



Influence of Pacific and Atlantic sea surface temperature variability on rainfall in South America and its forecasting potential

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Hydrological extremes have severe impacts in tropical South America and the Amazon basin in particular. Droughts increase the risk of fires and extreme heat waves, whereas prolonged episodes of enhanced rainfall can lead to devastating floods. Both have great effects on the flora and fauna as well as socio-economic ramifications.

Droughts and floods in tropical South America have been linked to sea surface temperature anomalies in the tropical Atlantic and Pacific¹, but although the sources and impacts of droughts have been widely studied², establishing an early warning for their occurrence has, so far, not been achieved.

In this study we use bivariate complex networks to investigate the relationship between sea surface temperature (SST) and rainfall anomalies. Coherent oceanic regions with SST anomalies influencing the rainfall on the South American continent are detected. Our results indicate that the central Amazon basin is impacted by two major distinct oceanic regions in the tropical Atlantic, in addition to the more well-known influence of the El Niño region in the Pacific³. We find that the correlation structure between the two tropical Atlantic regions exhibits characteristic changes already long before a drought occurs in the central Amazon. Based on the changes in the correlation structure we develop a forecasting scheme to predict droughts in the central Amazon basin with high skill, taking solely SSTs in the two Atlantic regions into account.

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