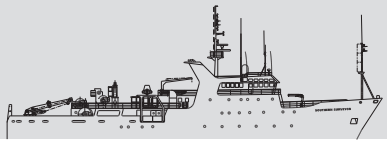


MARINE
NATIONAL FACILITY

2012 program

RV Southern Surveyor

voyageplan
ss2013_v01

Submarine landslides offshore northern New South Wales and southern Queensland: their geomechanical characteristics, timing and triggers.

Itinerary

Mobilise Brisbane 0800 hrs, Thursday, January 17th, 2013
Depart Brisbane 0800 hrs, Friday, January 18th 2013

Arrive Brisbane 1200 hrs, Monday February 4th, 2013 and demobilise

Principal Investigators

Associate Professor Thomas (Tom) Hubble *(Chief Scientist)*
School of Geosciences – The University of Sydney
Sydney Australia 2006
Mobile: 0417 697045 **Email:** tom.hubble@sydney.edu.au

Dr Jody Webster
School of Geosciences – The University of Sydney
Phone: 61-2-9036-6538 **Email:** jody.webster@sydney.edu.au

Associate Professor David Airey
Department of Civil Engineering – The University of Sydney
Phone: 61-2-9351-2222 **Email:** david.airey@sydney.edu.au

CSIRO

Scientific Objectives

An extensive region of the continental slope located offshore Northern NSW and Southern Queensland between Byron Bay and the southern tip of Fraser was demonstrated to have experienced intense submarine erosion dominated by submarine landsliding in 2008 (SS 12/2008, Boyd, Keene, Gardner, Exon, Hubble et al). Major questions about the geographic extent of the area affected by these processes, the geomechanics and dynamics of sliding; the timing and frequency of sliding; and the potential trigger mechanism for slide initiation have arisen from the analysis of the material collected by the scientists who participated in the SS12/2008 voyage. These workers and their colleagues (Hubble, Airey, Clarke, Yu, Keene, Boyd et al) demonstrated that submarine landsliding on Eastern Australia's continental margin is unexpectedly young and frequent at geological timescales. They have also developed geological and geotechnical models which attempt to explain the apparent youth and unexpected frequency of submarine landsliding in this area of the eastern Australian continental margin

This project will extend the findings of the SS 12/2008 work by collecting data that will help to validate or modify the models developed to explain the areas submarine erosion and landsliding. This will be achieved by collecting additional core and dredge samples in the original study area and by extending the coverage of detailed bathymetric to the north of the 2008 study area; and by sampling appropriate features in the area identified in the area where this new bathymetric mapping of the outer shelf and slope will be undertaken.

Voyage Objectives

Primary Objectives (In ranked order)

1. Extend the area of detailed bathymetric mapping of the outer continental shelf and continental slope to the north of the SS12/2008 survey area offshore Fraser Island and identify further submarine landslides and erosional features such as failure scars and scarps. Included in this objective are two specific aspirations which are to:

   a) determine the specific location and characterization of the site (or possible sites) from which an enormous olistostromic block was shed with the intent of establishing the trajectory of this slide block and the dynamics of its motion in this area - the general location that this block will have been derived from offshore the southern third of Fraser Island (Figure 1); and

   b) connect the heads of canyons to outer shelf sand-bodies that are suspected to be cascading downslope and contribute to incising the canyons and/or abrading and modifying the slope morphology (e.g. near the southern boundary of the Fraser Island swath map area).

2. Collect geological and geotechnical samples (core and dredge) offshore Fraser Island to enlarge the geological material available for geotechnical testing and dating.

3. Acquisition of cores and dredge samples from the SS12/2008 survey area to improve our knowledge about the frequency of submarine landslides (dating) and the landslide processes (geotechnical samples) – possible sites are shown in Figure 2. Additional undisturbed material from a number of identified but unsampled slides will be used to better characterise the timing of failure and the causes, mechanics and dynamics of sliding so that the influence of the two more-likely suggested causal factors for sliding (lowered sea-level and earthquake shaking) can be assessed (Figure 4).

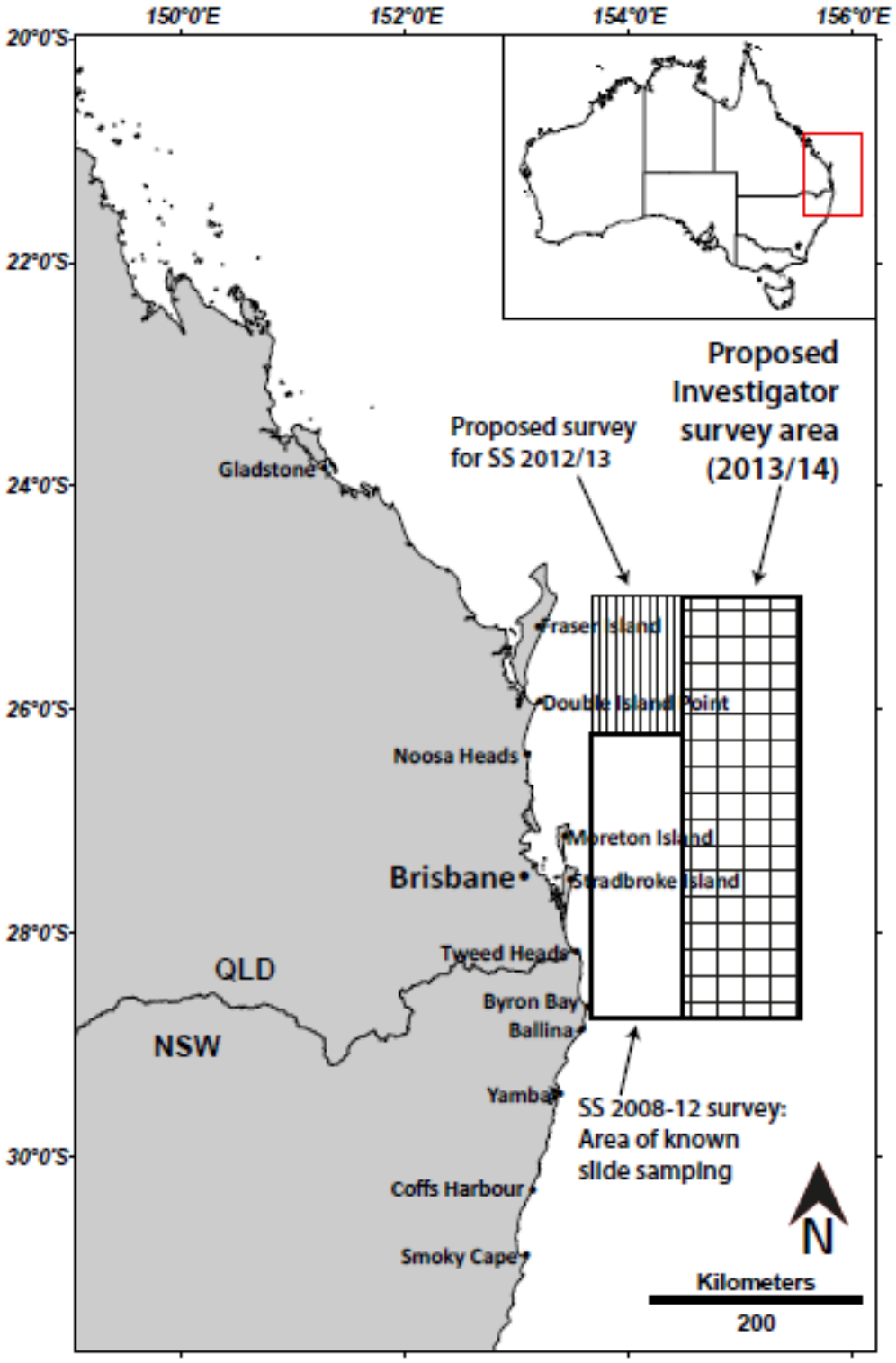
   Note that it is envisioned that repeat cores will be taken at some sites to provide minimally disturbed material for geotechnical testing and cores for sedimentological analysis.

Secondary Objective

4. Investigate the contention that bottom-currents have eroded material from the lower slope and contributed to destabilisation of the middle and upper slope; The original proposition was to deploy current meter/s at the foot of the slope at an appropriate location in the study area. However, given that the Eastern Australian Current experiment (Ridgeway et al) will collect a several-year-long data set appropriate to addressing this contention immediately offshore Brisbane and exactly in the middle of the study area, this objective has been modified to the collection of between two and four full-ocean depth CTD casts in the vicinity of the EAC moorings with the aim of providing appropriate data for calibration of the EAC data so that current velocity at the sediment/water interface can be inferred.

   Depending on the success of cruise bids currently in review (RV Sonne, and RV Investigator) the original proposal to deploy a current meter may still be attempted although it is more likely that this deployment will be part of the related Investigator/Sonne bids.Collection of samples will be done when and where an opportunity exists.

Voyage Track

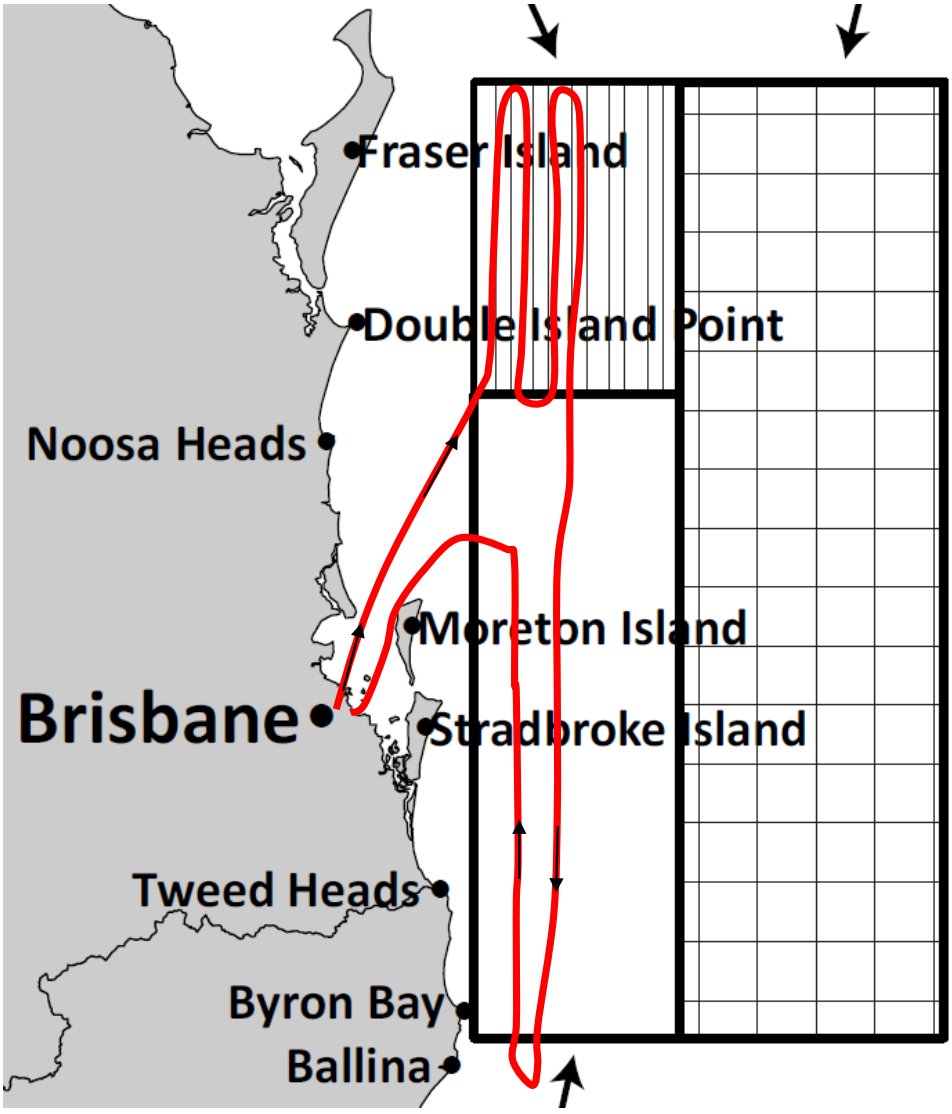


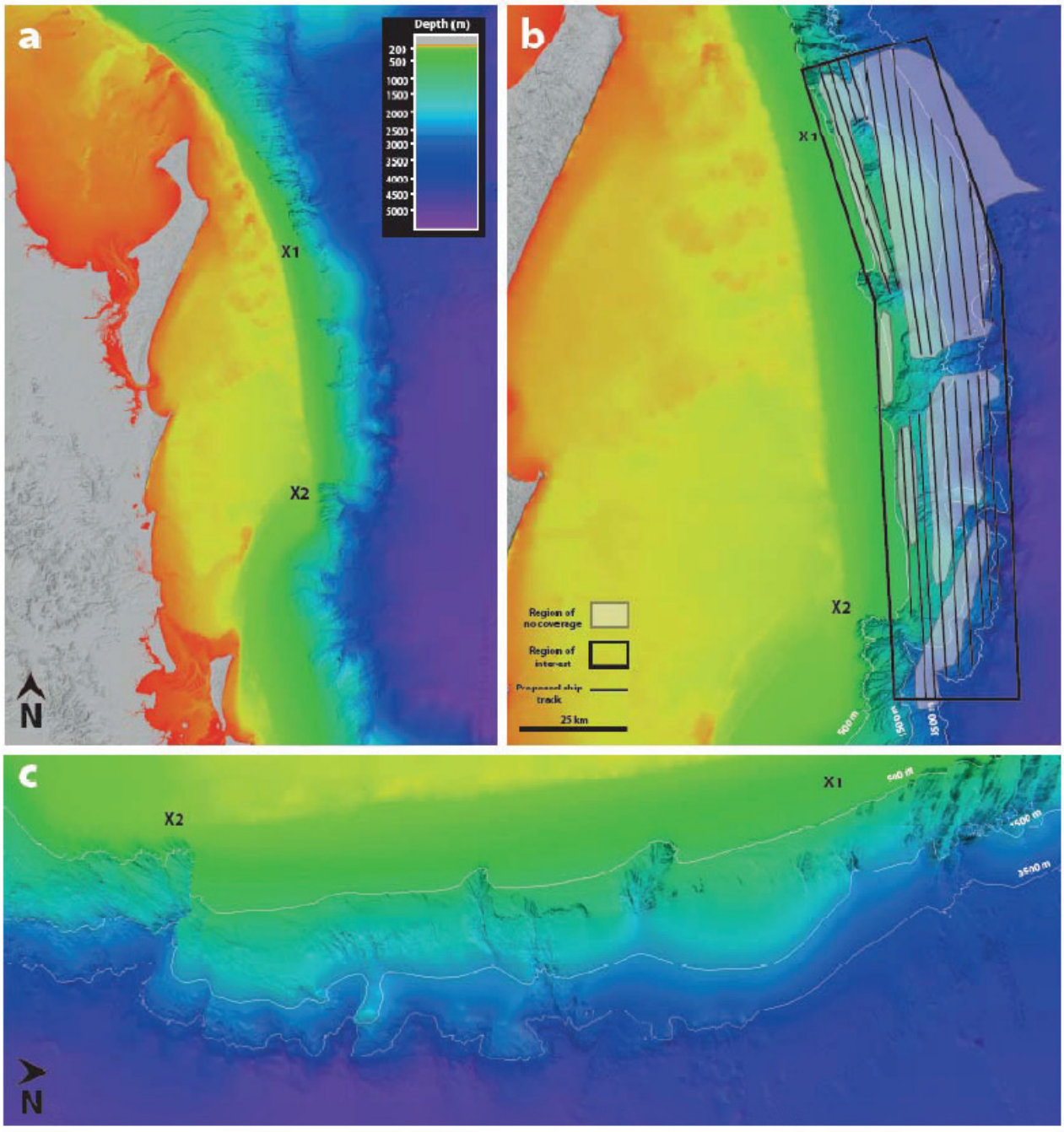
Area of operations for SS 1/2013 shown in relation to previous and proposed survey areas

Possible Ship's Tracks

Plan A - Sea State Dependent Good Sampling and CTD-Casting Weather – Straight to Byron and Tweed Canyons to undertake coring and dredging operations (general track shown in red).

Plan B – Sea state not favourable to sampling – Multibeam swath mapping offshore Fraser Island (reverse of depicted track). Major sites of sampling interest (and hence activity) are offshore from Byron Bay, Brisbane, and Fraser Island – Note that prior to coring operations in water depths of less than 1000m it is envisioned that east-west Topaz surveys will be undertaken upslope/downslope to identify optimal coring targets.





Possible multibeam survey tracks for the detailed swath mapping of the area offshore from Fraser Island. Points X1 and X2 are given as reference locations and have the same geographic position in all three images (a, b, c). The greyed out areas in image b, have not been surveyed with high-resolution multibeam previously and therefore appear to be fuzzy or smooth in the perspective view in image c.

Time Estimates

There are approximately sixteen days available for scientific work. It is envisioned that multibeam surveying of the upper slope in the Fraser Island Area will begin about 8pm on Friday evening 8 pm 18th Jan) and continue for approximately three days (Jan 22nd). At this stage it is envisioned that sufficient information about the upper slope will be available to choose suitable coring sites and we will progress to sampling operations during daylight and further swath mapping of the adjacent lower slope or outer shelf for the next six days (Jan 28th). Depending on results and sea-state it is envisioned that we will then steam south to the Brisbane and Byron Bay sites to undertake coring, dredging and CTD deployments for six days until it is time to transit (8am Feb 3rd) and return to Brisbane for arrival at 8am on February the 4th .

The balance of activities will depend on the crewing of the vessel. During the SS-2008/V12 voyage the experience of the crew restricted the sampling operations to one 12-hour shift (8am to 8pm). If this is the case again then sampling during the day and multibeam mapping and topaz profiling at night would be an efficient and effective use of the available ship's time. A breakdown of the available time by activity is given in the following table.

Point to Point	Distance	Sailing Time @ Ten Knots
Brisbane to Northern Survey Area (South West Corner)	~ 90 Nm	12 hours
South to North to South Full Return Traverse of Northern Survey Area offshore Fraser Island	~ 160 Nm	16 hours ea
Eight Multibeam Traverses Envisioned (16 ~2km wide tracks)	~1300 Nm	Approx five days
Transit Northern Survey Area to Southern Survey Area Southern Fraser Island to Byron Bay	~ 200 Nm	~ 24 hours
Transit Byron Bay Area to Brisbane	~ 240 Nm	~24 hours
Total Required Sailing Time		7 ½ days
Available Sampling and Instrument Deployment and ContingencyTime		9 ½ days
Total Available Time		17 days

Piggy-back Projects

None

Southern Surveyor Equipment

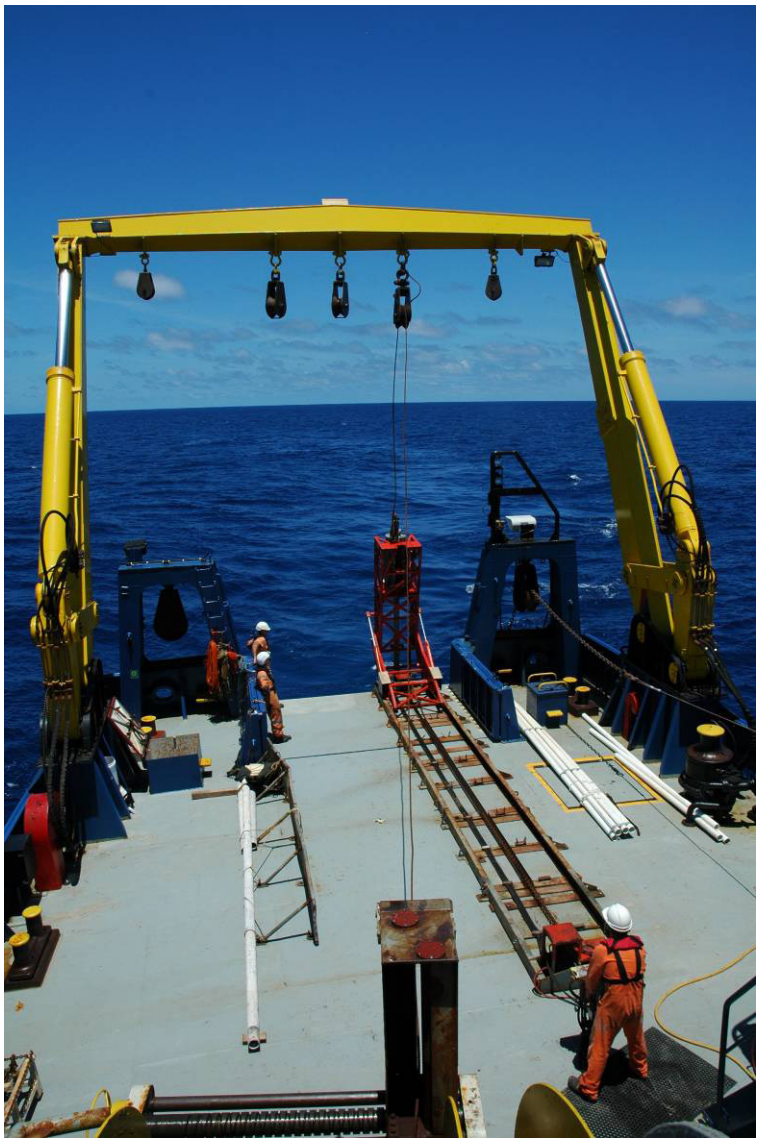
Multibeam Swath Mapping System
Kongsberg Topas Sub-bottom Profiling System
XBT's
CTD – Electronic Sensors Only
Dredges
Rock Saw
Cool Room and Freezer

User Equipment

GA Gravity Corer Deployment Rig – configured as for previous voyages (see Photograph)

Special Requests

None Identified



Geoscience Australia have given their support to this project and will provide the equipment.

USyd will provide a trained operator (David Mitchell) who is very experienced in the use of the corer deployment rig.

Afterdeck to be configured as shown in the photograph.

Role	Minimum Number	Normal Range	Number Required
MNF Voyage Manager	One - to assist the scientific project team with on-board planning and operational support.	1	1
MNF Electronics Support	One – to maintain and operate the MNF electronics systems.	1	1
MNF Computing Support	One – to maintain and operate the MNF IT systems	1	1
MNF Hydrochemistry Support	To provide standard hydrochemistry analyses.	0 to 2	0
MNF Swath Mapping Support	To provide support for multibeam acquisition and processing.	0 to 1	1
Chief Scientist *(from your project)*	One only.	1	1
Science Watch Leaders *(from your project)*	One *(or two if Chief Scientist does not lead one watch).*	1 or 2	2
Science Project Participants *(from your project)*	***You must provide adequate operational support for all planned activities – this is NOT provided by the MNF.***		7
MNF Trainee		1	1
Scientific berths requested	To a maximum of **15**.		15

Personnel List

Scientific participants

Participant	Affiliation	Role
Tom Hubble	USYD	Chief Scientist
Jody Webster	USYD	Co-Chief Scientist
David Airey	USYD	Principle Investigator
David Mitchell	USYD	Marine Technician
James Daniell (or GA Representative)	James Cook University	Multibeam Expert / Marine Geologist
Phyllis Yu	USYD-student	PhD on this project
Melissa Fletcher	USYD-student	MSc on this project
Samantha Clarke	USYD-student	PhD on this project
Angel Puga Bernabeu	Univ of Granada	Marine Geologist
David Voelker	GEOMAR Kiel	Marine Geologist

As per AMSA requirements for additional berths on Southern Surveyor, the following personnel are designated as System Support Technicians and are required to carry their original AMSA medical and AMSA Certificate of Safety Training on the voyage:

Name	AMSA Certificate of Safety Training No.
TBA	

This voyage plan is in accordance with the directions of the Marine National Facility Steering Committee for the Research Vessel Southern Surveyor.

Associate Professor Thomas Hubble
School of Geosciences
The University of Sydney

Chief Scientist
22nd October 2012

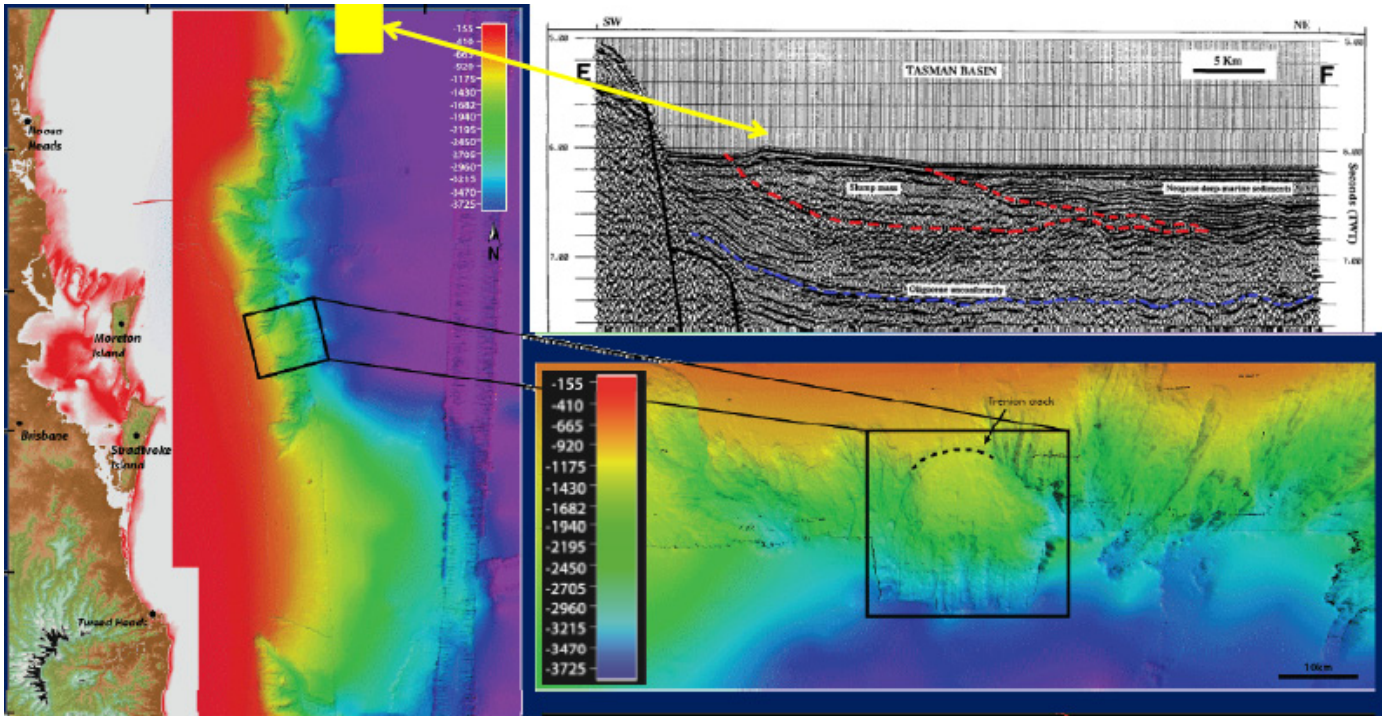


Figure1: Known location of an olistostromic slide block (Hill 1992) offshore southern Fraser Island (shown in yellow on the multibeam image). It is comparable in size to a incipient potential slide feature offshore Brisbane (black box on the multibeam image).

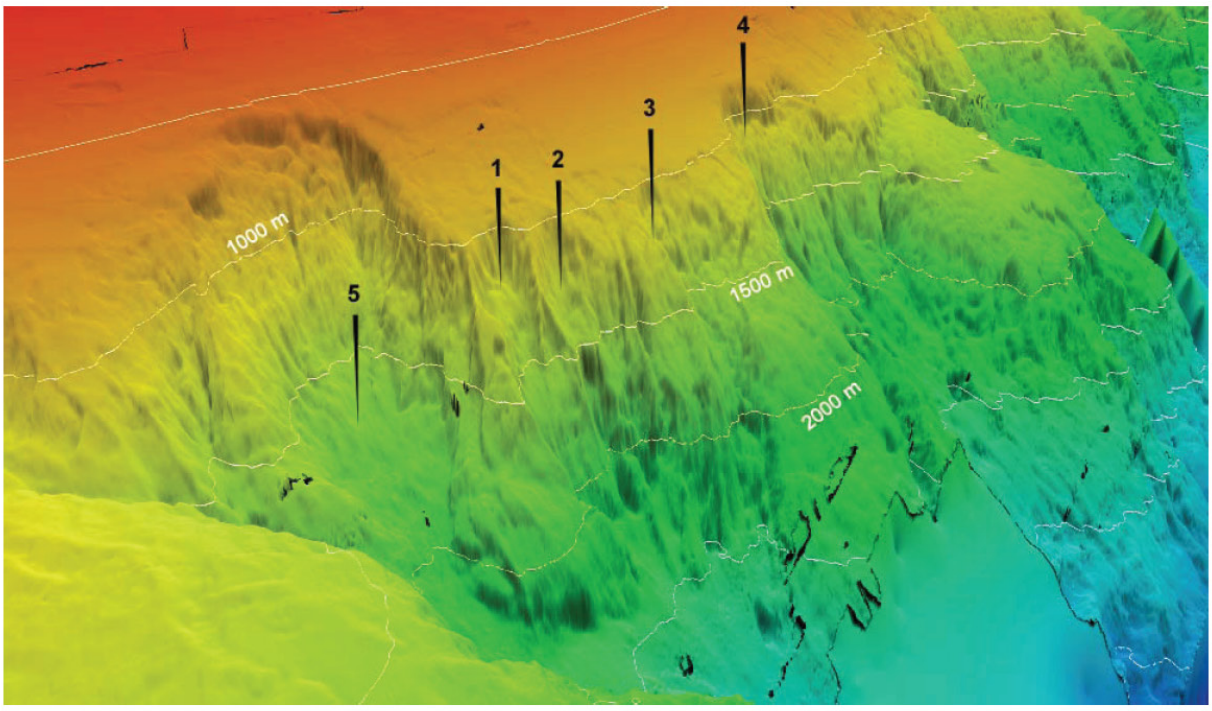


Figure 2: Five potential upper slide coring sites located offshore Brisbane on the upper slope within the Stradbroke and Centaur Canyon complexes (multibeam data from Boyd et al 2009)

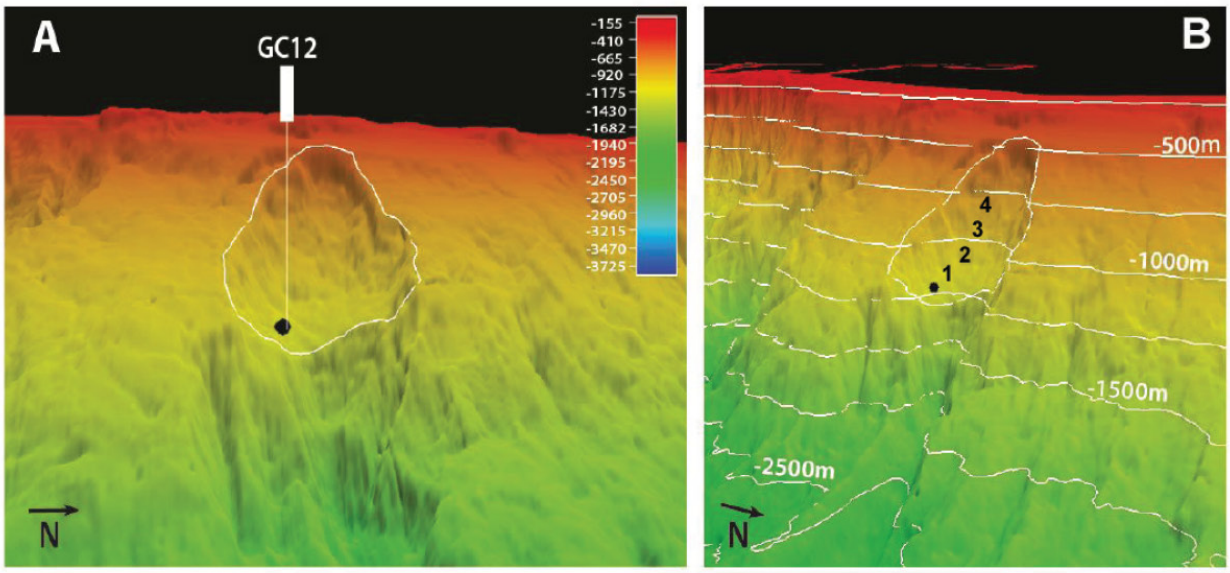


Figure 3: Detailed images of the Byron Slide showing the location of the single core recovered from this feature (image A) and a proposed set of potential additional cores (image B).

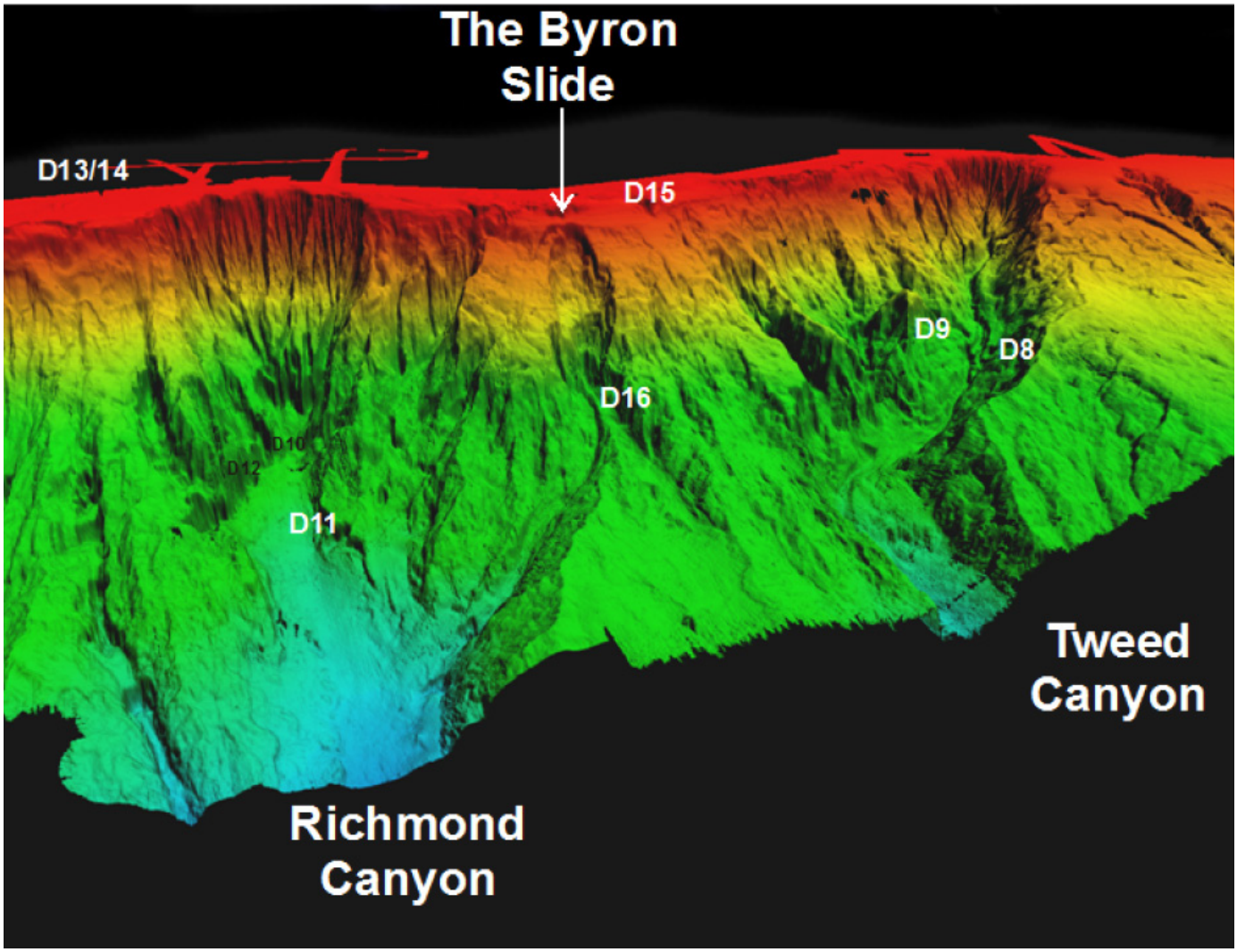


Figure 4: Potential Mid-slope slide scar dredge sites shown with white boxes. Two potential slide deposit core sites (?turbidites?) shown with white C's.