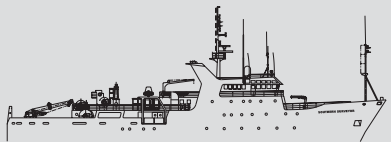

MARINE
NATIONAL FACILITY

2005 program

RV *Southern Surveyor*

voyageplan

SS01/2005

A new mechanism for supply of sand to deep water: the Eastern Australian Longshore Transport System, part 2 – the deep water story.

Itinerary

Depart Brisbane 10:00 Friday 7 January 2005
Arrive Bundaberg 10:00 Sunday 23 January 2005

Principal Investigators

Associate Professor Ron Boyd (Chief Scientist) – University of Newcastle,
Geology Building, University Drive Callaghan NSW 2308
Email: Ron.Boyd@newcastle.edu.au **Phone:** (02) 4921 5744 **Fax:** (02) 4921 6925

CSIRO

Scientific Objectives

The objective of this project is to evaluate the ability of the Eastern Australian longshore sediment dispersal system to supply sand to deep water at the Fraser Island end of the system, to identify the dispersal paths to deeper water, the processes responsible for sediment transport, and the form of sediment accumulation in deep water.

Voyage Objectives

At the beginning of the voyage we will deploy two current meters on the upper continental slope seaward of Breaksea Channel. These will measure the currents transporting the sand downslope to deep water. We will recover one of these moorings at the end of the voyage.

We plan to survey the continental slope in the vicinity of Breaksea Shoal and Breaksea Spit with the EM 300 multibeam swath mapping system from around 200 m depth to around 4000 m depth (Figure 1 – track plan attached). This will enable us to track the submarine gullies discovered funnelling the sand downslope on SS 04/03 in shallow water to their deep water termination on the continental rise. On several (all?) of these lines we will also run the subbottom profiler to determine sediment thickness and type (sand versus mud). We will also re-occupy at least four shallow water shelf lines surveyed on SS 04/03 to find if the large tidal bedforms have moved since April 2003.

Once we have surveyed the area, we will conduct a Smith-McIntyre grab sampling program to ground truth the multibeam and subbottom profiler data. We will collect around 30-50 samples in a range of depths to establish the character of the deep sea sediments and compare them to those in shallow water around Fraser Island (approximate sample locations on attached map). If we locate rock outcrop on the continental slope we will attempt to dredge it in up to 5 locations to establish the older history of the margin.

In order to image and record the sediment transport over the edge of the shelf and down the gullies, we will deploy a small ROV to take video and still photography and possibly some bottom samples. We estimate around 4 deployments of the ROV on the large tidal bedforms and in the gullies in up to 250 m water depth.

To supplement the current meter measurements and to determine if Hervey Bay estuarine water is involved in the transport of sediments to deep water we will collect a series of CTD profiles, reoccupying several stations from the SS 04/2003 voyage and several new ones to determine the water column character seaward of Hervey Bay.

Voyage Track

We will move from the Moreton Bay entrance channel directly to the mid continental slope around 2000 m water depth where we will commence collecting Multibeam and Subbottom Profiler data. We will follow this isobath north (approximately 12 hours) until we reach the area of detailed operations off Fraser Island, as shown on the attached map of Figure 1. The remainder of the voyage will be within the area of detailed operations. After recovering the current meter at the end of the voyage we will proceed directly in to Bundaberg. This return voyage should only take around 6 hours.

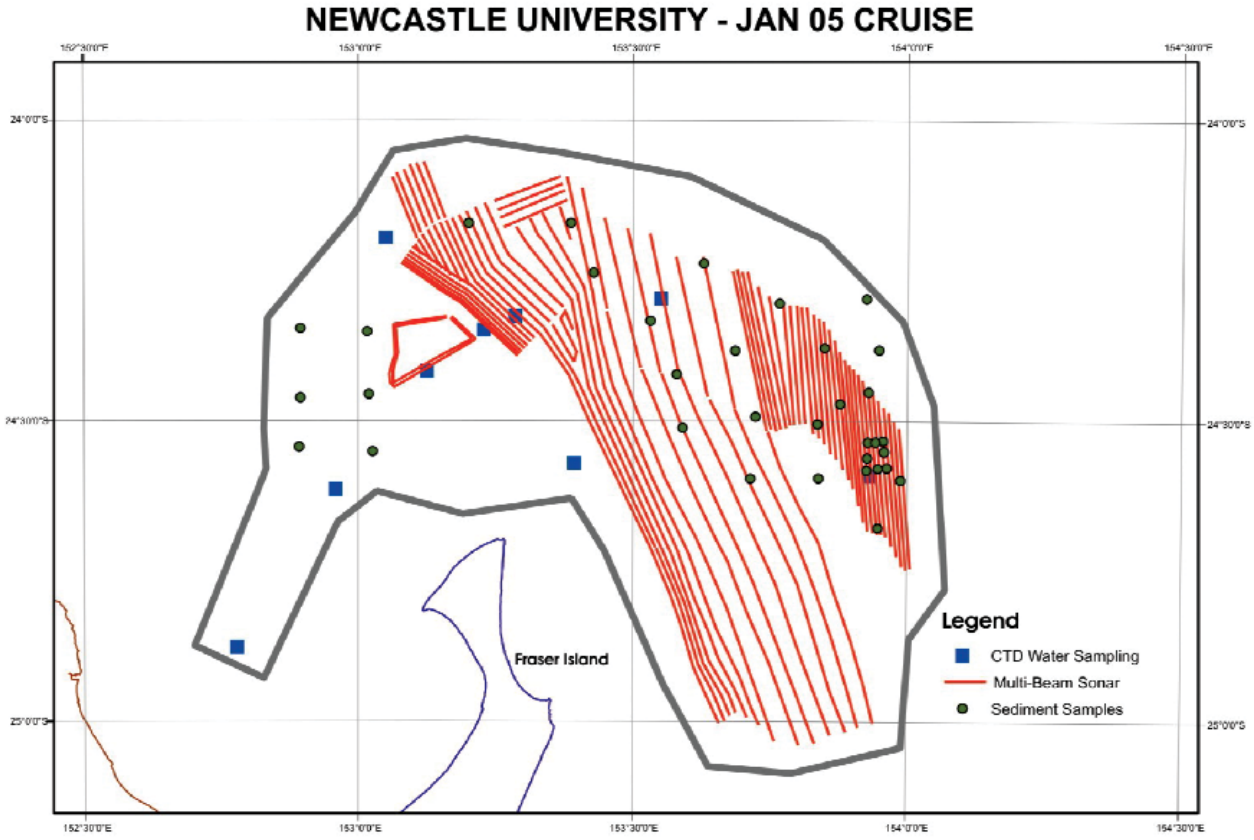

Figure 1: Area of detailed operation for SS 01/05. Approximate swath survey lines, sediment sampling stations and CTD stations are shown. The track to this area should originate directly from Brisbane in the south and finish in Bundaberg to the west.

Time Estimates

We estimate around 14 hours transit time from Brisbane to the Fraser Island study area via the continental slope transit. Subsequently we estimate 6 days of swath mapping at 10 knots (includes subbottom profiler lines as well), 5.5 days to acquire around 30 S-M grab samples and 3-5 dredges, 24 hours for around 10 CTD stations including steaming time (CTD stations will be located concurrently with 10 sediment sampling stations), 24 hours for 4, ROV deployments, each of 6 hours duration, 5 hours to deploy two current meter moorings (2 hours each plus one hour steaming time) plus 6 hours recovery time for one mooring. We estimate 6 hours transit time from Fraser Island to Bundaberg. This provides for a total of 14 days of data collection with one spare day for any additional transits to pick up equipment or personnel from shore or for bad weather.

Piggy-back Projects (if any)

None, but note the possible presence of an ABC film crew. The ABC TV program Catalyst has expressed an interest in filming our voyage as part of their 2005 series. If this takes place, we plan to exchange 2-4 scientific crew with the ABC crew for a period of around 2 days. The exchange could take place from a chartered boat in calmer waters behind Breaksea Spit without significant time problems. Discussions with ABC are currently in progress.

RV *Southern Surveyor* Equipment

We request use of the *Southern Surveyor* EM 300 multibeam swath mapping system measuring seabed reflectance with sound velocity profiler, and Subbottom Profiler and associated equipment (GPS positioning, Seapath Seatex 200, etc) throughout the voyage. We request access from both these systems to our desktop computers via the ship network. We would also like to see a paper recorder available to print out the subbottom profiler data line by line.

We request access to the Smith-McIntyre grab with sufficient cable to sample in up to 4000 m water depth. We would like to see several S-M grab sampler backups on board if possible in case one is lost. We would also like to use the National Facility rock dredge for up to 5 samples in 300 - 3000 m depth.

We request use of the ADCP Doppler current meter system and its data products on *Southern Surveyor* throughout the voyage as well as both Simrad sounders. We wish to use the hydrographic winch with the CTD at around 10 stations during the voyage with water bottle sampling in up to 4000 m depth and other stations ranging from 30 m to 3500 m. As we will have a hydrochemist on board, we would like to compare our results with those collected in the mid 1990's on Franklin by Jason Middleton (UNSW) in the same area. Hence we would request on board analyses of salinity, oxygen, nitrate, nitrite, silicate and phosphate. We also request use of the transmissometer on the CTD to determine deep water suspended sediments at CTD sites.

As this is a high resolution surveying voyage we would like to have the standard data stream (or at least position, ship heading and speed, attitude, and bathymetry) recorded as frequently as possible and at least every 1 second throughout the voyage. We would also request a copy of the bridge log photocopy.

User Equipment

We will be bringing two Windows based desktop computers and two laptop computers. We plan to interface the desktop computers with the ship network while on board to share and transfer data. We will also bring computer peripherals such as a colour A3 printer, and an A4 scanner. These computers will be used to process and interpret the multibeam swath data in real time. We will also bring digital video and photography equipment to record the sediment samples. We will bring a stereo microscope and lamp to describe the sediment samples and these, plus photography equipment may be set up in the photography darkroom.

For current meter deployment we will provide 2 Aanderaa RCM 9 Mk II instruments. These weigh 25 kg in air. They will each be attached to mooring tripod with attached weight and buoyed 400 m ground line (refer to mooring sketch of Figure 2). Note these moorings do not have acoustic releases nor surface lines. To recover the mooring at the end of the voyage we will need to grapple and connect to the 400 m buoyed ground line on the seabed and haul the current meter aboard with this line.

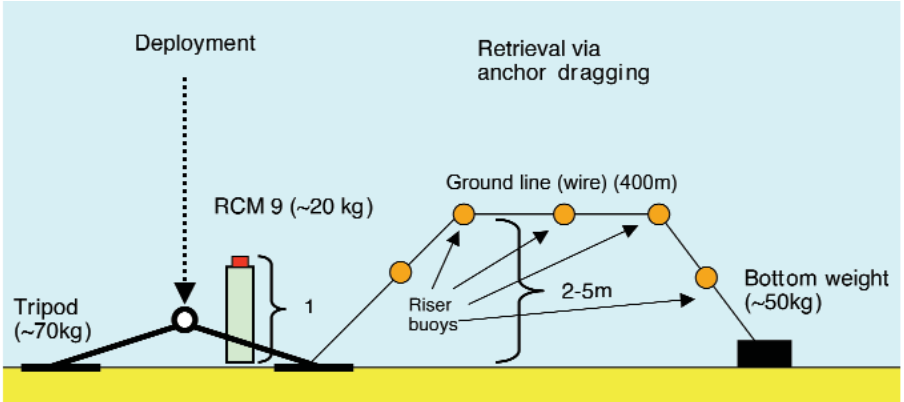

Figure 2: Current Meter deployment diagram

For ROV deployment we will use the University of Southern Illinois ROV, operated by Professor Ross Powell. This is a small ROV with a weight less than 100 kg plus attached 1" cables (need to avoid kinking of these on deployment). Ideally this would be deployed over the A-frame and winch with cable flaked out from a crate on deck. This operation will require around 2 persons on deck to assist with deployment. The ROV requires 3-4 linear meters of bench space for control console, VCRs and monitors, tracking system and computer. This system is sourced from the USA and runs on 110 V power. We will also supply a 110 v diesel generator to drive the ROV and peripherals and provide power leads from the generator to both the ROV in the water and the peripherals in the lab.

Most of our electronic equipment will be set up in the Main Deck laboratories, adjacent to the operations room and computer room. We will set up the ROV consoles etc in this room or in the Fish lab. Sediment samples and rock dredges will be examined and analysed in the shelter deck fish sorting room.

Personnel List

Ron Boyd – University of Newcastle, Chief Scientist
Ian Goodwin – University of Newcastle, Scientist
Kevin Ruming – University of Newcastle, Scientist (Data Organisation)
Simon Lang – Australian School of Petroleum, Scientist (Sediments and Seismic)
Saju Menacherry – Australian School of Petroleum, PhD Student (Sediments & Seismic)
Jochen Kaempf – Flinders University, Scientist (Current Meters)
Kristian Llewellyn – University of New Brunswick, Scientist (Multibeam)
Richard Raymond – University of New Hampshire, Scientist (Multibeam)
Ross Powell – Northern Illinois University, Scientist (ROV)
Michele Spinoccia – Geoscience Australia, Multibeam Swath mapping
Bob Beattie – CSIRO Marine, Voyage Manager/ Computing
Mark Underwood – CSIRO Marine, Electronics
Rebecca Cowley – CSIRO Marine, Hydrochemistry

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

Ron Boyd
Chief Scientist