



Skilful prediction of Sahel summer rainfall on inter-annual and multi-year timescales

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Summer rainfall in the Sahel region of Africa exhibits one of the largest signals of climatic variability, and, with a population reliant on agricultural productivity, the Sahel is particularly vulnerable to major droughts such as occurred in the 1970s and 1980s. Rainfall levels have subsequently recovered, but future projections remain uncertain. Here we show that Sahel rainfall is skilfully predicted on inter-annual and multi-year (i.e. ~ 5 years) timescales, and use these predictions to better understand the driving mechanisms. Moisture budget analysis indicates that on multi-year timescales, a warmer north Atlantic and Mediterranean enhance Sahel rainfall through increased meridional convergence of low-level, externally sourced moisture. In contrast, year-to-year rainfall levels are largely determined by the recycling rate of local moisture, regulated by planetary circulation patterns associated with the El Nino-Southern Oscillation and the Indian Ocean. Our findings aid improved understanding and forecasting of Sahel drought, paramount for successful adaptation strategies in a changing climate.