Request Information

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Addresses

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General Information

Request Type : Research
Existing or Future: Future
Project: Canterbury Basin
Related Request Number:

Co-Requesters

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Research Task: Picking the forams for his MS

Project Objective

This project will participate to the IODP Expedition 317 ¿ Canterbury Basin¿s objec- tive entitled ¿Date clinoform seismic sequence boundaries and sample associated facies to provide information for estimation of eustatic amplitudes.¿ I intend to reconstruct high-resolution paleodepth estimates via benthic foraminifera assemblages and a sequence- stratigraphy model of foraminiferal assemblages, and combine the results with detailed facies and lithology analyses over a complete Late Quaternary transgressive-regressive sequence. Site U1352-B provides a stratigraphic record of depositional cycles through the Holocene and late Quaternary across the slope, a depositional environment affected by relative sea level change. This core is suitable for high-resolution study of recent glacial cycles in a continental slope setting, allowing to estimate the timing and amplitude of global sea level change and to document the sedimentary processes that operate during sequence formation. I have attached a PDF that explains in greater details what the research will be.

Description	Filename	Size
Mathieu Richaud - Sample Request	IODP317-request samples.xls	undefined
	IODP317_SampleRequest.pdf	undefined

Sample Handling Instructions

Sample List

Group Sample List

Exp/Leg	Site	Hole	Sample Type	Parent Sample Type	Sample Volume (cm3)	Lithological Feature	Sampling Tool	Geological Age Young (Ma)	Geological Age Old (Ma)	Geological Age Interval (kyr)	Depth Type	Depth Interval Top (m)	Depth Interval Bottom (m)	Sampling Depth Interval (cm)	Other Resolution (e.g. 1 per core)	Shipping Address	Sample Location Flexibility (cm)	Observable Method Tool (OMT)

Specific Sample List

Exp/Leg	Site	Hole	Core	Section	Half (W/A)	Particular Sampling Position Top (cm)	Particular Sampling Position Bottom (cm)	Sample Location Flexibility (cm)	Piece Number	Sample Volume (cm3)	Sample Type	Parent Sample Type	Sampling Tool	Shipping Address	Observable Method Tool (OMT)

Estimated number of Samples: 63

IODP Onboard/Onshore Measurement Data Request

Measurements

General Comments

High resolution foraminiferal constraints on paleobathymetry during a Late Quaternary transgressive-regressive sequence, Canterbury Bight, New Zealand

Mathieu Richaud
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Fresno State

1 Introduction

This project will participate to the IODP Expedition 317 – Canterbury Basin's objective entitled *"Date clinoform seismic sequence boundaries and sample associated facies to provide information for estimation of eustatic amplitudes."* I intend to reconstruct high-resolution paleodepth estimates via benthic foraminifera assemblages and a sequence-stratigraphy model of foraminiferal assemblages, and combine the results with detailed facies and lithology analyses over a complete Late Quaternary transgressive-regressive sequence.

Site U1352-B provides a stratigraphic record of depositional cycles through the Holocene and late Quaternary across the slope, a depositional environment affected by relative sea level change. This core is suitable for high-resolution study of recent glacial cycles in a continental slope setting, allowing to estimate the timing and amplitude of global sea level change and to document the sedimentary processes that operate during sequence formation.

Furthermore, corresponding to the sequence overlying seismic sequence boundary U19, the upper sedimentary sequence on the Canterbury slope almost certainly correspond to marine isotope Stage (MIS) 1–5 (Expedition 317 Scientists, 2010).

If the vertical movements of a basin floor can be reconstructed from the sedimentary record, these movements can be more accurately constrained when information from the sedimentary history is combined with paleodepth estimates derived from fauna (Hayward, 1986; Murray, 1991; van Hinshergen et al., 2005).

2 Settings and Methods

I offer to reconstruct paleodepth estimates during a complete transgressive-regressive sequence using Site U1352-B. This site, located on slope within the Canterbury Bight would provide optimal paleowater depths from benthic foraminiferal biofacies (Expedition 317 Scientists, 2010). Also, I will identify critical bounding surfaces using the sequence-stratigraphic model for primarily shelf siliciclastic sequences proposed by Leckie and Olson (2003).

2.1 Reconstructing paleowater depths

Focused on the sediment encompassing U19, the paleodepth estimates (40 cm sampling step) will be undertaken by (1) analyzing benthic and planktonic foraminifera assemblages and their ratio as paleobathymetry estimates following a modernized conventional method described by van Hinshergen et al. (2005) and (2) using a novel approach to calculate paleobathymetry using the Modern Analog Technique (MAT) described by Hayward (2004). Indeed, Hayward (2004) strongly advocates for the combined use of MAT and conventional methods on the same sample to provide the most robust paleoenvironmental and paleobathymetry interpretations.

- Estimates of paleobathymetry using a conventional method

I propose to calculate the percentage of planktonic foraminifera with respect to the total (planktonic and benthic) foraminiferal association. As mentioned by van Hinte (1978), the ratio between planktonic and benthic foraminifera (P/B ratio) can be used as a tool to reconstruct paleodepths. The reason is that the abundance of benthic foraminifera generally reaches a maximum on the outer shelf and the upper slope. Planktonic foraminifera are virtually absent in neritic environments and their abundance generally increases with increasing water depth.

Because the oxygen level of bottom waters has a profound effect on the abundance of benthic foraminifera, and therefore upon %P, the fraction of benthic foraminiferal species that indicate an effect of oxygen stress on the biotic system will be counted as well. The effect of sea–floor oxygenation can be assessed by %S and included in the paleobathymetric equation: $\%P = 100 \times (P / (P + B - S))$.

- Estimates of paleobathymetry using Modern Analogue Technique

Hayward (2004) compiled a dataset of 371 modern analogue faunas strongly representative of inner–shelf (0–50 m) environments and outer-shelf and greater depths (>100 m) environments found in New Zealand. This is a definitive asset for the depth of U1352 (344 m water depth).

Hayward (2004) shows that MAT based on generic categories of benthic foraminifera can provide more objective estimates of paleobathymetry that are consistent, but at the present time no more precise, than those obtained by conventional methods. However, oxygen level in the conventional method used by Hayward (2004) did not take into account oxygen level of bottom waters and its influence on benthic foraminifera assemblages. Therefore, applying Hayward's method (2004) and van Hinsbergen's method (2005) on the same sample should allow to test the validity and internal consistency of both methods. To my knowledge, this has yet to be done.

3 Sediment Request

We would like to request 63 samples of marine sediment from IODP317-U1352B (see Excel file for precise sample information). We estimate that 10cc will be enough material to do the foraminifera count.

4 Role of the Investigator

Mathieu Richaud will supervise a Masters student at Fresno State that will

- clean, sieve and prepare the sediment samples,
- count the benthic and planktonic foraminifera,
- calculate the paleowater depths using the methods outlined above,

I was awarded a PEA on May 14, 2010 to fund a Masters student for that project explained above.

5 References

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Leckie, R. and Olson H. (2003) Foraminifera as proxies for sea-level change in siliclastic margins, SEPM Special Publication, 75, 5–19.

Murray, J. (1991) Ecology and paleoecology of benthic foraminifera, Longman Group, 397 pp.

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