (I) large-scale air mass advection, (II) cold-air pool displacement and outflow, (III) turbulent mixing at the top of the cold pool, (IV) daytime heating and (V) nocturnal cooling of the boundary layer. Some of the previous studies disagree on which processes are dominant. Furthermore, it is not clear to what extent today's high-resolution NWP models are able to represent these processes and, therefore, to correctly predict the time of foehn onset and decay.

In the framework of the research project "Penetration and Interruption of Alpine Foehn (PIANO)" we aim to answer some of these open questions. The methodology is based on a combination of turbulence-resolving observations and high-resolution numerical simulations. The PIANO field experiment was conducted in fall 2017 in the city of Innsbruck located in the Inn Valley (Austria). The instrumentation included four Doppler wind lidars, two scintillometers, several eddy covariance and automatic weather stations, a network of temperature and humidity sensors, as well as radiosondes launched at two different sites during Intensive Observation Periods (IOPs). A total of seven IOPs were performed to capture a variety of different foehn cases. From this dataset, several prototypes of foehn breakthrough and interruption will be deduced and the role of different processes of cold-pool erosion and foehn interruption will be assessed. In this presentation we will present the goals of the project, provide an overview of the field experiment and show observational highlights.