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HOLOCENE SEA-LEVEL CHANGE IN THE NEW ZEALAND ARCHIPELAGO AND THE GEOMORPHIC EVOLUTION OF A HOLOCENE COASTAL PLAIN INCISED-VALLEY SYSTEM: THE LOWER MANAWATU VALLEY, NORTH ISLAND, NEW ZEALAND

Related publications

Clement, A.J.H., Sloss, C.R., Fuller, I.C., 2010. Late Quaternary geomorphology of the Manawatu coastal plain, North Island, New Zealand. Quaternary International 221, 36–45.

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A thesis presented in partial fulfilment of the requirements for the degree of

Doctor of Philosophy in Geography

at Massey University, Palmerston North, New Zealand.

MASSEY UNIVERSITY

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2011

Typeset with LaTeX

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Abstract

The full body of work relating to Holocene sea-level histories in the New Zealand region has been integrated and critically analysed to provide context for the construction of detailed, local-scale Holocene sea-level curves for regions within the New Zealand archipelago. These local-scale sea-level reconstructions in turn provide context for an investigation of the stratigraphic and geomorphic evolution of the Manawatu coastal plain incised-valley system during the Holocene.

The state of knowledge of sea-level fluctuations in the New Zealand region during the Holocene is revealed to be poor. Holocene sea-level histories are fragmented and unreliable, with sea-level reconstructions produced for the whole of the New Zealand masking local-scale trends in Holocene sea-level fluctuations.

Local-scale Holocene sea-level curves produced for regions within the New Zealand archipelago show a north-south trend in sea-level fluctuations. In the Auckland-Northland region present mean sea-level (PMSL) was attained c. 7,700 cal. yr BP. Approximately 7,500 cal. yr BP PMSL was attained in the southwest North Island. PMSL was attained in Pegasus Bay c. 7,100–6,600 cal. yr BP, and in East Otago c. 6,900 cal. yr BP. It is also possible to discern a north-south lag in the timing of sea-level fluctuations following the attainment of PMSL between the southwest coast of the North Island and the East Otago peninsula. The degree to which the north-south lag in the timing of the attainment of PMSL is a manifest response to external driving forces is not yet clear as the local-scale sea-level histories are highly variable, quite contradictory, and appear to be responding inconsistently to different external drivers.

Vibracores and water well logs have been used to reconstruct the sedimentary infill of the lower Manawatu River valley, North Island, New Zealand, in response to Holocene sea-level change and the influx of sediment from the bordering axial ranges. Cross-sections across the incised-valley system have identified: the lowstand incision of the Manawatu River c. 22–18 ka, and associated fluvial terraces buried at depth beneath the Holocene valley fill; the extent of the Holocene estuary which occupied the lower valley at the culmination of the Holocene marine transgression (c. 7,500 cal. yr BP); the sedimentary succession which filled the valley associated with the Holocene sea-level highstand; and late Holocene to recent coastal progradation of 5–6 km. A 3D model of the sub-surface stratigraphy of the lower valley was constructed from the borehole data and cross sections. Digital elevation models were also constructed for key palaeo-surfaces within the valley's Holocene sedimentary fill. Holocene sea-level fluctuations in the valley were reconstructed from radiocarbon dated estuarine bivalves recovered from vibracores. These radiocarbon dates also record subsidence of the valley due to a combination of sediment compaction, post-glacial water and sediment loading, the evolution of the Wanganui Basin, and neotectonics. Information from all sources was collated and used for the construction of palaeogeographic maps and a series of conceptual models of the evolution of the lower valley.

Acknowledgements

Many people contributed their expertise and gave support in many varied ways throughout my PhD research.

First and foremost I wish to thank my supervisors, Dr. Ian Fuller and Dr. Craig Sloss: hands-on supervisors who gave freely of their time, knowledge, advice, and keen and critical insight. Both are excellent mentors who provided encouragement, guidance, and support throughout the course of my research.

A great deal of this research hinged on successful fieldwork. In this respect I am extremely grateful to David Feek, whose constant optimism and innovation often meant the difference between success and failure in the field. Thanks also to those who lent a hand, always somewhere wet and often cold: John Appleby; Rob Dykes; Jane Richardson; and Gigi Woods.

Many people freely provided data, both published and unpublished, and information borne of their own expertise, which is gratefully acknowledged: Scott Nichol (GA), unpublished measurements of cores on Great Barrier Island; Christine Prior (GNS), advice about radiocarbon age determinations; Patrick Hesp (LSU), advice on Manawatu geomorphology and dune sequences; Andrew Steffert (Horizons), airborne LiDAR data and orthophotos of the Manawatu; Louise Chick (Waikato), unpublished data on tectonic movements of the Kerepehi Fault; John Ogden (Auckland), unpublished aspects of cores from Whangapaoa Estuary; Martin Hewitt and Mark Peters (Geosystems), advice on NZGeoid05 and grid files for TGO; Will Newell (Geosystems), advice on Trimble R8 use and NMEA message output; John Oldman (NIWA), advice on cores from Mahurangi Estuary; John Dymond (Landcare), subset of the ECOSAT DEM covering the Manawatu; Hisham Zarour (Horizons), bore logs from throughout the Manawatu; John Begg (GNS), data and advice for extrapolating the extent of Manawatu river terraces under the modern floodplain; Alan Hogg (Waikato Radiocarbon Laboratory), advice regarding conventional radiocarbon ages; Fiona Petchley (Waikato Radiocarbon Laboratory), advice on and a keen eye for fossil mollusc species; Dougal Townsend (GNS), preliminary data from unpublished QMAPs; and Clinton Duffy (DoC), unpublished bathymetric data for the Hauraki Gulf.

Thank-you to the many friendly farmers I met through the course of my research who gave valuable local advice and context and allowed access to and across their land: Mark Anderson; Wayne Moxham; Rachel Taylor; Denise Fraser; Des and Lyn Legg; KD Craw; Mark Craw; Bevan Claridge; Salvie;

the Malettas; Adrian Swinbank; Stuart McPhail; Justin and Sally MacLean; Colin Ryder; Ian Barnes; Chris Whittfield; Julian Marshall; Brendan; Chris Preston; Ian Eastern; Malcom Wood; and Kristian Funnell.

I am thankful to have received generous financial support in the form of: a Massey University Vice-Chancellor's Doctoral Scholarship, succeeded by a Top Achievers' Doctoral Scholarship; an IAG Travel Grant to attend the 7th International Conference on Geomorphology (ANZIAG) in Melbourne, 6–11 July 2009; an INQUA 1001 Travel Grant to attend the first joint international conference of IGCP Project 588 and the INQUA Coastal and Marine Processes Commission in Hong Kong, 30 November to 4 Decemeber 2010; the Geological Society of New Zealand Wellman Research Award 2008; as well as research grants from the School of People, Environment and Planning's Graduate Research Fund.

Last, but by no means least, I wish to thank my family who have provided constant, immeasurable support throughout the duration of my PhD research.

AJHC.

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Common abbreviations

GPS Global Positioning System

LGM Last Glacial Maximum

MIS Marine isotope stage

MHT Mean high tide

MHWN Mean high water neaps

MHWS Mean high water springs

MLWN Mean low water neaps

MLWS Mean low water springs

MSL Mean sea-level

NZGD2000 New Zealand Geodetic Datum 2000

NZMG New Zealand Map Grid 1949

NZVD09 New Zealand Vertical Datum 2009

PMSL Present mean sea-level

RTK-dGPS Real-time Kinematic differential Global Positioning System

WVD53 Wellington Vertical Datum 1953

A note about ages presented in this thesis

Many of the radiocarbon ages presented by New Zealand researchers from the mid-1950s until the 1990s were not conventional radiocarbon ages (CRA) as defined by Stuiver and Polach (1977). These ages, determined at Rafter Radiocarbon Laboratory, were not determined with respect to the standards which define a CRA (C. Prior, personal communication). (All ages determined at the Waikato University Radiocarbon Laboratory are CRAs.) These "unconventional" ages are suffixed with "years BP". Broad statements about the timing of events dated by unconventional ages, such as in the interpretation of sea-level curves constructed using unconventional ages, are similarly expressed in "years BP". Conventional radiocarbon ages, where available, have been given and are suffixed "14C years". Where conventional radiocarbon ages have been calibrated to sidereal years, these dates are suffixed "cal. yr BP". Large ages of the order of millions of years are suffixed "Ma".

A note about ages presented in this thesis