Beyond the ice: records of millennial scale climate change from the Polar Front

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The Southern Ocean (SO) plays a major role in global climate through redistributing heat and nutrients into all the major oceanic basins and regulating ocean-atmosphere CO_2 exchange. Research focusing on the mechanisms behind abrupt climate change has highlighted the degree of variability recorded in the SO. This variability can be better understood through increasing the spatial and temporal resolution of marine records, particularly in the South Pacific where data are sparse. The bipolar seesaw is a well-documented relationship that describes the out-of-phase timing of Arctic and Antarctic millennial scale climatic events evident in polar ice cores throughout Marine Isotope Stage 3 (MIS3). However, their expression in the southern mid-latitudes is poorly known. Consequently, this period may provide an important window to gauge how Earth in general and the NZ region in particular could respond to anthropogenic-induced abrupt climate changes.

Two marine sediment cores collected from the Polar Front, south-west of NZ, have provided a new high resolution elemental record measured by XRF. The data show a progression of abrupt elemental changes we interpret in terms of ice-rafted debris flux and plankton productivity.
Preliminary age modelling suggests these unique marine records detail key elemental changes during MIS3. This data provides a means to understand the different components culminating in a sudden perturbation to Earth's climatic state, with the hope to better constrain the timing and spatial extent of these events in the Southern Hemisphere.