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A validation of heat and carbon fluxes from high resolution land-surface and regional models

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The performance of ORCHIDEE, a model of surface hydrology, plant phenology and vegetation dynamics, in reproducing field measurements of heat and carbon fluxes at various spatial and temporal scales is assessed. The model is forced by two high resolution (30 km) Regional Climate Models (RegCM3 and WRF) output in the Euro-Mediterranean region for the period 2002-2007.
First a validation of the Regional Models surface climatology is conducted in comparison to gridded meteorological station data and to other state of the art regional models.
Then annual cycles and interannual variability of latent and sensible heat, gross primary production and net ecosystem exchange are produced and compared to in situ experimental data provided from the CARBOEUROPE network. Seven sites were chosen across the Euro-Mediterranean region, representing different forest environments.
The model is able to reproduce the annual cycle of heat and carbon fluxes, with errors comparable with the measurement uncertainties. The interannual variations appear more problematic. While the variations of sensible heat are at least of the same sign as observed, latent heat is less well reproduced, while there is hardly any skill in reproducing carbon fluxes.
The main difference between the two regional models used for forcing is an excessive precipitation produced on average by RegCM3. This causes errors in the latent heat and gross primary production of ORCHIDEE.