SESSION: (B1) Mechanisms of S2D predictability

(B1-16)

Investigating the impact of soil moisture on European summer climate predictions

Ardilouze, Constantin (1), Batté, Lauriane (1), Déqué, Michel (1), Van Meijgaard, Erik (2), Van den Hurk, Bart (2)

CNRM UMR 3589, Météo-France/CNRS, Toulouse, France (1), Royal Netherlands Meteorological Institute (KNMI), De Bilt, Netherlands (2)

Due to the limited skill of state-of-the-art prediction systems, high expectations on summer seasonal forecasts over Europe are only marginally fulfilled. A number of studies have shown the prominent impact of soil moisture anomalies on summer mid-latitude climate variability and predictability. However, because of model systematic errors, even the best possible initialization of soil moisture conditions falls short in estimating the theoretical upper limit of predictive skill induced by soil moisture boundary conditions. The present study aims at addressing this question by comparing idealized ensemble re-forecast-like simulations in which soil moisture conditions are prescribed from the ERA-Interim LAND reanalysis with initialized dynamical re-forecasts in which soil moisture evolves freely. Two regional climate models with domains centered over Europe contribute to these experiments and generate very similar results. Simulations with constrained soil moisture display significantly increased correlation between observed and simulated seasonal anomalies of maximum temperature precipitation and surface solar radiation, as compared to the reference re-forecast. This widespread increase is not restricted to regions already known as hot-spots of land-atmosphere coupling. In spite of a limited change of the ensemble spread, the idealized simulations better perform in capturing anomalies exceeding a defined threshold. A focus on two case studies reveals contrasted results between the 2003 and 2010 heat waves. These results suggest that soil moisture may be a larger source of summer predictability than expected from previous works.