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The role of SST and internal atmospheric variability in forcing variability in the beginning and end times of the rainy season in North Africa.

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Observations show that the onset of the African monsoon is controlled by the development of the heat low in the Sahara and the dynamics of the low-level convergence in the Inter-tropical Front and the meridional shallow circulation. The relationship between Sahel rainfall and the Sahara Low is reproduced, at least in its broad outline, by current climate models.

To understand what drives variability in the beginning and end times of the rainy season in North Africa, we investigate the sources of variability of Sahel rainfall and the Sahara Low during the pre-onset and demise seasons at interannual timescales in observations and in coupled and atmosphere-only general circulation models (GCMs). During the summer months, both Sahel rainfall and the Sahara Low are negatively correlated with tropical Pacific SST; this is reproduced by the models. At the time of the pre-onset and of the demise of the monsoon this relationship no longer holds; on the contrary, observations suggests a correlation of opposite sign with tropical SST (in the sense of positive Sahel rainfall anomalies in response to warm anomalies). Integrations with atmospheric GCMs forced by varying and fixed SST indicate that the SST-forced variability strongly projects on atmospheric internal dynamics that link variability in this tropical region to variability in the mid-latitude jet.

Finally, we explore the implication of a large role of internal atmospheric dynamics on the time of monsoon onset for seasonal prediction efforts.