Spatially averaged sensible heat fluxes in mountainous terrain for model evaluation (SASHIMI)

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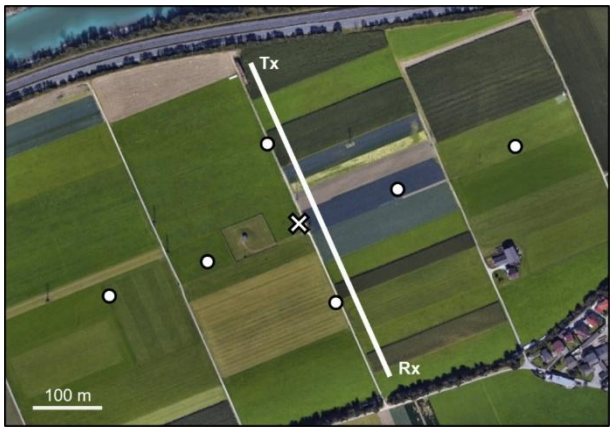
One of the main challenges in mountain meteorology is the extreme spatial variability of surface and atmosphere conditions. The substantial differences that occur from place to place make it very difficult to obtain representative measurements and complicate the evaluation of numerical weather prediction (NWP) models. In contrast to typical eddy covariance (EC) measurements, scintillometry can provide area-averaged heat fluxes over larger scales which are more comparable to the grid box size of NWP models. Studies have shown that scintillometers can be used in heterogeneous landscapes, in gently sloping terrain and in urban areas. However, as very few studies have taken place in mountainous terrain, it remains unknown whether scintillometry can be used successfully in such environments.

The summer Extensive Observation Period (sEOP) of the TEAMx programme offers a perfect opportunity to address this knowledge gap and find out (i) whether scintillometry can be used in highly complex terrain, (ii) how scintillometer measurements compare to EC measurements, and (iii) whether the larger-scale heat fluxes are better suited for comparison with numerical models. This project will bring together scientists from the Department of Atmospheric and Cryospheric Sciences, University of Innsbruck and GeoSphere Austria to tackle these research questions.

The proposed work will concentrate on the i-Box site at Kolsass, where multiple EC stations will be used to capture spatial variability and estimate advection. This project will add a large-aperture scintillometer to the setup, enabling derivation of sensible heat fluxes over a region covered by several of the EC stations. The resulting dataset will enable direct comparison of sensible heat fluxes derived from scintillometry with those from EC. Furthermore, these two observational datasets will be compared with simulations from the AROME model, contributing to the ongoing evaluation of AROME and helping to advance numerical modelling in complex terrain.



The proposed scintillometer path at Kolsass measuring 550 m from transmitter (Tx) to receiver (Rx). Eddy covariance stations are marked by a cross (existing station) and circles (additional stations). Aerial imagery from Google Earth.