

Southeast Asian Hydroclimate Extremes Over the Past Millennium and their Societal Impacts

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Long tree ring records from Southeast Asia are used to analyze the spatiotemporal variability of the hydroclimate of the past millennium, notably the near millennial Vietnamese cypress tree-ring record that reveals the two worst droughts of the past 7 centuries, each more than a decade in length, coinciding with the demise of the Khmer civilization at Angkor in the early 15th century CE. The droughts were separated by a sharp pluvial period of equal magnitude that damaged infrastructure and must have impacted agriculture. The latter half of the 18th century was dominated by a megadrought that lasted for more than two decades, and extended from India across Indochina. At this time all the charter states saw rapid realignment as the result of droughts, famine and a raft of related and unrelated social issues. These climate extremes each impacted society, agriculture and infrastructure, are of great interest to us from a climate dynamics perspective. However their role in the collapse, or disruption of, regional societies is of increasing concern given projections for future climate change scenarios. We demonstrate that the tropical Pacific accounts for much of the canonical variability we see in our record, implicating lower frequency variability in the ENSO phenomenon for driving decadal scale droughts, and exhibiting generally opposite sign anomalies to the North American Great Basin. However, the great Angkor droughts exemplify an anomalous same-sign scenario that is rarely seen. Historical documentation from the region provide corroborative evidence of our tree-ring reconstructed climate extremes.