

Shelf Excitement

1) What determines dispersal and deposition on a high-discharge, basin-filling shelf?

A fundamental building block of the margin stratigraphic record is the clinoform, which tends to be scale invariant. Preliminary observations from the Waipaoa shelf suggest that such building blocks are not present. A key question is how are the processes which operate to produce strata on the Waipaoa shelf distinct from those which produce clinoforms. The answer to this question is fundamental in deconvolving climate, tectonic and eustatic forcing functions from the preserved stratigraphy. In addition, conceptual and numerical models developed from this new understanding will allow us to predict sedimentary facies relationships (e.g., porosities, permeability networks) for reservoir characterization and resource assessment.

2) How is the signal of storm-generated sediment input modified during transport and is it preserved in the shelf sediment record?

Large and small storms are a major control on the input, dispersal and deposition of sediment on continental shelves. The high discharge and storm-frequented Waipaoa shelf provides an opportunity to resolve the effect and impact of storms both in real time and the geologic record, and relate those to natural and anthropogenic perturbations affecting the terrestrial part of the Waipaoa system. Observation of modern events passing through the terrestrial catchment and onto the shelf basin will provide an insight into event transformation through a range of settings. To look back in time, we utilize a high resolution 6500 year old record of storm events from Lake Tutira. This allows direct comparison between the terrestrial storm signal and that preserved on the continental shelf. Thus, we are in a position to evaluate those

events preserved offshore and the reasons for their preservation as derived from the process-based and palaeoenvironmental data.

3) What are the relative roles of ambient storms and major system perturbations (e.g., tectonic, volcanic, anthropogenic, super-storms) on transport processes and depositional patterns on a high-discharge shelf?

Just about every geologist and earth scientist has been asked about the effects of land use policies or coastal modifications on sediment dispersal and related aspects (e.g., nutrients, contaminants, habitat) on the coastal ocean. The modern period is effectively an experiment with fundamental changes to land use, erosion, drainage, river damming, and both source and non-source contaminant inputs to the coastal zone. There are fundamental questions world-wide about how these changes affect the nearshore and offshore environments in terms of sediment inputs, and also in terms of contaminant and pollutant distribution and marine habitat. The range of events that affect the coastal inputs include, in addition to anthropogenic change, tectonic events (earthquakes and tsunamis), volcanic events (ash falls), climate and vegetation changes, and sea-level change. The WSS provides a special opportunity to identify the effects of deforestation on the modern system as well as the sedimentary record allowing us to compare its signal to natural historical (pre-anthropogenic) signals of similar magnitude.