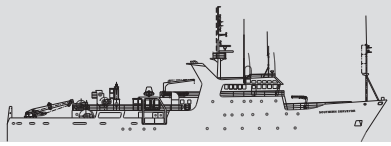


MARINE
NATIONAL FACILITY

2011 program

RV *Southern Surveyor*

CSIRO

voyage summary SS2011_t04

SS2011_t04

Transit voyage:
Pre-industrial sea-surface temperature reconstructions in the Australian region

Voyage period
Start: 10/11/2011
End: 20/11/2011
Port of departure: Fremantle, Western Australia
Port of return: Hobart, Tasmania

Responsible laboratory
Research School of Earth Sciences, The Australian National University
Building 47, Daley Road, Canberra ACT0200, Australia

Chief Scientist
Patrick De Deckker – RSES, ANU
Sabine Schmidt – University of Bordeaux, France

Scientific objectives

To reconstruct past sea-surface temperatures in the ocean along the southern margin of Australia across a large temperature gradient for comparison with northern hemisphere record spanning the last millennium. In addition, collect calcareous nanoplankton and foraminifera to identify levels of calcification and for comparison with sub-fossil material to be extracted from short cores. Finally, to sample air during the voyage for the determination of its microbial composition under clean conditions.

Voyage Objectives

This project aims at generating high-resolution records of sea-surface temperature [SST] changes that have occurred in the oceans surrounding Australia. Part 1 covered [the Tasman Sea voyage ss2011-t01], whereas part 2 did cover the ocean south of Australia [going from Fremantle to Hobart; this voyage ss2011-t04]]. A variety of innovative proxies will be employed on the samples we collected and used for comparison with lake records on mainland Australia. Our objectives are to obtain short cores along the Australian coast line [at approximately 1,000 m water depth] across a temperature gradient. The innovation is to use organic biomarkers that can be reconsruct past SST, backed up with a sound chronology.

Additional small projects were conducted during this voyage. These are:

(1) to continuously filter air at the front of the vessel during the entirety of the cruise, and those samples will be treated in the laboratory at ANU, and with the microbiota to be determined by their DNA composition;

(2) to examine the nature of the sea floor and its microbiota [benthic foraminifera] to determine if they live at the sediment water interface or below;

(3) to obtain samples from the cores for dating purposes using radionuclides. All these supplement our research into calibrating past environmental records; and

(4) to collect plankton samples and filter waters at the same collection sites for calcareous nanoplankton,and foraminifera as well as water samples for chemical analysis [e.g. trace elements and $\delta^{18}O$].

Results

1. Collection of a good set of short cores from the sea floor at six stations located at critical sites.
2. Several multicores taken at each station were also sub-sampled for their benthic foraminifer content in order to determine their habitat and ecology at the sediment water interface.
3. Sampling aerosols during the entire voyage: Our 2 pumps worked extremely well and a vast number of samples was obtained and have been kept at –80°C prior to their transfer to Canberra where DNA extraction procedures will commence soon after the voyage.
4. Extract calcareous nanoplankton at different water depths for analysis in Canberra and for comparison with nutrients and dissolved oxygen that we are to receive from the MNF hydrochemist who was on board
5. When time permitted plankton tows were performed at every multicoring station.
6. Carry out some swath mapping at selected site as requested by Dr Gordon Keith,CSIRO.
7. Collect a large amount of sea water at one site for CSIRO as requested by Mark Underwood, CSIRO.

One great disappointment for us was to discover that the nature of the sediment at approximately 1,000m was sandy and, as a consequence, the corer did not retrieve sediments after several tries.

Voyage Narrative

Day 1 – 10 November 2011

Departure from Fremantle at 1600 local time. We sailed through the harbour guided by a pilot. Several of us saw whales while we still could see the coastline and several lighthouses. Two hours later, we all met for an induction, and afterwards the scientific party and MNF support staff met to discuss the various tasks to be undertaken during the voyage. We arrived at the first coring site, just south of the Perth [Swan] Canyon, and sent the multicorer overboard to find out that there was no reading of the tension on the cable. The problem was identified and rectified and we proceeded to deploy the corer down to 1000m water depth. The corer returned only 3 tubes with sediments, some with gaps near their bottom. We siphoned water from above the sediment in the tubes for alkalinity and pH measurements. While the winch was being fixed, we deployed the CTD and collected several water samples, some for chemical analysis, others for nanoplankton counts per litre of water from 3 selected depths in the water column.

Two multicore sediment tubes were sliced at specific depth intervals by Ashley Burkett for her project on living benthic foraminifera, and the 3rd core was sliced at half centimetre intervals for the following analyses [1/3 for organic compound [Uk'37, TEX86 and Dix]; 1/3 for 210Pb and other nuclides; and the rest for foraminifera, coccolith and pteropod examination in Canberra].

The seas, although fairly gentle, forced some of the staff to adjust to sea conditions, but all were up when required.

We headed towards the next coring site scheduled for 2000. As a result of the 3 hours lost at the first coring site, we decided not to take plankton tows and water samples every 60nM as planned as this would slow us down. The seas were progressively becoming higher, and we were expecting rougher conditions after passing Cape Leeuwin.

Day 2 -11 November 2011

The seas were somewhat challenging and, on arrival at our proposed coring site, we faced the issues of a current moving at about 3 knots; we were obviously in the middle of the Leeuwin Current and therefore it proved challenging to stay at the same site while coring. Water temperatures remained high, around 20°C, despite the fact that the air temperature was around 16.8°C. We deployed the multicorer above a site that was considered suitable for the recovery of sediments, but unfortunately the corer returned tubes with no sediments inside them, except for one that had about 1 cm of pale beige mud. All the other tubes were full of water.

It was clear that we had reached bottom, but the pull on the cable due to the strong current very likely prevented the corer from hitting the sea floor in the correct (vertical) position. Also, prior to the corer being returned on deck, the cable was at about at a 45°angle. We decided not to take a CTD at this station due to the short amount of time left, and we aimed for a new coring station some 10 hours of sailing away.

Day 3 – 12 November 2011

We seemed to have departed from the influence of the Leeuwin Current, with water temperature dropping by some 3°C. At 0950 local time, we attempted to deploy the multicorer to sample the sea floor at 1140m, but all the tubes returned closed and were full of clear water. It is more than likely that the corer was triggered on its way down. We decided to attempt coring at a shallower depth (~500m). The corer seemed to have worked this time, as 3 of the tubes contained very little coarse sand sediment, very likely associated with a hard bottom. The multicorer is definitely not designed for coring sand! Once again, we decided not to take water samples and CTD profiles for fear that additional time would consume our schedule. At this stage, we only had 9 hours left scheduled for our tasks. The weather thus far had been kind as the forecast, when we left Fremantle was that we could expect to encounter several fronts, which instead must have remained further south.

We now headed towards a new station, hoping that the core tubes would be returned on deck full of sediment. The multicorer was deployed just before midnight and brought back only 2 tubes with sediments. From one, 5cm of sediments were sub-sampled for organic compounds, foraminifers and nanoplankton, and the other third for Pb210 analyses. The other smaller sample was subsampled for benthic foraminifer analysis. It is clear that there are substantial bottom currents at this site, as a scaphopod, aninfaunal echinoid, and coarse sand were recovered.

Day 4 – 13 November 2011

After the coring was completed, we headed for a new station which was reached at ~1200 [noon] local time. The Leeuwin Current still had an effect on navigation, with speeds of over 11 knots reached, and the last hour prior to coring winds of over 30 knots helped the ship gain a bit of speed. However, we attempted coring this site, using only 4 tubes, and were unsuccessful. [We reduced the number of tubes as we thought that penetration could be much easier and possibly deeper with a reduced number of core tubes].

There was evidence that the corer triggered on the sea floor, but only coarse sand was found on the bottom of 2 tubes. We obviously encountered a sandy sea floor once more.

We then aimed for another station some 2.5 hours away where we could see a possible depression with finer sediments might accumulate on the swath maps. Once again, we only used 4 tubes and all returned with some sediments, one tube yielding ~10 cm of sediments, and the others about 5cm each. The sediments in these tubes were sampled in 0.5 cm slices for the previously delineated analyses. After this somewhat successful coring, we deployed the CTD down to 400 m and took several water samples for filtering nanoplankton [at 3 different depths], and also one sample at 10m water depth for radiocarbon analysis. Other bottles were sampled for nutrients, dissolved oxygen, salinity etc. The CTD profile showed evidence of mixing in the upper part of the water column down to 250 m, and the fluorometer showed a peak around 75m. After this station we aimed at reaching station 8, on the western side of the Great Australian Bight [=GAB] for taking a core there. Since we are running out of time, our decision was not to follow the 1000m contour line all along the GAB and take a sample in the middle of the Bight, as originally planned, but aim at Kangaroo Island, in the vicinity of which we know there are soft clayey sediments.

Day 5 – 14 November 2011
The weather remained somewhat clement, and also some wind on our back, and no clouds above us.

We reached the core site at 0800, after having turned away from a potential site 5 miles away, that looked like a depression formed after an underwater slide. We decided, upon examining the data on the Topas monitor, that the site would not yield sediment, so returned to the original Site C, now called potential station 8. We had success with 4 out 4 tubes recovering 17cm of sediment in each. The sediment was much finer, although near the bottom of each core, it appeared more sandy. The CTD equipment was deployed for water sampling [for analysis of dissolved oxygen and nutrients, plus one level sampled for 14C, and several others for nanoplankton extraction at selected water depth. This site proved to be a good one, and raised our morale after having had little success at several other sites.

The next planned station was located on the eastern side of the GAB and, as a result, we spent a bit more than 2 days to reach it. So far, the seas and the weather remained good.

Day 6 – 15 November 2011
We were still in transit to the next coring station and did not expect to reach the site until approximately midnight at the end of Day 6. The seas were fairly smooth, and we were able to sail at speeds a bit above 10 knots. The water salinity is in the vicinity of 35.6, indicating the high evaporation rate in the Great Australian Bight.

Day 7 – 16 November 2011
The entire day was spent transiting and this continued until Day 7 around 1000. We stopped twice in the morning to collect about 200 litres of water at a depth of 100m for use as standard by CSIRO as requested by Mark Underwood.

Day 8 – 17 November 2011
We deployed the multicorer late in the morning, but the tubes were brought back on deck with no sediment. There was only a little bit of sand on the flaps that close the tubes, indicating a hard, possibly sandy substrate. We made the decision to head for another site near a small canyon where there was a depression, but while passing over it we realised that this had a rocky bottom, so we continued towards our next way point, While transiting, we kept an eye on the floor with the Topas and it was approximately 45 minutes before we located a suitable site. We then deployed the multicorer with 6 tubes at a depth of ~1,100 m and we had success as all tubes contained very fine sediment. In fact the outer parts of the tubes were also coated with fine grained mud.

We then deployed the CTD for nutrient analysis and dissolved oxygen, as well as filtering for nanoplankton. One water sample at 10 metres was taken for 14C analysis. We noted that the water column at this site is well stratified, with the mixed layer extending to ~40m compared to the last station where it extended to ~200m.The next station is planned for the next morning. Surprisingly, the seas were still calm and the atmospheric pressure above 1012hPa. This is much appreciated and is rendering coring activities much easier.

Day 9 – 18 November 2011

We reached the core site at about 0600. We cored it and returned a good set of 6 tubes with sediments, much darker grey [compared to before] and very fine grained. This was followed by a CTD for various chemical analyses, and after that a plankton tow. The next station was to be 120 miles away but on arrival, and for quite some distance, we found a rocky sea floor, definitely unsuitable for coring. We decided to aim for the deep CTD profile for our colleagues at ANU who are studying deep-sea corals in the region, with water masses were especially targeted for dating by AMS 14C. We deployed the CTD down to 2,400m, and after that aimed for a new coring station, some 7 hours away. In the meantime, through the night, Maureen, Lyndsay and Chris spent long hours preparing samples from the CTD while the others rested, and readied themselves for the next multicore deployment.

Day 10 – 19 November 2011

The weather remained clement and we woke up to a fairly smooth sea and blue sky. After travelling at almost 11 knots through the night, we arrived at a suitable core site well before we were due at our designated station, we saw a good accumulation of sediment on the sea floor with the Topas. The depth was 1277m and once again we recovered several cores up to 15cm long. They consisted of fine grained sediment at the top of the cores, changing to stiffer and more sandy sediment near the bottom. We decided not to take a CTD at this site so as to save time as our aim is to get as many cores as possible. Already, with this latest core [station 11], we now have a range of 10° latitude between this site and the first one taken offshore Fremantle. After this, we aimed at the swath mapping location for Gordon Keith who asked for a long transect be made to map a deep-sea canyon/ undersea slide. Our next coring station was to have been in the pathway of the swath mapping exercise, but at 1800 local time, the winds increased substantially to 30 knots and the seas became very rough. It was clear then that it would be too difficult and possibly dangerous to attempt coring this site. Nevertheless, two hours later, the winds calmed down to 10 to 15 knots, and after completing the swath mapping, we sailed towards our original station 18, south of Tasmania.

Day 10 – 20 November 2011

Arrival on site at 0200 local time. The seas had come down somewhat but we were still rolling substantially. We deployed the corer down to 980 m depth, but due to the strong waves, it proved hard to maintain the winch at a constant speed with the tension on the cable going at time times from near zero to ~100m per minute. To our great surprise, when the corer arrived at the surface, it was upside down with the cable caught around one of its feet. It proved really difficult to return the corer on deck, but this was eventually achieved and, finally, the corer was put back into a normal position on the rear deck. This took approximately 20 minutes. We really thought at some stage that we could have lost the corer, but thanks to the crew it was recovered safely. I decided to abort any coring for fear that perhaps some items of the corer could have cracked and, if redeployed, it could have been lost. It was 0300 by then, and we decided to get a good rest in preparation for the cleanup prior to our arrival. We continued the swath mapping program.

We packed all the gear successfully, and arrived in Hobart at 1300.

Summary

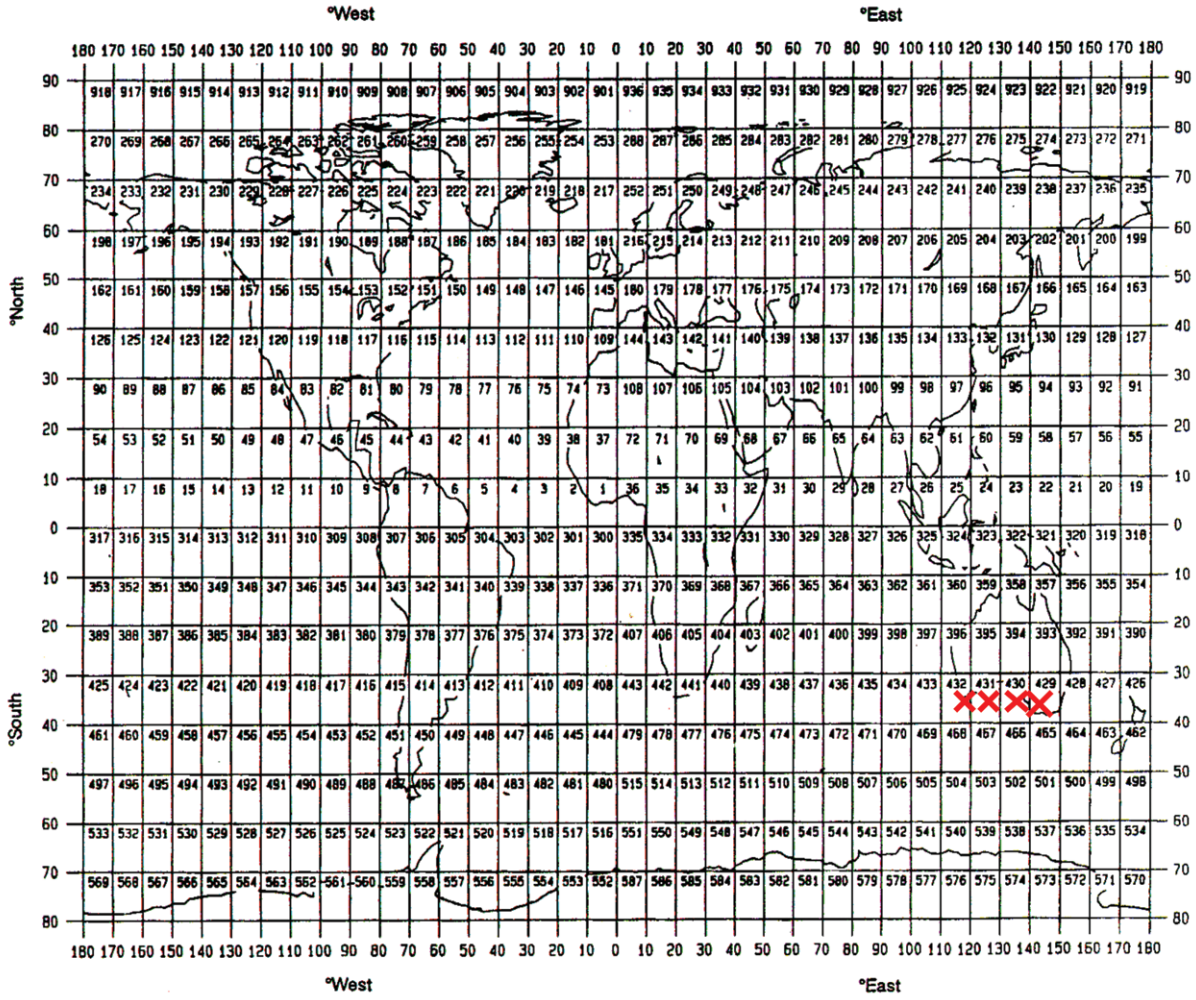
This has been a successful research voyage for a variety of reasons: (1) we obtained a good array of multicores which we are going to study intensively with the aim at reconstructing past sea-surface temperatures in the ocean offshore southern Australia; (2) we collected ample material to study the ecology of benthic foraminifera at all the core sites; (3) we obtained adequate water samples, including from a CTD extending down to 2,400m to determine the 14C age of the various water masses; (4) we now have sufficient material to write a paper on sedimentation rates in the eastern Indian Ocean bordering the southern coast of Australia and for comparison with the Tasman Sea, based on samples obtained during our previous transit voyage; and (5) we have continuously filtered air samples from Fremantle to Hobart to determine their microbial composition and again for comparison with samples taken in the Tasman Sea in May 2011.

Finally, we have been able to train 4 undergraduate and 2 postgraduate students at sea and they have learned a variety of oceanographic tasks and also to work as part of a coherent team.

Principal Investigators

A. Patrick De Deckker, Research School of Earth Sciences, ANU, Canberra
B. Sabine Schmidt, Département d'océanographie, University of Bordeaux I, France

X Areas where data were collected.

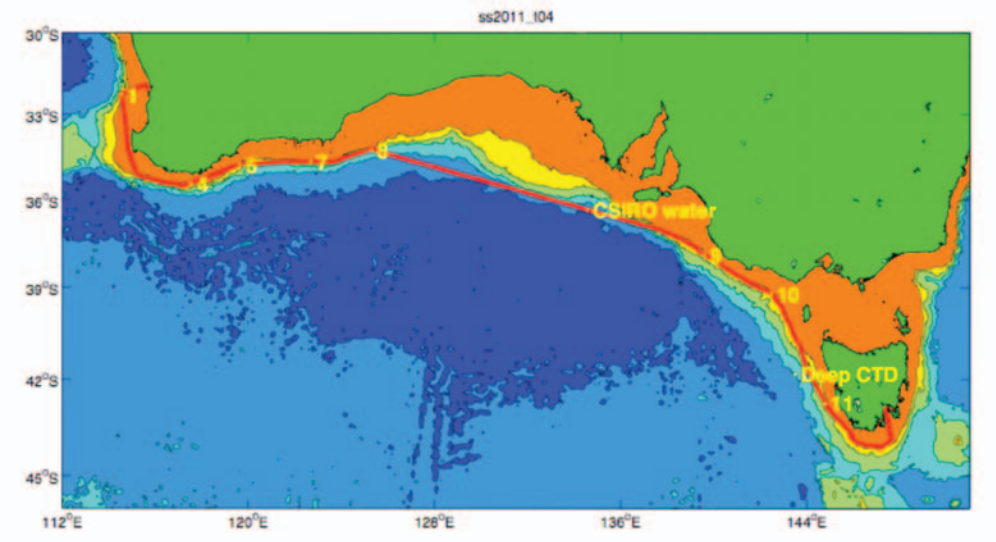


SUMMARY OF MEASUREMENTS AND SAMPLES TAKEN					
Item No.	**PI**	**NO**	**UNITS**	**DATA TYPE**	**DESCRIPTION**
1		40		M71	Filtered air samples for DNA analysis
2		40		M90	Atmospheric measurements to link with item1
3		11		G04	Multicores deployed to sample upper part of sea floor
4		10		H10	CTD profiles and water sampling for nutrients, dis. oxygen
5		10		B08	Samples taken from CTD for calcareous nanoplankton analysis
6		10		H73	C14 of waters taken from CTD profiles
7		10		B09	Plankton tows at every coring station
8		11		B18	Benthic foraminifera in surface sediments at every multicore station
9		11		----	Radionuclides in sediments taken with multicorer

Curation Report

Item No.	DESCRIPTION
1	Plankton tows and calcareous nanoplankton samplesare to be housed at RSES at ANU.
2	Multicore samples for SST reconscructions are to be kept at ANU, with portions of these to be processed in both Bordeaux [for radioclide and organic carbon analysis, plus grain size analysis] and NIOZ at Texel in Holland [for organic compound extractions for SST reconstructions].
3	Benthic foraminifera analysis from the multicores at to go to Indiana State University for anslysis. It is likely that Ashley Burkett, PhD student who participated in the voyage will return in mid 2012 to the ANU to carry out geochemical analysis on the foraminifera.
4	The aerosol samples will be curated at the Research School of Biology prior to DNA extraction.
5	The water samples will be kept in cool storage at ANU prior to their chemical analysis.
6	Dating selected water samples by AMS for radiocarbon 14C.
7	Filtered calcareous nanoplankton to be indentified under light microscopy and with the use of a SEM.

Voyage track



General Ocean Area(S)

We sailed in the eastern Indian Ocean along the southern margin of Australia prior to reaching Hobart.

Specific Areas

While coring we tried to stay along the1.000 m contour line to avoid terrigenous material and hopefully to penetrate through fine grained sediment. This assumption proved incorrect on several occasions when we tried to core [unsuccessfully] a sandy substrate consisting mostly of biogenic [foraminiferal] sediments.

Personnel list

Scientific Participants

Name	Affiliation	Role
Patrick De Deckker	ANU	Chief Scientist
Sabine Schmidt	University of Bordeaux	Principal Investigator
Maureen Davies	ANU	Help with all the tasks while on board
Graham Nash	ANU	To operate the multicorer
Ashley Burkett	Indiana State University	To operate the multicorer and subsample the cores for their microbiota
Marita Smith	ANU	Subsample cores for organic compound analyses
Rebecca Kaye	ANU	Subsample cores for planktic foraminifera, and study material from the plankton tows
Sam Eggins	ANU	To gain training for all the tasks performed at sea
Lyndsay Dean	ANU	Help with the CTD and water sampling for a variety of purposes as well as filer waters for nanoplankton analysis
Chris Munday	ANU	In charge of the aerosol samplers and help with the multicorer.
Lindsay Pender	CMAR	MNF Voyage manager/Computing support
Tara Martin	CMAR	MNF Swath Mapping
Lindsay MacDonald	CMAR	MNF Electronics support
Alicia Navidad	CMAR	MNF Hydrochemistry support

Marine Crew

Name	Role
Michael Watson	Master
John Boyes	Chief mate
Tom Watson	Second Mate
Mike Yorke-Barber	First Engineer
Graeme Perkins	Second Engineer
Nick Fleming	Chief Engineer
Tony Hearne	Chief Integrated Rating
Nathan Arahanga	Integrated Rating
Kel Lewis	Integrated Rating
Pete Taylor	Integrated Rating
Jonathan Lumb	Integrated Rating
Mick O'Connor	Chief Steward
Aaron Buckleton	Second Cook
Stuart Mills	Chief Cook

Patrick De Deckker
Chief Scientist
20/11/2011

Acknowledgements

We are grateful to all the MNF staff who provided an excellent support and who provided much valuable advice. Tara Martin also helped at crucial times before deploying the multicore with the interpretation of the nature of the sea floor. All the crew provided much support during any aspects of our activities, and above all who helped making is a safe operation. Prior to the voyage, Lisa Woodward and Don McKenzie provided much help and advice. We thank them all.

Thanks to everyone for a great scientific voyage. We received great support from the master and his crew, the scientific group was excellent, the MNF staff very supportive and helpful beyond the bounds of duty, and the students gained a good appreciation of many activities undertaken at sea.

CSR/ROSCOP parameter codes: codes of relevance to this voyage are highlighted in red

M01	Upper air observations
M02	Incident radiation
M05	Occasional standard measurements
M06	Routine standard measurements
M71	Atmospheric chemistry
M90	Other meteorological measurements
	PHYSICAL OCEANOGRAPHY
H71	Surface measurements underway (T,S)
H13	Bathythermograph
H09	Water bottle stations
H10	CTD stations
H11	Subsurface measurements underway (T,S)
H72	Thermistor chain
H16	Transparency (eg transmissometer)
H17	Optics (eg underwater light levels)
H73	Geochemical tracers (eg freons)
D01	Current meters
D71	Current profiler (eg ADCP)
D03	Currents measured from ship drift
D04	GEK
D05	Surface drifters/drifting buoys
D06	Neutrally buoyant floats
D09	Sea level (incl. Bottom pressure & inverted echosounder)
D72	Instrumented wave measurements
D90	Other physical oceanographic measurements
	CHEMICAL OCEANOGRAPHY
H21	Oxygen
H74	Carbon dioxide
H33	Other dissolved gases
H22	Phosphate
H23	Total - P
H24	Nitrate
H25	Nitrite
H75	Total - N
H76	Ammonia
H26	Silicate
H27	Alkalinity
H28	PH
H30	Trace elements
H31	Radioactivity
H32	Isotopes
H90	Other chemical oceanographic measurements
	MARINE CONTAMINANTS/POLLUTION
P01	Suspended matter
P02	Trace metals
P03	Petroleum residues
P04	Chlorinated hydrocarbons
P05	Other dissolved substances
P12	Bottom deposits
P13	Contaminants in organisms
P90	Other contaminant measurements
B01	Primary productivity
B02	Phytoplankton pigments (eg chlorophyll, fluorescence)
B71	Particulate organic matter (inc POC, PON)
B06	Dissolved organic matter (inc DOC)
B72	Biochemical measurements (eg lipids, amino acids)
B73	Sediment traps
B08	Phytoplankton
B09	Zooplankton
B03	Seston
B10	Neuston
B11	Nekton
B13	Eggs & larvae
B07	Pelagic bacteria/micro-organisms
B16	Benthic bacteria/micro-organisms
B17	Phytobenthos
B18	Zoobenthos
B25	Birds
B26	Mammals & reptiles
B14	Pelagic fish
B19	Demersal fish
B20	Molluscs
B21	Crustaceans
B28	Acoustic reflection on marine organisms
B37	Taggings
B64	Gear research
B65	Exploratory fishing
B90	Other biological/fisheries measurements
	MARINE GEOLOGY/GEOPHYSICS
G01	Dredge
G02	Grab
G03	Core - rock
G04	Core - soft bottom
G08	Bottom photography
G71	In-situ seafloor measurement/sampling
G72	Geophysical measurements made at depth
G73	Single-beam echosounding
G74	Multi-beam echosounding
G24	Long/short range side scan sonar
G75	Single channel seismic reflection
G76	Multichannel seismic reflection
G26	Seismic refraction
G27	Gravity measurements
G28	Magnetic measurements
G90	Other geological/geophysical measurements

Core studies, sediments, microfossils and organic compounds, radionuclide analyses

The multicorer being fixed to the rear deck after returning with sediment in the tubes.The sediment-water interface is clearly visible in several of the tubes.

The multicorer being returned on the rear deck with sediment in the lower half of the tubes. The entire apparatus weights about 800 kilos.

The ss2011-t04 team that includes the ANU-Bordeaux-Indiana State University group and the MNF support staff. From left to right are: Patrick De Deckker, Tara Martin, Sabine Schmidt. Alicia Navidad, Lindsay MacDonald, Rebecca Kaye, Ashley Burkett, Lyndsay Dean, Marita Smith, Maureen Davies, Chris Munday, Lindsay Pender, Graham Nash, and Sam Eggins

date	station no.	time local	time UTC	longitude E	latitude S	depth (m)	water temp	air temp	salinity	density	humidity %	pressure	CTD	CTD st no.	multicore	plankton tow	nannopl waters	Notes
10/11/11	1		15:25	114° 33.004′	32° 17.400′	1034	20.4	18	35.41	1024.969	76	1017	down to 400m	2	success short cores	yes		
11/11/11	2	20:50	12:50	115° 13.816′	35°09.719′	1021	20	17			66	1019	none		no recovery	none	none	
	3		23:20	117°10.605′	35°31.83′	1050	17	17	35.53	1025.829	70	1019	none		tubes full of water	none		
	3 retry	9:50	0:50	117°15.81′	35°30.266′	1140	17.4	16	35.53	1025.829	81.9	1016	none		tubes full of water	none		
12/11/11	4	12:58	3:58	117°33.084′	35°26.394′	529	18.9	17	35.42	1025.356	84	1015	none		a little sand	none		
12/11/11	5	14:42	0:42	119°38.6674′	34°46.116′	1080	18.5	18	35.43	1025.466	79	1013	none		2 tubes with a bit of material	none		
13/11/11	6	13:08	3:08	122°09.822′	34°40.819′	804	18.2	18	35.48	1025.584	73	1011	none		no recovery	none		
13/11/11	7		6:36:05	122°41.030′	34°40.874′	726	18.1	18	35.48	1025.61	79	1011	to 400m	3	5-15cm sediment in all 4 tubes	yes		
14/11/11	8	9:33	0:33	125°17.351`	34°15.082`	1297	17.1	17	35.57	1025.917	89	1014	to 400m	4	17cm sediment in all 4 tubes	yes	yes	The multicorer was deployed twice at the location. Did not trigger on the first attempt
17/11/11	9	13:58	3:58	139°36.411`	37°52.652`	1117	16.7	18	35.48	1026.189	79	1011	to 400m	7	14cm in all six tubes deployed	yes	yes	Some cores had sloped sediment/ water interface
18/11/11	10	6:25	20:25	142°28.580`	39°11.390`	1160	15.7	18	35.58	1026.258	78	1007	to 400m	8	6 deployed, all successful	yes	yes	One core leaked a little. Plankton tow full of salp and ble copopods
18/11/11	CTD	23:09	13:09	143°56.096`	41°32.486`	2449	14.1	14			96	1008	to 2430m	11	n/a	none	none	CTD only
19/11/11	11	9:20	22:20	144°48.225`	42°45.881`	1277	13.7	13	35.28	1026.456	82		none		6 deployed, 5 successful	none	none	about 15cm of mud in 5 of the tubes, 5cm in the other. A bit more sandy than previous cores.