Tropical western Pacific hydrology during the last 6000 years based on charcoal records from Borneo

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Borneo is one of the islands between the tropical Pacific and Indian Oceans. The climate is tropical, and both temperature and precipitation are high year-round. The precipitation is influenced by both the Asian winter monsoon the El Niño-Southern Oscillation (ENSO). Today, the ENSO regulates the frequency of forest fires in Borneo. In El Nino years, the frequency of forest fires is significantly higher, due to low precipitation and dry environments.
In this study, we generated 6200-year long charcoal records from Borneo peats to understand changes in hydrology in the western Pacific region on centennial and millennial timescales and what regulated precipitation in Borneo. Charcoal in sediments is a good proxy of forest fires. We retrieved peat cores from five different sites in northwestern Borneo.
In each site, charcoal abundance show large fluctuation. The peaks are correlated between five different locations. This correspondence suggests that charcoal abundance reflect regional environmental changes rather than local factors. The abundance peak of charcoal in Borneo peats appeared every several hundred years, showing a 560-year periodicity, reflecting regional dry-wet cycles in Borneo. Higher charcoal abundance corresponded to higher solar irradiance and El Niño (Moy et al., 2002) from about 4000 to 1000 years BP, but the relationship was not clear and even reverse in other periods. The variation is consistent with stalagmite δ18O records from inland China and central India. This suggests a linkage of tropical climatic dynamics and the Asian summer monsoon on multi-centennial timescale.

Keywords: fire history, Borneo, Charcoal, Holocene

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