Ecohydrological monitoring of two Alpine ecosystems representing possible broader future conditions in the Alps

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High-altitude non-glacial grasslands and peri-urban new-growth forests are still two poorly studied ecosystems that represent present and future conditions in the Alps. Hence, studying the functioning of these environments is crucial, especially if land surface models' capability of representing the ecosystems' processes is assessed.

The data are collected at two eddy covariance sites located in the Northwestern Alps, respectively on a high-altitude grassland (2550 m a.s.l.) and in a forest (650 m a.s.l. with a 25 m high mast). The data are characterised by time series spanning 365 days per year, since 2018 for the grassland site and since 2021 for the forest site.

The ecosystem and soil information (energy fluxes and actual evapotranspiration, ETa, soil moisture) obtained from measurements is combined with simulation results obtained with the land surface CLM model (The Community Land Model, NCAR, US). A rather good agreement is found between observations and simulations.

A particular focus on dry conditions in 2022 on the forest site is also presented. The results show that soil moisture, pressure head, and net radiation are more important than vapor pressure deficit, wind speed, and air temperature as ETa drivers. During the drought, despite the low soil moisture, both cases of water- and energy-limited conditions occurred. A weak effect of the drought on ETa is observed, likely due to the deep root system. The cosmic ray neutron sensor (CRNS) measurements revealed a good agreement with capacitive probes profile (CPS) ones.

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