



## **Measurement of advection of CO<sub>2</sub> over grasslands in complex terrain in the Alps**

Peng Zhao (1), Albin Hammerle (1), Georg Wohlfahrt (1,2)

(1) University of Innsbruck, Institute of Ecology, Austria (peng.zhao@uibk.ac.at), (2) European Academy of Bolzano, Bolzano, Italy

The role of advection is often ignored in the estimation of net ecosystem exchange (NEE) of CO<sub>2</sub> in ecosystems. However, some studies reported that more realistic estimates of night-time NEE could be gathered if horizontal and vertical advections are included. While most of previous advection experiments have been conducted in forest ecosystems, grassland ecosystems have a great advantage as measurements of advection can be realised with smaller infrastructure and thus less experimental effort. In a preliminary simplified study, advection showed an important contribution to NEE during night time at a sub-alpine grassland site.

This three-year program is focused on the role of advection for NEE of grassland ecosystems in complex terrain in the Alps. We are going to carry out field campaigns at four sites which cover a range of terrain types typical for mountains with varying degrees of complexity, including a valley-bottom site, a steep-slope site, a mixed-terrain site, and an undulating-terrain site. Observations will take place in a notional control volume with a length varying from 50 m to 5 m at each site in order to quantify the effects of horizontal spatial scale on advection estimates. The observations at each site include vertical flux of CO<sub>2</sub> measured by eddy-covariance technique, horizontal and vertical advections of CO<sub>2</sub> calculated from the measurement of wind components and CO<sub>2</sub> gradients, and NEE measured by chambers. Among all, the measurement of the horizontal advection of CO<sub>2</sub> needs many efforts because of small-scale variability in sources/sinks of CO<sub>2</sub>. We are going to use tubes with multiple inlets, which allows sampling at multiple positions across the faces at three heights of the control volume. Thus, we would be able to quantify the contribution of advection to NEE at different grassland sites situated in complex terrain in the Alps, and to quantify the effect of spatial scale of advection measurements with a given experimental setup and accuracy on the inferred fluxes and to devise the respective optimal spatial scales for advection experiments.