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Land - atmosphere exchanges and the role of model formulation and high resolution earth observations.

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The land surface is a key component of the earth system. It controls the exchanges of energy, water and carbon between the biosphere and the atmosphere. Due to the turbulent nature, spatial heterogeneity and temporal variability of these exchanges, large uncertainties arise from the current representation of these fluxes in the land surface components of earth system models.

Modeling efforts and observation-based studies have advanced our understanding of the earth system and the role of the land surface. Earth observations and the developments in retrieval algorithms brought high spatial and temporal resolution observations of key land-surface characteristics (e.g. leaf area index, fraction of vegetation cover, albedo). However, while observations provide the fundamental basis for our understanding of the different processes and feedbacks, these need to be complemented by modeling studies to allow the development of weather forecasts, climate change projections and hypothesis testing. The quality improvements of Earth Observations (EO) has enhanced our understanding of land surface dynamics. Higher resolution satellite products can help to close the gap between in-situ point observations and the grid-cell size of the models, as well as to provide unique spatial sampling.

In this study we evaluate the performance of the ECMWF land surface model comparing two formulations for evaporation: with (CTESSEL) and without considering plants photosynthesis (CHTESSEL). The model simulations are compared with in-situ tower observations (FLUXNET2015) and the role of high resolution EO is investigated, particularly leaf area index and surface albedo. Additionally, an uncertainty analysis was carried out to identify key model parameters which are not observationally constrained. Preliminary results suggest that considering plant photosynthesis has an added value in the representation of the surface turbulent fluxes as well as the use of high resolution EO data.