

Late Pleistocene and Holocene Stratigraphy of an Active Forearc Basin, Waipaoa Continental Shelf, New Zealand

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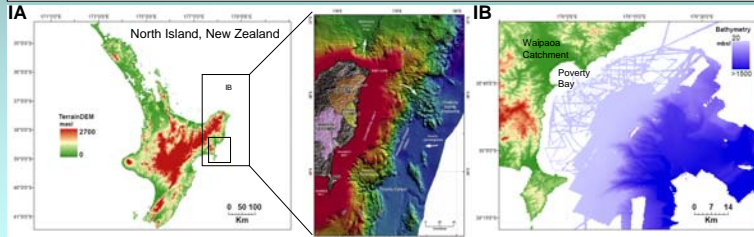
I. Overview

Study Objective

Determine the volume and pattern of sediment storage on the Waipaoa Shelf through the Late Pleistocene and Holocene to assess the impact of long term (tectonic, eustatic) and recent (deforestation) controls on the Waipaoa stratigraphic record.

Data

- CHIRP subbottom (5-7.2 kHz, 30ms), sidescan sonar (107.5 kHz, 1 km swath) and multibeam (95 kHz) shelf datasets collected aboard the *R/V Kilo Moana*; multibeam added to existing slope bathymetry.
- Extensive suite of shallow (<3 m) gravity cores (2005) and 5 recent (2006) long (14-25 m) piston cores.



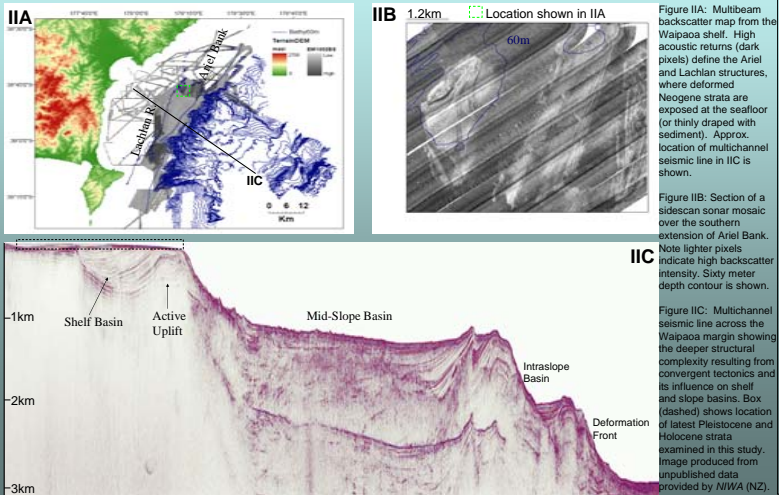
II. Regional Setting

i. Tectonics (Fig. IA, inset; Fig.II)

- Subduction of the Pacific Plate beneath the Raukumara Peninsula generates volcanism and uplift (~3 mm yr⁻¹) of the North Island axial range and deformation along the North Island continental margin.
- The Waipaoa shelf is a forearc basin subsiding at 2-4 mm yr⁻¹ behind an imbricated thrust front marking the landward edge of a highly deformed continental slope (Fig.II.C).
- Two anticlinal ridges along the front are defined by high surface reflectivity (Fig. IIA,B)

ii. Sediment Supply and Dispersal

- The Waipaoa basin (2200 km²) shows a very high specific sediment yield (6800 t km⁻² yr⁻¹) dominated by gully erosion and shallow landsliding.
- The Waipaoa catchment is still adjusting via knickpoint retreat to LGM sea level fall and more recently, via increased erosion, to anthropogenic deforestation.
- Modern sediment dispersal via Poverty Bay by hypopycnal and, during large floods, hyperpycnal plumes.



III. Regional Stratigraphic Architecture (Figs. III A-J)

i. Inner/Mid-shelf Sediment Prism: Subsidence and Uplift

- Late Pleistocene and Holocene growth strata above a major unconformity (UcF) flank the forelimbs of Ariel (north) and Lachlan (south) anticlines and fill adjacent synclines.
- Growth strata in the prism contain multiple, closely spaced reflector packages that are semi-continuous to continuous in character.
- Growth strata in the prism decrease in dip from stratigraphically lower to higher units and display onlap, overlap, and offlap geometries.
- Maximum sediment thickness above UcF mapped ($V=1500 \text{ ms}^{-1}$) at 40 m; inferred thicknesses approach 50 m beneath gas-masked synclinal trough.

ii. Outer Shelf Sediment Prism: Shelf Bypassing?

- Recent (Holocene) lobe of strata above UcF bounded by Lachlan anticline to the west and a fault to the east (Fig. IIIH).
- Main depocenter thickens through Poverty Gap to a maximum observed thickness of 45 m seaward of Lachlan tip.

