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Two centuries of Indonesian Throughflow-controlled hydrological changes in the southeastern Indian Ocean

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The Indonesian Throughflow (ITF) is the only low latitude connection of heat/salt between the Pacific and Indian Oceans, which is suggested to modulate Global Mean Surface Temperature (GMST) warming by heat redistribution. The Cocos (Keeling) Islands, southwest of Indonesia, are located in the region where thermohaline conditions are directly influenced by the outflow of the ITF. Local sea surface salinity (SSS) is strongly controlled by ITF variability. Reconstructions of SSS in this region hold thus information on past ITF variability, also on timespans longer than presently available through observations. We reconstructed ITF-controlled sea-water-δ18O, which is related to SSS, using paired analysis of δ18O-Sr/Ca. This allowed to trace ITF leakage into the southeast Indian Ocean over the past 200 years in bi-monthly resolution. Our data indicates that ITF leakage into Indian Ocean is dominated by the interannual climate modes of the Pacific Ocean (El Niño Southern Oscillation) and Indian Ocean (Indian Ocean Dipole), in line with observational data. Moreover, the coral data shows that over the last 2 centuries, Pacific decadal climate variability had a significant impact on ITF strength, being important for ITF changes on multi-decadal timescales. A comparison of our sea-water-δ18O record to GMST indicates that ITF transport varied in synchrony with global warming rate, being predominantly high/low during GMST warming slowdown/acceleration, respectively. Hence, this may imply that the ITF is involved in global warming rate modulation.