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Validation of planetary boundary layer fluxes and land-atmosphere coupling of the CLM regional climate model with European fluxnet observations

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Several recent modeling studies have suggested that land-atmosphere coupling (LAC) has a large impact on European summer climate variability, which on the other hand is strongly linked with the occurrence of extreme climate events such as heatwaves or heavy precipitation. Therefore, we particularly focus on turbulent fluxes of heat (sensible heat flux) and moisture (latent heat flux), since they are crucial for LAC. Observational data from eddy-covariance measurements from Fluxnet (CarboEurope) are used to validate the CLM (COSMO), a non-hydrostatic regional climate model (RCM). Additionally, the latent heat fluxes are validated using a basin-scale atmospheric water-balance estimate for evapotranspiration.
The net radiation in CLM turns out to be strongly underestimated in summer which can at least to some extent be linked to systematic cloud cover overestimation. Also there seems to be a miss-partitioning of the incoming surface energy into latent and sensible heat fluxes, with the latter being rather too small, which is likely due to a soil moisture excess. The net radiation underestimation turns out to be mostly only a problem of CLM, whereas the wrong partitioning of the incoming surface energy seems to be a common feature of some of the current RCMs (data from ICTS project).
First results from offline simulations with stand-alone land-surface schemes indicate that the more advanced land-surface scheme from NCAR (the community land model) with dynamic vegetation and carbon cycle can reproduce the observed turbulent fluxes much better than the land-surface scheme from the CLM (TERRA).