Observations and model hindcasts of multi-decadal changes in the Indian Ocean (IO) indicate a zonally-extended band in the southern tropics where sea level has substantially fallen since the 1960s. The sea level drop is consistent with the observed decrease in upper-ocean heat content associated with a shoaling thermocline in this region. Understanding the causes of these regional trends is of crucial importance for improving projections of future changes. Here we use a sequence of global ocean model simulations to identify a significant contribution from the western equatorial Pacific, via wave transmission of thermocline anomalies through the Indonesian Archipelago, and their subsequent westward propagation by baroclinic Rossby waves. Whereas interannual variability in the southwestern tropical IO thermocline appears mainly governed by IO atmospheric forcing, our model simulations suggest that the bulk of the late 20th-century cooling trend was due to the oceanic teleconnection from the Pacific, representing a manifestation of the major shifts in Pacific climate in the mid 1970s and late 1990s associated with the Pacific Decadal Oscillation. The result suggests that future trends in the tropical IO will depend on the evolution of the thermocline in the western tropical Pacific in response to changes in the trade winds over the Pacific Ocean.