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Was there an asynchronous evolution of monsoon rainfall over South Asia in the Holocene?

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Recently pubished Holocene records of the South Asian monsoon from continental Oman, around the Arabian Sea and the Bay of Bengal reveal substantial regional differences. At least three domains with a very different evolution of monsoon-rainfall can be identified. Paleosalinity in the Bay of Bengal, derived from foram δ^{18}O and Alkenone-SST records and reflecting total rainfall over the Ganges-Brahmaputra basin, shares a similar long-term trend with monsoon-rainfall over coastal Oman, derived from a stalagmite δ^{18}O record. Here, an early Holocene maximum in monsoon-rain is followed by a gradual decrease. This trend correlates with the long-term trend in Arabian Sea summer monsoon wind strength derived from ocean upwelling records off Oman. Discharge from the Indus basin draining NW India and Pakistan (derived from foram δ^{18}O) shows a distinctively different pattern without a clear long-term trend. Considering that climate events and multi-centennial climate cycles appear to be coherent between the NE Arabian Sea and the winter rain dominated Persian Gulf and Red Sea but not with coastal Oman, the best explanation is an additional winter rain component over the Indus basin. In southern India, discharge from the western Ghats into the Arabian Sea (derived from foram δ^{18}O) increased during the late Holocene. In this region summer monsoon rain dominates at the present day, but the long-term trend is anti-correlated with summer monsoon records elsewhere. Consequently, summer monsoon wind strength cannot be used to infer Holocene paleo-monsoon rainfall over South Asia in general.

It is notable, that records based on different kinds of “monsoon”- proxies often display strikingly different monsoon histories even if they come from sites close to each other. This is particularly the case when δ^{18}O records based on calcite (from forams or stalagmites) and records based on bulk sedimentary properties (mineralogical, geo-

chemical or otherwise) are compared. The underlying assumption with the use of bulk sedimentary proxies is that they can be related to total monsoon rainfall through erosion, fluvial freshwater discharge and fluvial sediment discharge in a straight forward way, and that total monsoon rainfall is the controlling factor on erosion and fluvial sediment transport. Recently published results on erosion rates and landscape formation processes, however, do not support this chain of arguments. This calls for a re-interpretation of the bulk sedimentary proxy records. Factors such as seasonality of rain, peakedness of rain and plant-cover are potential candidates capable of affecting erosion rates during Holocene climate cycles.