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Use of Regional Climate Models to Study the Connections of ENSO and the Nile droughts

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There has been a wide recognition that natural oscillations in the state of the Pacific Ocean leave a significant impact on the patterns of weather and climate around the world. The dominant among these oscillations is known as the El Nino – Southern Oscillation (ENSO) which has a period of about 4 years. The ENSO indices use Sea Surface Temperature (SST) Anomalies of the central and eastern Equatorial Pacific or the sea level pressure difference between Tahiti and Darwin, Australia. This global index has a strong relation to the regional climate in tropical areas including Africa, and it affects the river flow in these tropical areas.
Here, we propose to study the connections between ENSO and the Nile droughts using a physically based model of the climate system: the Regional Climate Model version 4(RegCM4). The model will be run with a coarse resolution over Pacific Ocean to the African continent, and then nested with a fine resolution over the Blue Nile catchment. The initial and lateral boundary conditions for the RegCM4 simulation are obtained from the new ERA-Interim gridded reanalysis ((Simmons et al., Winter 2006/2007); (Uppala et al., 2008)) which is the third generation ECMWF reanalysis product. Sea surface temperature (SST) used to force RegCM4 is obtained from the National Oceanic and Atmospheric Administration (NOAA) Optimum Interpolation (OI) SST.
The Tele connection between the warm Sea Surface Temperature in the Pacific Ocean and the drought in the Nile can improve the seasonal forecasting in the region.
The results of these experiments would highlight the relative roles of the Pacific Ocean in shaping the hydroclimatology of the Nile basin. It can lead to better management of the irrigation projects and hydropower reservoir operations in the Nile basin.