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Impact of Atmospheric Tides on Climate Models

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Introduction

Drought is perhaps the most devastating of the recurring natural disasters. North American droughts rhythms have been associated with three modes; the inter-annual **ENSO** variability, the centennial variability and bi-decadal variability[1]. While the physical courses of these variability indexes are still under investigation, studies confirm that the drought rhythm is associated by the 22 yr Hale solar magnetic cycle minima and the 18.6 yr lunar nodal cycle maxima[2]. Recent **modeling** results also indicate that the rhythm could be the result of unstable ocean-atmosphere interactions in the North Pacific. In this study, we seek to investigate the ocean-atmosphere forcing resulting from enhanced **atmospheric tides** as well as tides associated with conducive solar-lunar geometries on both the North American and the Eastern Africa domains. The study is on-going.

Eastern Africa Climate variability

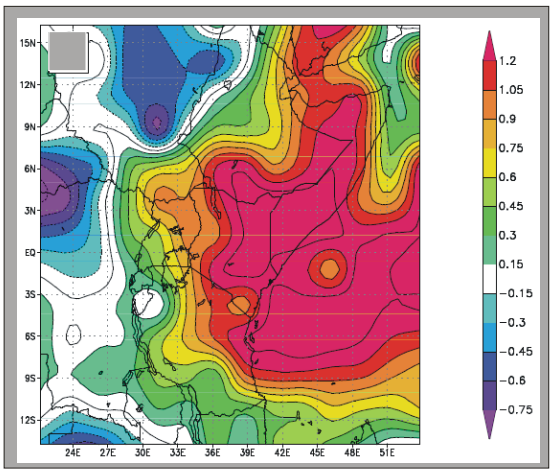

Figure 1.
Eastern African Regional EOF-1

Analysis of gauge data and CPC Merged Analysis of Precipitation (CMAP)[3] of OND seasonal rainfall over the Eastern Africa region for the period 1979-1999 reveal that the variability of the seasonal rainfall is attributed to the leading mode EOF-1 associated with ENSO[4]. See Figure 1.

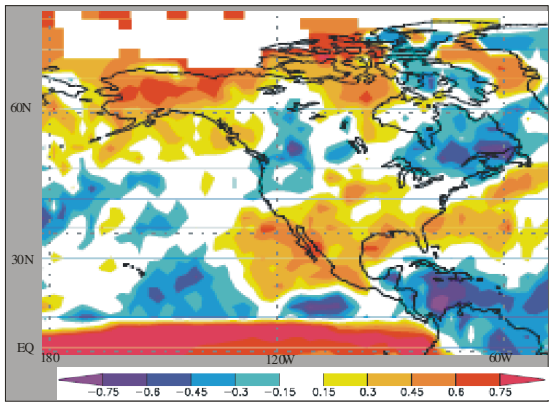

Figure 2.
North American EOF 1 spatial pattern

North American climate variability

Of the sea-surface temperature oscillations indexes, North American climate is associated mainly with ENSO and TSAO. Figure 2 shows the spatial pattern of the leading variability ENSO mode, EOF1.

Global versus Regional time series

A comparison is made between the Regional and the global time series in Figure 3. The two upward spikes in the Eastern Africa time series occur during the warm ENSO events of 1982 and 1997. The two series give comparable values for the period under investigation.

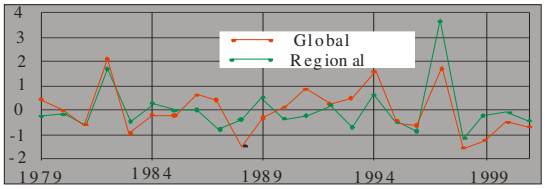

Figure 3
Global and Eastern Africa time series.

Conclusion

Oscillations of sea-surface temperatures are good indicators of climate variability. However, understanding the cause(s) of the temperature oscillations may provide solutions to long term climate modeling.

Bibliography

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