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Grain Analysis of Pliocene-Pleistocene Sediments from the Chatham Rise

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Proxy Analysis of Pliocene-Pleistocene Sediments from ODP Site 1123

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BACKGROUND

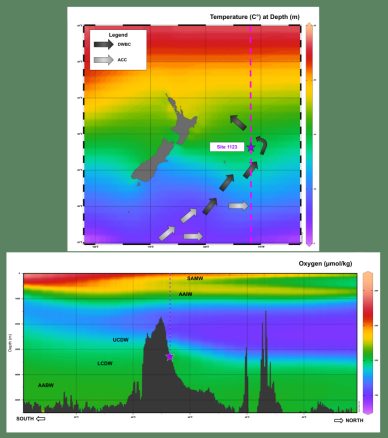

Fig 1. The top map shows a gradient of changing sea surface temperatures across the area, with the DWBC in black and the ACC in white, and the study site as a purple star at 41°47.147′S 171°29.941′W. The bottom plot shows a cross-section of oxygen content across a N-S transect, with the core location in purple and all notable water masses listed[1].

- Ti, K, Fe, Ca, Mn, Al, O and C isotopes as various proxies[2,3]

METHODS

Fig 2. This figure shows the methodology of the study from sample collection on the JOIDES Resolution to microscope analysis, XRF and XRD, and preparation for the sedigraph with sieving and application of acetic acid and hydrogen peroxide[4,5,6,7]

Sediment supply changes appear cyclical during the Late Pliocene

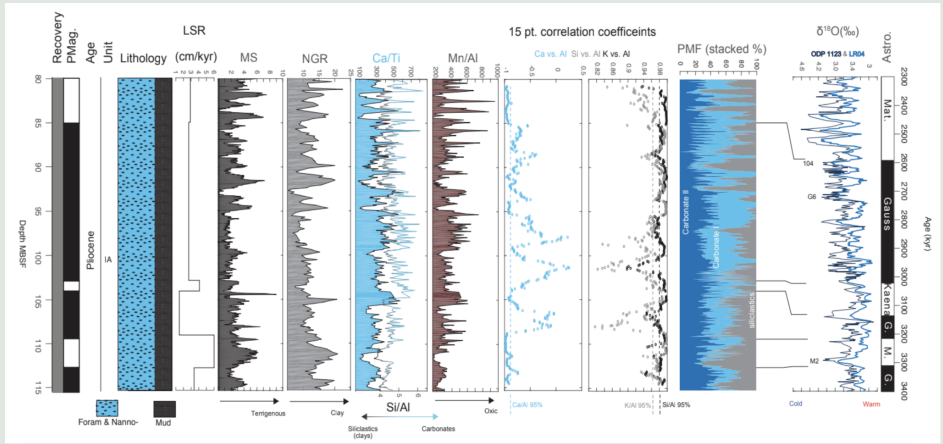

Fig 3. Composite figure displaying changes in the core as depth increases. Age increases with depth and variables from left to right include lithology, LSR, MS, NGR, Ca/Ti ratio, Si/Al ratio, Mn/Al ratio, Ca vs. Al, Si vs. Al, K vs. Al, PMF and $\delta 18O_{1123}$ isotope stages from this site and global LR04[1]

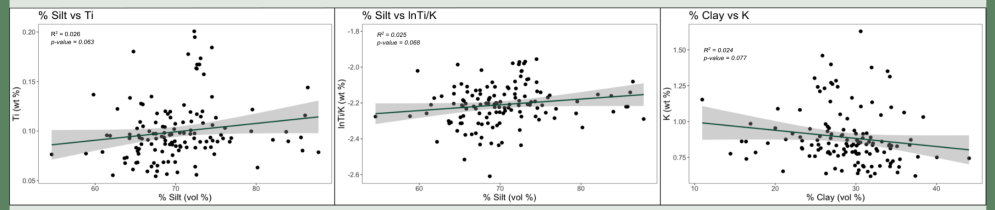

Fig 6.

- positive relationship
- clustered around 70% silt
- Ti should = coarse grains

- positive relationship
- clustered around 70% silt
- Ti/K should = heavy/light

- negative relationship
- clustered around 30% clay
- K should = fine grains

Hypotheses to be tested:

Do XRF proxies accurately reflect terrigenous grain size variability?
- Test by comparing %silt and heavy element Ti and %clay and XRF clay proxy K

Is there an influx of Southern Ocean deep water flowing into the Pacific Ocean during 100kyr Late Pliocene Southern Hemisphere cooling events?
- Test using d13C, lnMn/Al ratios, grain size proxies,
- *Develop a high-resolution sortable silt grain size record*

RESULTS

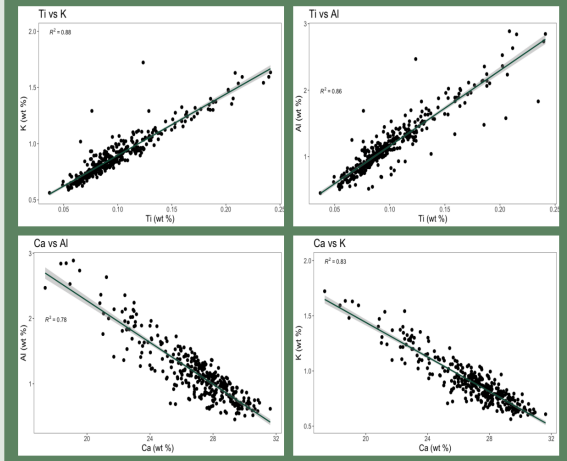

Fig 4. These graphs show the relationship between various elemental proxies: Ti and K, Ti and Al Ca and Al, and Ca and K. Both graphs with Ti have a positive relationship while the Ca have negative

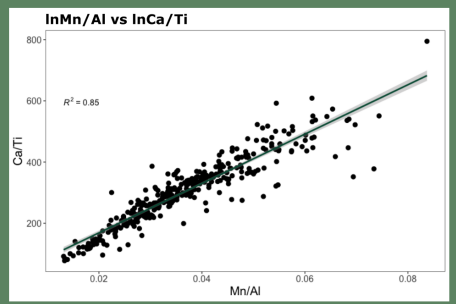

Fig 5. During warm periods Ca/Ti is high and there is a lot of overturning, invigorating circulation. During cold periods there is lower Ca/Ti and reduced overturning, lowering Mn/Al.

REFERENCES