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Indian Ocean Dipole variability from Indonesian corals during the Little Ice Age

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The Indian Ocean Dipole (IOD) is an ocean-atmosphere climate oscillation within the Indian Ocean basin, and one of Australasia's key climate drivers that influences the distribution of rainfall across the region. Future projections of the activity of the IOD suggest that positive IOD events may become more frequent with greenhouse warming. However, the short duration of instrumental records and biases in model representations of the IOD make it difficult to confidently separate anthropogenic-related trends from natural variability. To better understand natural IOD variability, high-resolution reconstructions of the Indian Ocean sea surface temperature (SST) are needed to provide a comprehensive view of IOD upwelling activity prior to the 20th Century.

In this research, a fossil Porites coral has been used reconstruct past SST from the Sunda Strait, between the Indonesian islands of Java and Sumatra. Tectonic and volcanic activity in this region has preserved fossil coral material of various ages along the Sunda Strait coast. The southern Sunda Strait (6.5ºS, 105.5ºE) area is a key area for measuring IOD activity, as the cold upwelling waters in the eastern Indian Ocean, associated with a positive IOD event have a clear signature here that is captured by geochemical changes in coral skeletal material. The focus of this project is on a new 170 year, ∼monthly resolution ∂18O record from a Krakatoa coral tsunami block dated to 1883 BP. This coral-based SST reconstruction reveals insights into the frequency and intensity of positive IOD events prior to anthropogenic climate change that gives context to the intensification of positive IOD events since the 1960s.