

## **Evidence for a Holocene Climatic Optimum in the Southwest Pacific: a multiproxy study**

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The early Holocene sea surface temperature (SST) gradient across the Subtropical Front (STF) to the east of New Zealand was  $\sim 2^{\circ}\text{C}$  (measured between core sites MD97-2121 and MD97-2120): considerably less than the  $\sim 6^{\circ}\text{C}$  modern gradient between the two core sites. We document the surface ocean temperatures east and south of New Zealand during the early and middle Holocene, to test and expand upon this reconstruction. This new study samples a latitudinal transect of seven sediment cores from  $37^{\circ}\text{S}$  to  $60^{\circ}\text{S}$  in the southwest Pacific from subtropical waters north of New Zealand to polar waters in the Southern Ocean. Our compilation of SST proxies consists of 525 SST estimates from five different methods, and includes 243 new data points. We confirm that an early Holocene warm peak in this region was mostly restricted to the area immediately south of the STF, which resulted in a lower temperature gradient across the STF than in modern times. However, there is no change in Holocene SST south of the Polar Front. Faunal assemblages suggest an early Holocene meridional expansion of fauna characteristic of the modern Subtropical Front in the Bounty Gyre. We suggest that such an expansion could be achieved by a reduced inflow of Subantarctic Surface Water into the Bounty Gyre. Results from a modern-analogue matching platform called the Past Interpretation of Climate Tool (PICT) suggest that the early Holocene SST is most consistent with reduced westerly winds in the New Zealand sector of the Southern Ocean.