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Title: Prediction Rainfall in North Africa
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Abstract:
The summer climate of North Africa exhibits strong decadal variability (the low frequency, LF) and also substantial variability within the decadal regimes (the high frequency, HF). Statistical analyses on raw climate data can confound processes on the HF and LF or be overwhelmed by the decadal scale. The HF and LF are studied separately. In recent decades, the LF in tropical North Africa is dominated by decreasing rainfall, strongest in summer months, but not absent in the transition seasons. The known change in the north-south interhemispheric gradient of sea surface temperature (SST) has accompanied climate fluctuation not just in the Sahel, but through much of the Tropics, including a modest decline in July-September (JAS) Indian rainfall. These large-scale changes of the ocean and atmosphere are consistent with a coupled ocean-atmosphere phenomenon, though results are also discussed in terms of a possible role for land surface changes in tropical North Africa.^M
A canonical correlation analysis showed that between 25% and 50% of the HF JAS rainfall variance (at large spatial scales) can be specified from the HF JAS SST. When April-June (AMJ) unfiltered SST is used, skill for the Sahel and Soudan is good at the LF, but near zero for the HF. This is likely an underestimate due to the conservative nature of the methods used, and the NiÃ±o3 tropical Pacific SST index in AMJ does show some predictive potential for the Sahel and Soudan regions on the HF. Nonetheless, the results indicate that a substantial part of the key SSTs, especially those related to ENSO, appear to evolve during late spring, a result previously also found for Indian rainfall. The Guinea Coast region in JAS exhibits little LF variance and tropical Atlantic AMJ SSTs yield hindcasts that explain about 30% of the rainfall variance. So for the Guinea Coast, forecasts can be expected to contain clear skill in predicting year-year fluctuations in rainfall.^M

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