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## Mechanisms and effects of dry and wet Sahel epochs

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The Sahel is Northern African region between the equator and the Sahara desert. It is home to a belt of semi-arid grassland that stretches from the Atlantic and across the continent westward towards the Red Sea. The monsoon type rainfall season that occurs in this region is influenced by the way that moisture transport along this belt region combines along the Inter Tropical Convergence Zone (ITCZ). The Sahel is one of the most productive crop areas of Africa, and if the rains fail – it has long lasting implications for its community. Due to its planetary location dry conditions pervade the Sahel for most of the year, with food production and livelihoods reliant on the summer monsoon rainy season between July and September. In this study we use (where available) up to 100 years of re-analysis records (GPCC rainfall, NCAR wind and HadISST ocean data) together with an accurate signal decomposition approach (dominant frequency state analysis, DFSA). With this we assess how the teleconnection influence of the Pacific ENSO and the Atlantic dipole mechanisms influence the dry and wet Sahel rain conditions. The severe Sahelian drought of the 1980's is shown to be a compounded sequence of drying dynamic effects that combined to occur suddenly over the span of 5-10 years. Our work indicates that dry and wet conditions appear to be related to land-air evaporation and condensation in the vicinity of the Sahel river catchments, with the land locked Lake Chad catchment having a particularly sensitive arid climate. Our latest findings help explain how the Atlantic and Pacific physical mechanism influence the Sahel monsoon and its extremes. With an assessment of agricultural data we also show how agricultural growth in the region is impacted by these factors. We present and discuss Africa dry and wet rainfall epoch forecasts over the next 30 years for Sahel based on stable and altered climate hysteresis scenarios.