Climatic influences on daily rainwater $\delta^{18}O$ and δD timeseries in Northern Borneo

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A large number of key paleoclimate reconstructions are based on variability in water isotopes as a proxy for past hydrological activity. While pioneering work by Dansgaard (1964) and subsequent refinement by Rozanski (1993) established that water isotopes are intricately involved in large-scale hydrological cycling, detailed investigations of the temporal and spatial variability of water isotopes at a given site are rarely undertaken. This is especially true for the deep tropics, where coverage in the Global Network of Isotopes in Precipitation (GNIP) database is scant. Thus, the climatic interpretation of an increasing number of tropical paleo-hydrology records that rely on water isotopes is oftentimes poorly constrained. Furthermore, the advent of remotely-sensed water isotopes (Worden *et al*. 2007) and the incorporation of water isotopes in coupled global climate models (e.g. Schmidt *et al*. 2007) require comparisons with multi-year, high-resolution timeseries of rainfall isotopes.

Here we present a 5-year timeseries of rainfall $\delta^{18}O$ and ∂D from northwestern Borneo, collected at daily to bi-weekly resolution. We document large (~10‰) subseasonal shifts in rainfall $\delta^{18}O$ associated with intraseasonal variability, as well as prominent seasonal variability linked to the migration of the Intertropical Convergence Zone and associated large-scale wind patterns. Day-to-day variations of >10‰ reflect a complex mixture of vapor sources including evaporation from the nearby ocean and recycled moisture originating from the surrounding rainforest. In general, our analysis reveals the value in pursuing such site-specific timeseries of rainfall isotopes in order to refine the paleoclimatic interpretations of speleothem $\delta^{18}O$-based records from climatically complex regions.

Climate-driven changes in the Arabian Sea OMZ influenced by iron

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The Arabian Sea contains a large oxygen minimum zone (OMZ), arising from high rates of primary production and carbon export in the overlying waters. Wind-driven upwelling associated with the northeast and the southwest monsoon is responsible for high production and is strongly influenced by climate change. Goes *et al*. [1] argued that southwest monsoon intensification associated with Eurasian landmass warming leads to an increase in primary production on decadal timescales. Here we show that a substantial region of the Arabian Sea is strongly iron limited during the southwest monsoon. Findings are consistent with models [2] and satellite data [3]. Climate induced changes in primary production will depend on how monsoon intensification affects iron supply (primarily dust) to the region. Changes in dust depositional patterns will influence the balance between nutrient draw-down and C export in the well ventilated western Arabian Sea versus the more stratified eastern side, where the OMZ conditions exist. Fe supply may exert an important influence on the size and intensity of the OMZ.

[1] Goes *et al*. (2005) Science **308**, 545–547 [2] Wiggert & Murtugudde (2007) J. Geophys. Res. **112**, C05005, doi:10.1029/2006JC003514. [3] Behrenfeld *et al*. (2009) Biogeosciences, **6**, 779–794.