

Paleoenvironmental changes of the continental shelf in the Canterbury Basin based on benthic foraminiferal assemblages

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Introduction

The Quaternary benthic foraminiferal assemblages in top 74 m of two cores, Hole U1353B (hole depth; 211.48 m) and Hole U1354B (hole depth; 77.52 m) of IODP Exp. 317, were examined to understand the paleobathymetric and paleoclimatic history at the Canterbury Basin, New Zealand. The purpose of IODP Exp. 317 is to understand the relative importance of eustasy and tectonic and sedimentary processes in controlling the development of continental margin sedimentary cycles (sequences). Sites U1353 and U1354 provide a high resolution record of recent glacial cycles covering the middle to late Quaternary in a continental shelf setting (Expedition 317 Scientists, 2011). Top 74 m of these cores have the glacial-deglacial records since 0.5 Ma based on the datums of microfossils and the oxygen isotope curves.

Foraminiferal taxa group

We identified 50 genera and 95 species of fossil benthic foraminifera (>0.125 mm) in 120 samples of these core, and recognized 4 taxa groups, with different depth ranges in the present ocean around New Zealand (Hayward et al., 1999).

Taxa group 1 - *Bulimina marginata*, *Cassidulina carinata*, *Anomalinoidea sphericus*, *Notorotalia zealandica* and *Sphaeroidina bulloides* - deep inner shelf to outer shelf (about 20-200 m in water depth)

Taxa group 2 - *Nonionellina flemingi* and *Angulogerina angulosa* - deep inner shelf to mid shelf (about 20-100 m in water depth)

Taxa group 3 - *Notorotalia finlayi*, *Notorotalia aucklandica*, *Quinqueloculina* spp. and *Cibicides* spp. - inner shelf (about 0-50 m in water depth)

Taxa group 4 - *Zeaflorilus parri*, *Elphidium charlottense*, *Haynesina depressula* and *Virgulopsis turris* - shallow inner shelf (about 0-20 m in water depth)

Paleoenvironmental changes

Based on the paleo-water depth estimated by benthic foraminiferal assemblages, the sediments of U1353B and U1354B since 0.5 Ma were divided to 7 bio-cycles. 1 bio-cycle represents from shallower taxa group to next shallower group via deeper taxa group. And each cycle may correlate to a glacial-deglacial cycle.

Subtropical benthic species, *Bulimina marginata*, is abundant during the three warmer periods (MIS 1, MIS 11, MIS 13). This species indicates that Canterbury Basin was warmer than modern in climate.

According to the previous studies on the Tertiary stratigraphy in Oamaru (Hornibrook et al., 1961), *Bolivina parri*, *Bolivina wanganuiensis* and *Siphotexturalia wairoana* were extinct at the boundary of Haweran and Castlecliffian in NZ stages, corresponding to 0.34 Ma. However, the present study represent that these highest occurrences were not the same, and seem to be controlled by the paleoenvironmental changes related to glacial-deglacial cycles.

Keywords: benthic foraminifera, paleobathymetry, continental shelf, Canterbury Basin, Pleistocene, IODP Exp. 317