Typical landscape of a "cold valley" (Combe Lavaux in Côte-d'Or, May 23, 2018) :encasement, atmospheric humidity, no exploitation.

Modélisation bioclimatique des vallons froids dans le Nord-Est de la France

Principle investigator: Jean-Luc DUPOUEY, UMR Silva

Collaborations : Anna Schmitt, Sandrine Chauchard, Vincent Badeau (UMR SILVA) et Christophe Randin (Université de Lausanne)

Context —

The lowlands of northeastern France contain numerous scattered climatic microrefugia, located in steep-sided valleys. These particular landforms, so-called "cold valleys", display specific habitats of high environmental value, linked to the presence of different contrasting microclimates that coexist on short distances. Microclimates of the “cold valleys” are decoupled from the regional climate. On the south-facing slopes, climate is sub-Mediterranean whereas on the north-facing slopes and in the thalweg, climate is sub-montane. Consequently, “cold valleys” exhibit large variations of climate at fine scale (below 100 m) and constitute microrefugia for both cold-adapted and thermophilous species. Thus, they could contribute to mitigate climate change effects, but are also under threat of regression.

Objectives —
To protect these high conservation value sites, we need to improve our knowledge of their location and to finely characterize their vegetation and microclimates in relation with topography. More widely, cold valleys represent ideal and appropriate case studies for i) understanding the microclimatic basis of the habitats distribution of relict and/or specialized plant species and ii) challenging and refining species/community distribution models. In parallel, we will carry out vegetation surveys to verify these models.

Approaches —
We will first reconstruct the long-term temporal variation of temperature and humidity at sites equipped with in situ sensors. The reconstructed temperature and humidity variability will then be spatially interpolated using multiple regression techniques. This new set of predictive variables will be tested in species and community distribution models.

Key results —

. installation of 90 sensors in 14 valleys in Lorraine and 3 valleys in Burgundy, at different topographical positions (valley bottoms and slopes), including one sensor on plateau and in an open area for each valley.

. characterisation of soils, herbaceous vegetation and forest stands (70 plots in total) in the 14 valleys of Lorraine and 1 valley of Burgundy.

. 8 additional sensors were installed near micro-meteorological measuring stations for calibration and verification purposes (Champenoux sites and Hesse flow tower).

. temporary and voluntary interruption of measurements in the forest due to suspicion of measurement bias. Calibration/verification session of all the sensors in an air-conditioned chamber.

. evidence of significant systematic biases in the measurements.

Main conclusions including key points of discussion —
These preliminary results suggest that current micro-meteorological measurements are biased.

Perspectives —
As a first step, further analysis of calibration/verification measurements to decide whether to continue with these sensors, or to change them.

Leveraging effect of the project —
Le projet a permis d'établir une collaboration avec les gestionnaires de la réserve naturelle nationale "Combe Lavaux", et avec l'ONF de Bourgogne.

.Il a permis de prendre contact avec l'équipe d'écologie de l'Université de Lausanne, qui travaille sur ces mêmes thématiques.