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PROJECT DESCRIPTION

PROJECT INFORMATION

Project title: **High-resolution land surface modelling across the Alps**

Project ID: 278

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Hypotheses

Land surface processes represent a significant challenge in our efforts to model the terrestrial earth system, through their role in modulating exchanges of energy, mass and momentum, particularly within the carbon and water cycles. Accurate land surface process simulations are hence crucial for current and future climate impact assessments. Currently, however, our understanding of the effects of choice of model resolution on land surface processes have not been well quantified. In this project we aim to better understand and quantify the gain of high-resolution (1km) land surface model (LSM) simulations over complex terrain.

We aim to quantify the merit of high-resolution simulations, as well as identify processes for which higher resolution simulations result in no or little performance gain. For this purpose we will use the Community Land Model 5 (CLM5, Lawrence et al., 2019), the land component of the Community Earth System Model, which is a state of the art, process-based LSM that simulates carbon, nitrogen, and energy exchange between the atmosphere and the terrestrial Earth.

We will perform CLM5 simulations over the ridge of the European Alps and a belt of adjacent foreland terrain. Simulations will be run at 1km and 60km resolution, using a combination of W5E5 (Lange et al., 2021) and CHELSA (Karger et al. 2021) meteorological forcing data-sets. Due to a lack of suitable gridded products, we will perform our model evaluation at point locations, for which we would like to make use of ICP Forests data. More specifically, we are interested in data from meteorological measurements (e.g. incoming/outgoing longwave radiation, sensible/latent heat flux, incoming/reflected shortwave radiation, …), as well as soil measurements (e.g. soil temperature, soil water content, …) and carbon-related variables. In addition to ICP Forests data, we plan to use data from FLUXNET2015 as well as from the Integrated Carbon Observation System (ICOS) to evaluate model performance.

This study will contribute to high-resolution sensitivity experiments as part of the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP3).

References:

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