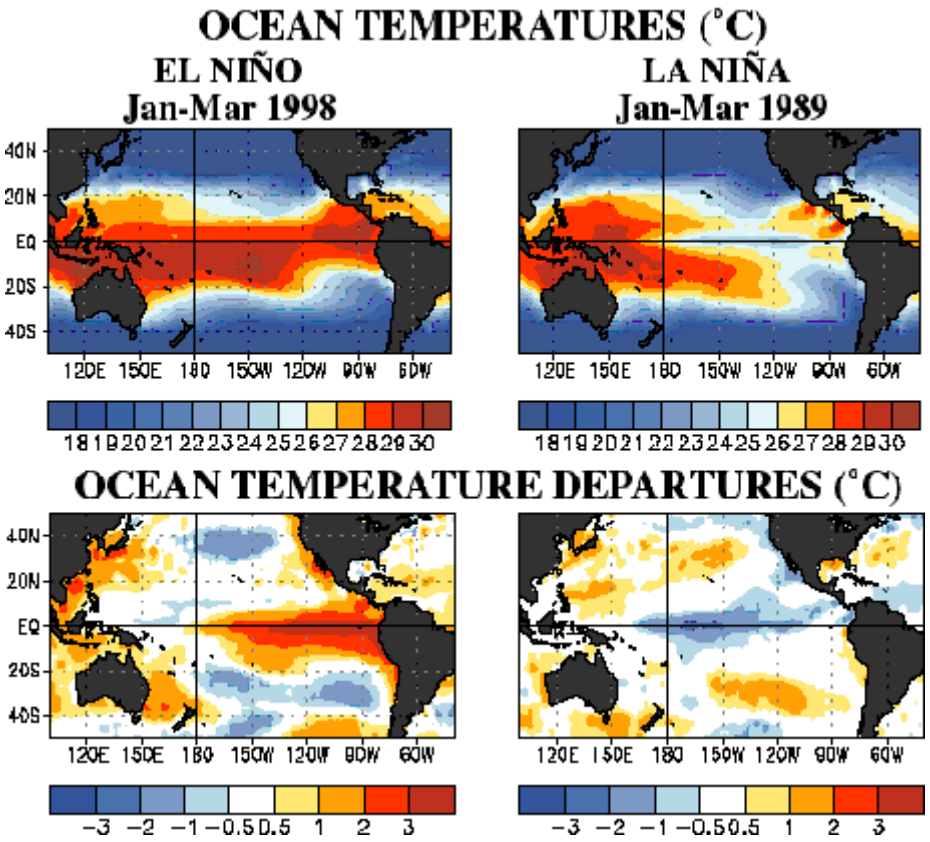

El Niño Southern Oscillation, La Niña and the Chagos Archipelago

The El Niño Southern Oscillation is a major climatic/oceanic variation over the extent of the Pacific Ocean, influencing the adjacent continents and oceans. The driving force is the differential in air pressure between east and west Pacific, as measured over Tahiti and Darwin, referred to as the Southern Oscillation.

El Niño results in warmer waters moving eastward, driven by stronger than normal westerly winds over the western Pacific unopposed by weakening Pacific easterly trade winds. This results in decreased or, conversely, increased rainfall / sea surface temperature (SST) in many regions and a warmer than normal band of water across the extent of the equatorial Pacific right up to the American coast.

La Niña is an exact reversal of the El Niño conditions and consequences, with weakening westerly winds over the western Pacific and very strong easterly Pacific trade winds over the eastern Pacific. This pushes the warmer surface waters west, allowing an upwelling of cooler, deeper, nutrient rich waters to the surface along the eastern Pacific, most notably along the Peruvian coast which produces abundant fish stocks. Arid regions experience rain and rainfall fails in other regions.

The Indian Ocean and Chagos regions experience increased rainfall and SST in El Niño years and the opposite in La Niña years. The Chagos coral bleaching / mortality in 1998 occurred during the combined occurrences of El Niño and a positive Indian Ocean Dipole event, which also produces higher temperatures and rainfall in the western Indian Ocean.

El Niño events have been detected in analysis of oxygen isotopes from Porites coral cores from Chagos, formed during the periods of increased rainfall and SST[1,2,3].

[1] Zinke, J., Pfeiffer, M., Timm, O., Dullo, W.C. and Davies, G. R. (2005). Atmosphere - ocean dynamics in the Western Indian Ocean recorded in corals. *Phil. Trans. R. Soc. A* 363: 121–142

[2] Pfeiffer, M., Timm, O., Dullo, W. C. and Garbe, D. (2006). Paired coral Sr/Ca and 18O records from the Chagos Archipelago: Late twentieth century warming affects rainfall variability in the tropical Indian Ocean. Geology. 34: (12) pp 1069–1072

[3] Pfeiffer, M., Dullo, W.C., and Eisenhauer, A. (2004). Variability of the Intertropical Convergence Zone recorded in coral isotopic records from the central Indian Ocean (Chagos Archipelago). Quaternary Research 61: 245-255.