



## **Southeast Asian Monsoon variability may have assisted the rise and fall of the Khmer Empire**

Yamoah Kweku Kyei Afrifa, Akkaneewut Chabangborn, Sakonvan Chawchai, Barbara Wohlfarth, and Rienk Smittenberg

Geological Sciences Department, Stockholm University, Stockholm, Sweden (kweku.yamoah@geo.su.se)

Climate shifts with links to human migration and social change have contributed to the global rise and fall of ancient civilizations (Weiss et al 2001; Haug et al. 2003). At the same time, these civilizations also tend to influence their environment significantly (Buckley et. al, 2010). Here we use  $\delta^{13}\text{C}$  and  $\delta\text{D}$  data of long-chained n-alkanes to unravel the drivers of monsoon intensity and their potential effects on the Angkor civilization. Strong Sea Surface Temperature (SST) variability from the Indo Pacific Warm Pool (IPWP), coupled to dramatic changes in the Pacific Walker Circulation (PWC) is suggested as a potential driver of the monsoon variability in Southeast Asia over the last two millennia. Our dataset provides independent evidence that past vegetation in Southeast Asia was greatly influenced by the activities of the Angkor people at about AD 834 to 1431 when agricultural activities and extensive hydrological systems may have contributed immensely to change the vegetation type. The massive agricultural boom as a result of increase in monsoon intensity, along with an extensive hydrological system, may have contributed significantly to the rise of the Khmer Empire. However, a prolonged drought as a result of the gradual weakening of the monsoon intensity over time (AD 1375-2000) may have caused the water management system to fail thus contributing significantly to the demise of the Khmer empire.

### References

- B. M. Buckley et al., Proc. Natl. Acad. Sci. U.S.A. 107, 6748 (2010).  
G. H. Haug et al., Science 299, 1731 (2003).  
H. Weiss, R. S. Bradley, Science 291, 609 (2001).