Deglacial southern ocean ventilation history from a benthic foraminiferal $\delta^{13}C$ Transect

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Abrupt climate changes during the last deglaciation are associated with corresponding changes in Southern Ocean overturning circulation and ventilation, particularly during the Antarctic Cold Reversal (ACR). Herein, we present high-resolution, mono-specific (*P. wuellerstorfi*), benthic foraminiferal $\delta^{13}C$ records from a depth transect of cores to reconstruct ventilation changes in the New Zealand region of the Southern Ocean. The cores span depths of; 600m (RR0503 87TC/87JPC), 1200m (RR0503 79JPC), 1600m (RR0503 83TC/83JPC), 2045m (H214;), 2500m (RR0503 125JPC), and 3800m (RR0503 41JPC). Age control is based on tephrastratigraphy, and additionaly constrained by $\delta^{18}O$.

During the last glacial period, the difference in $\delta^{13}C$ values ($\Delta\delta^{13}C$) between 600 and 3800m, is ~1.7‰, significantly higher than during the Holocene (~0.7‰), implying reduced glacial ventilation. In the early deglaciation, $\delta^{13}C$ increased at deep sites, suggesting increasing ventilation. Glacial $\delta^{13}C$ values at 1200m lie evenly between the values of the deeper sites (1600 – 3800m) and the shallowest core (600m), suggesting a distinct glacial intemediate water mass. During the ACR, $\delta^{13}C$ at 1200m increased and converged with values at 600m, suggesting that a single water mass to bathed 600 – 1200m. Following the ACR, $\delta^{13}C$ values at 1200m again become distinct from the shallow and deep sites and the $\delta^{13}C$ in the deeper cores increases rapidly (by ~0.5‰), reducing the $\Delta\delta^{13}C$ to ~1.0‰ post-ACR.

These results indicate a step-wise change in stratification and ventilation across the ACR boundary, suggesting the ACR had both a short term and enduring impact on shallow interior ventilation in the Southern Pacific.

Characterisation of the transfer and biodegradation of chloroacetamide herbicides in lab-scale wetlands

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Chloroacetamide herbicides are extensively used in the USA and in Europe for the control of annual grasses and broad-leaved weeds in a variety of crops including maize, sugar beet and sunflower. The major dissipation route for metolachlor, alachlor and acetochlor herbicides appears to be microbially-mediated degradation in soil ecosystems. However, detailed knowledge about their transfer, mitigation and biodegradation in wetland systems is scarce. Here, we examine the transfer and attenuation of metolachlor, acetochlor and alachlor in wetland systems, mainly focusing on their *in situ* biodegradation under different conditions and the characterisation of the microorganisms involved. In order to reach an integrated understanding of chloroacetamides attenuation processes, our investigations will include two different scales. The mesocosm scale experiment will examine the transport and biogeochemical changes under field-like conditions, whereas the microcosm experiment will involve aerobic and anaerobic enrichment cultures set-up in a sediment extract medium and a minimal medium. The biogeochemical dynamics of the lab-scale wetland systems will be characterised using hydrochemical, biomolecular and compound-specific isotope analyses (CSIA). Changes in herbicide concentrations, their enantiomeric ratios and some of their degradation products will be assessed over the flow path and over time. In parallel, changes in the structure of the microbial communities present in lab-scale wetlands will be characterised using PCR-T-RFLP analysis. CSIA methods will be developed to characterise the biodegradation of chloroacetamide herbicides during their transfer in wetland systems.