New Zealand Fjord Records of Southern Hemisphere Westerly Wind Variability

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The strength, latitudinal position and zonal symmetry of the Southern Hemisphere westerly winds (SWW) play an important role in Southern Ocean (SO) C cycling by driving meridional overturning circulation and subsequent air-sea gas exchange. The efficiency of the SO carbon sink is highly dependent on the symmetry and strength of the SWW, but evaluating the role the SWW play over centennial to millennial timescales requires a distributed network of senstive paleoclimate records spanning a range of latitudes from all SO sectors, which we presently lack. Fjords along the SW margin of NZ and along the eastern margin of the subantarctic Auckland Islands offer excellent opportunities to reconstuct past changes in the SWW and contribute to our understanding of past westerly symmetry. Here, we present ongoing work towards evaluating past variations in the SWW from fjord geochemical sediment records obtained from Fiordland and the subantarctic Auckland Islands.

In Fiordland, we apply a suite of organic and inorganic geochemical proxies to track delivery of terrestrial organic carbon enhanced by precipitation/fluvial discharge and fjord circulation. Auckland Island fjords have smaller catchment/fjord surface areas that result in limited fluvial discharge at the head of the fjord that prevent the establishment of significant estuarine circulation. Here we use the $\delta^{13}C$ and $\delta^{18}O$ of benthic foraminifera, bulk organic $\delta^{13}C$ and $\delta^{15}N$, and down core profiles of redox sensitive elements to monitor marine incursion, preicpitation-driven erosion of the catchment and water column stratification, respectively, that is related to the strength of the SWW. Overall, our results suggest weak westerlies during the early Holocene with a trend towards increasing strength after 5ka. We will discuss these results within the context of complimentary records developed from southern South America to ultimately obtain a Pacific basin view of the SWW through the Holocene.