



Coral Sr/Ca records from Enggano Island (Indonesia): Proxy records of IOD-induced upwelling and mean SST in the Eastern Indian Ocean

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We present monthly resolved coral Sr/Ca and $[\delta^{18}O]$ records of modern and historical corals from Enggano Island, about 100 km southwest of Sumatra, Indonesia. Enggano is located in the center of action of the Indian Ocean Dipole (IOD). Positive IOD events cause upwelling of cold thermocline water and strong but short-lived cooling events in September-November. Coral Sr/Ca successfully records regional sea surface temperature (SST) variability, including the cooling events caused by positive IOD events. The magnitude of cooling inferred from coral Sr/Ca is consistent with modern satellite data. Historical SST reconstructions (grid-scale), which are estimated from sparse observations, underestimate the cooling during IOD events. This reflects the small-scale SST variability in the Eastern Indian Ocean. A historical coral record covering the 19th century was derived from a fossil *Porites* colony drilled in a dead reef found at approximately 3m water depth off Enggano Island. The Sr/Ca record of this coral shows marked changes in the amplitude of the seasonal cycle through time. We attribute these changes to variations in the strength of the SE monsoon winds, which induce the coastal upwelling off Java and Sumatra during September-November. Our results suggest that profound changes in the mean climate of the eastern Indian Ocean may occur on historical time scales. Our results are consistent with low-resolution sediment records that indicate cooling and intensified upwelling in the eastern Indian Ocean sector during the 19th century.