

RV Algoa Cruise Report:

Cruise Algoa-175



Mozambique Channel,
11 December – 23 December 2009

H. Ridderinkhof
Chief Scientist

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1 Cruise Narrative

1.1 Highlights

- a: RV Algoa cruise 175 in the Mozambique Channel
- b: Expedition Designation (EXPOCODE): ALG-175
- c: Chief Scientist: Prof. Dr. ir. Herman Ridderinkhof
Royal Netherlands Institute for Sea Research (NIOZ)
P.O. Box 59
1790AB Den Burg/Texel
The Netherlands
Telephone: 31(0)222-369423
Telefax: 31(0)222-319674
e-mail: herman.ridderinkhof@nioz.nl
- d: Ship: RV Algoa Call Sign: ZR4311
length 52 m.
beam 10.8 m
draft 4.85 m
cruising speed 10.0 knots
- e: Ports of Call: Durban (South Africa) to Pemba
(Mozambique)
- f: Cruise dates: December 11, 2009 to December 23, 2009

1.2 Cruise Summary Information

Summary

Early afternoon on Friday 11 December 2009 RV Algoa left the quay in the harbour of Durban, South Africa, and headed for the narrowest section of the Mozambique Channel to service (recover and redeploy) several current meter moorings and one sediment trap mooring. On Wednesday 16 December, late afternoon, the work along the mooring section in the Mozambique Channel started with the successful recovery of the sediment trap mooring that had been serviced early 2009 with the Dutch RV Pelagia

(all other moorings had been serviced for the last time in early 2008 on a cruise with the German RV Meteor). Starting at sunrise, moorings LMC4, LMC5 and LMC5A on the African side of the Mozambique Channel could be recovered successfully on Thursday 17 December. Meanwhile the instruments from these moorings: ADCPs, single point current meters and T-S sensors were read out. The available space on the Algoa did not allow to recover all moorings before redeployment.

On Friday 18 December preparations started for the redeployment of the moorings. First a 1000 m CTD was done with all 11 T-S sensors from the moorings that had been read out and serviced, attached to the CTD frame. The T-S sensors were programmed to measure every 5 seconds. During the upcast of the 1000 m CTD the frame was stopped every 100m and stayed at this fixed level for 10 minutes in order to obtain good data for (inter) calibration of the sensors. Mooring 5A was redeployed successfully during the afternoon of Friday 18 December with the calibrated T-S sensors and 'new' current meters and an ADCP that replaced the ones that had been taken of the days before. The weather was good, with some swell (2m) from the south.

On Saturday 19 December moorings LMC4, LMC5 and the sediment trap mooring were redeployed. As for mooring LMC5A, the ADCPs and current meters that were deployed in these moorings had been serviced and prepared in our home lab in the Netherlands (NIOZ Royal Netherlands Institute for Sea Research) and the T-S sensors were the same as during the previous period. The weather was very good, with only minor swell from the south.

On Sunday 20 December the servicing of the moorings on the Madagascar side of the Mozambique Channel started with the recovery of moorings LMC6, LMC7 and LMC8. LMC8 was released about 30 minutes after the sun went down. The very calm weather conditions made that this mooring could still be sighted by eye when, after 10 minutes, it had come to the surface. The weather remained very good during the whole day.

On Monday 21 December the last mooring, LMC9, at the Madagascar side of the channel was recovered just after sunrise. Then a 1000 m CTD was done to calibrate the T-S sensors from the moorings and preparations started for the redeployment of the last 4 moorings. The redeployment of mooring LMC9 commenced early afternoon and in the evening mooring LMC8 was redeployed successfully.

Tuesday 22 December was the last day of our activities on the mooring section. First, just after sunrise, mooring LMC7 was redeployed followed by

the last mooring, LMC6. Again, weather conditions and the state of the sea were very good during these last days.

RV Algoa set course for Pemba early afternoon on Tuesday 22 December. Due to the strong countercurrent the average speed of the vessel was around 8 knots. She arrived in Pemba on Wednesday 23 December, late afternoon.

Cruise Track

The cruise was carried out from Durban, South Africa to Pemba, Mozambique. The main work area was at the narrowest section of the Mozambique Channel where moorings were recovered, serviced and redeployed. The complete cruise track is shown in figure 1. The RV Algoa sailed closely along the coast from Durban to the southern entrance of the Mozambique Channel to avoid strong counter currents, followed by a course through the centre of the Channel to reach the mooring array. During the last part use was made of the northern currents in the centre of the Channel.

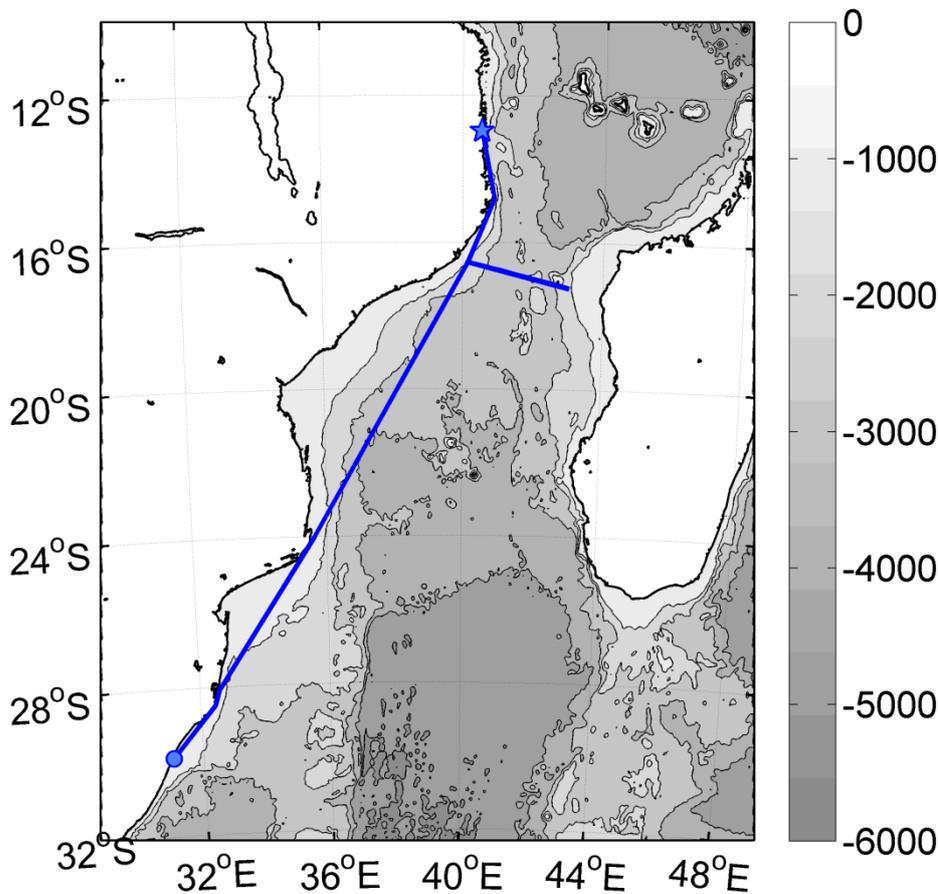


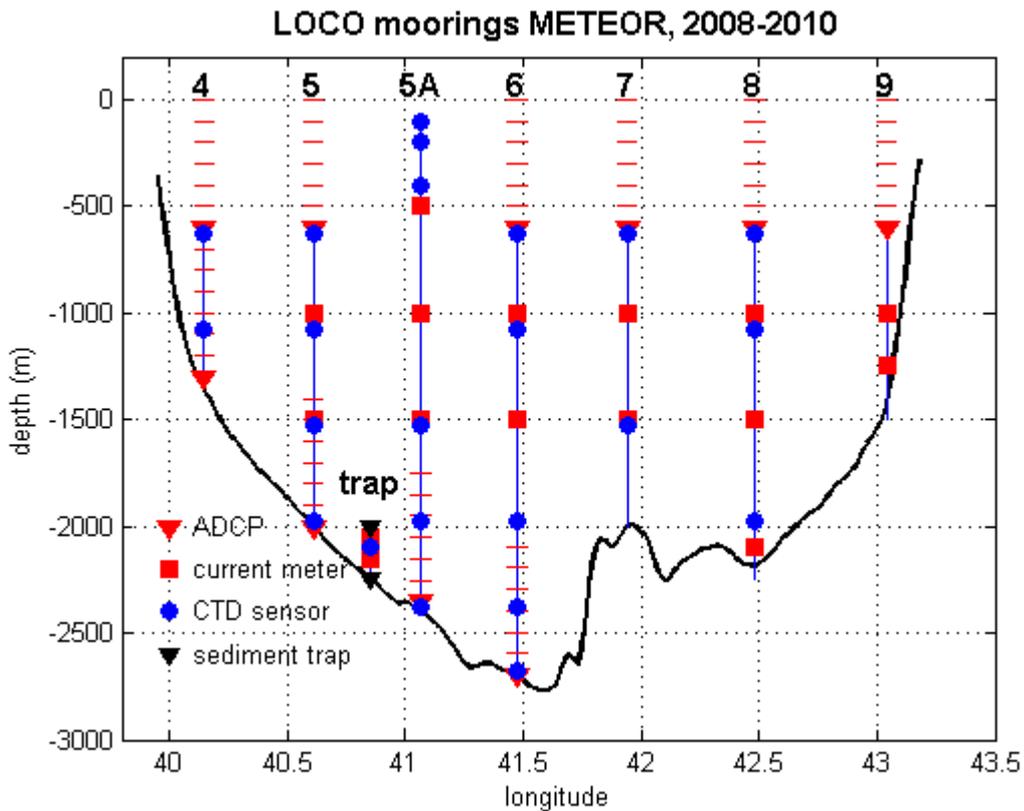
Figure 1. Cruise track of FS Meteor cruise ME75-1B

Moorings

The major goal of this cruise was the recovery, servicing and redeployment of an array of long-term moorings in the narrowest part of the Mozambique Channel. These moorings have been deployed for the first time in November 2003 (RV Charles Darwin) and have been serviced in March 2005 (RV Charles Darwin), March 2006 (RV Discovery) and January 2008 (FS Meteor). 7 moorings are equipped with ADCPs, current meters and T-S sensors. In addition, one mooring with 2 sediment traps, one

current meter and 2 T-S sensors was deployed. The position of the moorings and the location and type of instruments in the cross-section is shown in figure 3. The measuring interval of the physical instruments ranges from 5 minutes (T-S sensors), 15 minutes (current meters) to 30 minutes (ADCPs). The cups in the sediment traps collect discrete samples over intervals of 17-23 days.

During this cruise moorings with instruments were recovered that had been deployed with FS Meteor in January 2008. Detailed information on the performance of the instruments in the moorings is given in appendix B. This shows that the amount of good data as retrieved from the moored instruments during this period was extremely good. All 10 ADCPs have good data for the entire period. 2 out of 16 current meters (at 1500 m depth from moorings 5A and 7) do not have a full record of data, 1 of these (5A) did not function for the entire period. All moored T-S sensors functioned. 5 out of 21 T-S sensors do not have records for the complete period because the power of the batteries of these 5 instruments became too low. 1 stopped functioning in May 2009, 4 stopped functioning in November 2009. Compared with the previous mooring periods this was the most successful period with respect to the data return from the moorings.



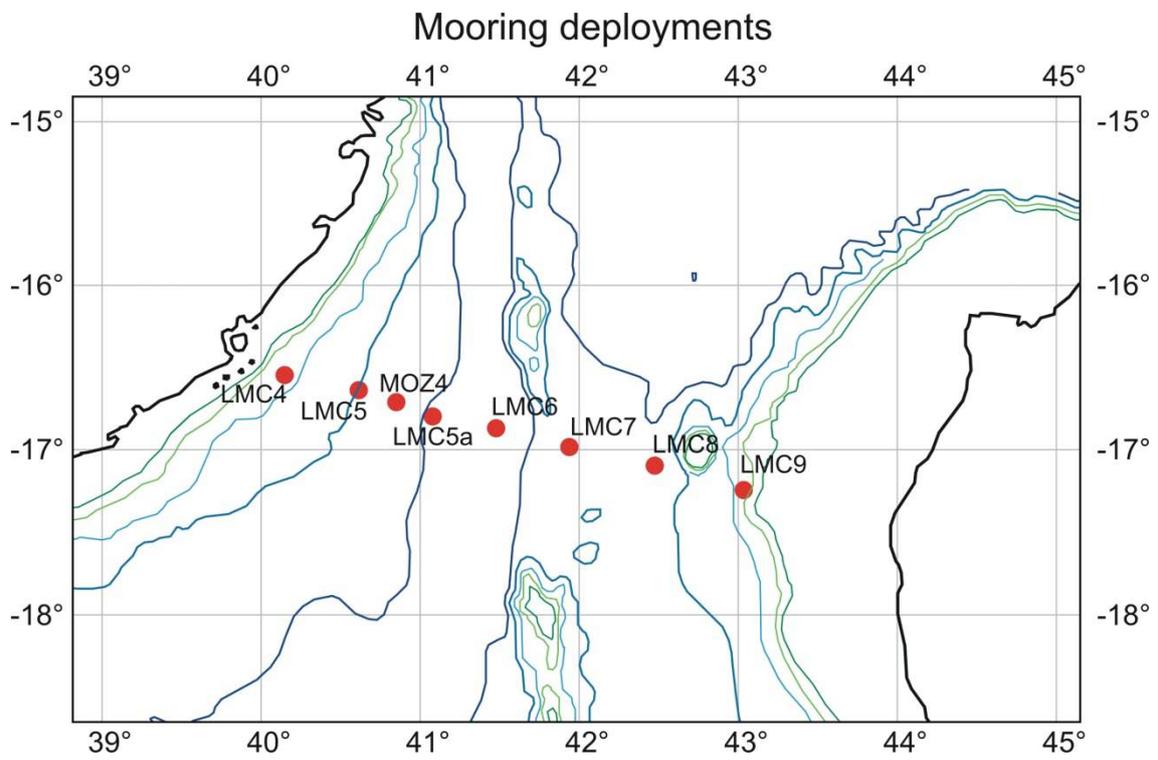


Figure 2. Position and configuration of the long-term moorings in Mozambique Channel.

Hydrographic Stations

A total of 3 CTD casts were taken. The positions of these CTD stations along the mooring sections are indicated in figure 3. The maximum depth that can be reached on the Algoa is approximately 1000 m. All 3 stations were done to this maximum depth. The first station was done just to obtain sea water from 1000 m depth to be used to prepare the trap mooring. The other 2 stations were done to calibrate the T-S sensors from the moorings.

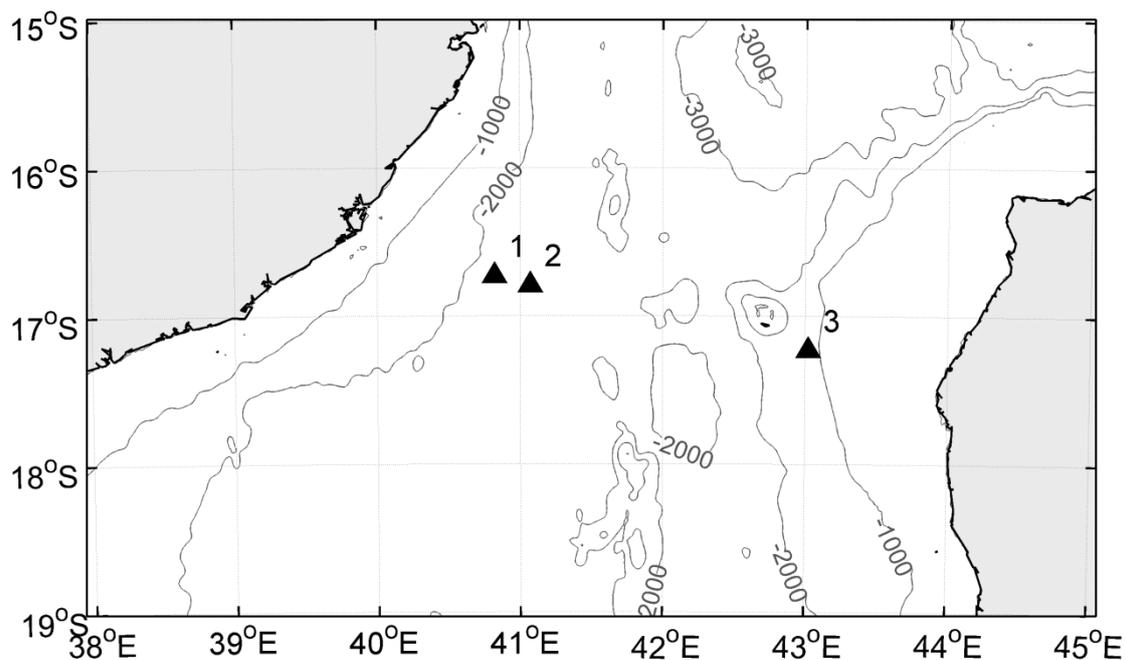


Figure 3. Distribution of hydrographic stations.

*.SUM file

A hard copy of the cruise summary file (*.SUM file) describing all stations occupied is added in the appendix A.

1.3 Scientific Programme and Methods

The goal of cruise 175 with the South African Algoa was:

- long-term monitoring of the currents, some hydrographic properties and vertical particle fluxes at the narrowest section of the Mozambique Channel

Long-term observations with moorings (see figure 5)

To address the first goal 8 long-term moorings are deployed across the Mozambique channels. Of these, 7 moorings are more or less evenly distributed across the channel and these moorings were equipped with recording ADCPs, current meters and T-S sensors. The observations have started in November 2003 and are planned to continue till at least 2011. Data will be used to determine the variability in water- and heat transport through the channel. During a previous pilot experiment it was found that the currents are dominated by southward migrating anti-cyclonic eddies which fill more or less the entire section. Therefore the mooring design (also based on the availability of instruments) is such that the top of 6 moorings, at 600 m below surface, is equipped with a Long Ranger ADCP. The near-bottom ADCPs on the western side (moorings 5A, 6,7) are intended to observe the magnitude of the undercurrent carrying NADW equatorward, as discovered during the pilot experiment. One mooring, 5A, extends to 100 m below surface in order to obtain near surface observations on the (variations in) temperature and salinity. In between moorings 5A and 6 a mooring with 2 sediment traps has been deployed. These observations will be used to determine the temporal variability in the particle fluxes, see below.

1.4 Major Problems Encountered during the cruise

During this cruise with the South African RV Algoa no major problems were encountered. There was no delay by bad weather nor problems with the gear, the vessel etc. All operations went very smoothly.

1.6 Lists of Cruise Participants

Scientific crew

Name	Institute	Nationality	Function/ Speciality
Herman Ridderinkhof	NIOZ	Dutch	Chief scientist, Physical oceanography
Geert-Jan Brummer	NIOZ	Dutch	Senior scientist, Marine geology
Jenny Ullgren	NIOZ	Swedish	Scientist
Selma Huisman	IMAU	Dutch	PhD student
Sander Asjes	NIOZ	Dutch	Electronics technician
Jack Schilling	NIOZ	Dutch	Senior technician
Jan Dirk de Visser	NIOZ	Dutch	Technician
Fialho Nehama	UCT	Mozambican	PhD student
Jose Patreque Ribeiro	IIP	Mozambican	Scientist
Raquel do Santos Fernandes	IIP	Mozambican	Scientist

2. Moored instrumentation

2.1 Physics moorings

All moorings were recovered successfully. Moreover, almost all instruments functioned over the entire measurement period of 22 months. All 9 ADCPs , 14 out of 17 current meters and 19 out of 20 CTD sensors recorded data over the full period. Some instruments (2 current meters and 1 CTD) from the longest mooring, 5A, did not function during the complete period. Most presumably mooring motions and vibrations of this mooring with its top only 100 m below surface, caused some damage.

Before redeployment all instruments were technically inspected; if necessary spare parts were installed and batteries were replaced. Because there were hardly any instrument failures, some additional instruments that were on board for replacement, could be deployed in the new mooring design. Compared to the previous period additional CTD sensors were placed in mooring 5, at 600 and 1500 m below surface and an ADCP was placed at the top of mooring 6 (replacing a single-point current meter). The result is that the mooring section is now equipped with more instruments than during any previous period.

Acknowledgements

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Appendix A

Cruise summary of Algoa cruise 175

Cruise code	Station	Date	Time	Latitude		Longitude		Depth (m)	Gear	Action	comment
				deg, min S		deg, min E					
AL175	1	16/12/09	14:22	16	42.45	40	51.04		MOR	released	start mooring trap recovery
AL175	1	16/12/09	15:11	16	42.25	40	50.7		MOR	buoy sighted	
AL175	1	16/12/09	16:55	16	43.21	40	49.67		MOR	mooring on deck	end mooring trap recovery
AL175	2	16/12/09	17:30	16	43.78	40	49.41		ROS	CTD out board	water sampling at 1000 m
AL175	2	16/12/09	18:13	16	43.78	40	49.41		ROS	CTD on board	
AL175	3	17/12/09	3:07	16	32.76	40	8.9		MOR	released	start recovery LMC4
AL175	3	17/12/09	6:18	16	32.76	40	8.9		MOR	mooring sighted	
AL175	3	17/12/09	7:33	16	33.3	40	8.08		MOR	mooring on deck	
AL175	4	17/12/09	8:19	16	38.16	40	36.45		MOR	released	start recovery LMC5
AL175	4	17/12/09	8:29	16	38.16	40	36.45		MOR	mooring sighted	
AL175	4	17/12/09	10:44	16	40.3	40	34.65		MOR	mooring on deck	
AL175	5	17/12/09	14:25	16	47.63	41	4.43		MOR	released	start recovery LMC5A
AL175	5	17/12/09	14:34	16	47.63	41	4.43		MOR	mooring sighted	
AL175	5	17/12/09	17:36	16	50.12	42	2		MOR	mooring on deck	
AL175	6	18/12/09	5:20	16	47.63	41	4.43		CTD	CTD out board	calibration SBE sensors
AL175	6	18/12/09	7:47	16	47.63	41	4.43		CTD	CTD on board	
AL175	7	18/12/09	14:00	16	48.35	41	4.57		MOR	float in water	start deployment mooring LMC5A
AL175	7	18/12/09	15:56	16	47.84	41	4.72	2415	MOR	anchor released	end deployment mooring LMC5A
AL175	8	19/12/09	3:22						MOR	float in water	start deployment mooring LMC5
AL175	8	19/12/09	5:21	16	38.73	40	36.6	1999	MOR	anchor released	end deployment mooring LMC5
AL175	9	19/12/09	9:24							float in water	start deployment mooring LMC4
AL175	9	19/12/09	10:19	16	32.8	40	6.88	1288	MOR	anchor released	end deployment mooring LMC4

AL175	10	19/12/09	15:35							float in water	start deployment mooring trap
AL175	10	19/12/09	17:09	16	42.7	40	51.3	2250	MOR	frame released	end deployment mooring trap
AL175	11	20/12/09	3:16						MOR	released	start recovery mooring LMC6
AL175	11	20/12/09	3:35						MOR	mooring sighted	
AL175	11	20/12/09	6:02						MOR	mooring on deck	end recovery mooring LMC6
AL175	12	20/12/09	10:17	16	58.8	41	56		MOR	released	start recovery mooring LMC7
AL175	12	20/12/09	10:28						MOR	mooring sighted	
AL175	12	20/12/09	12:05						MOR	mooring on deck	end recovery mooring LMC7
AL175	13	20/12/09	16:08						MOR	released	start recovery mooring LMC8
AL175	13	20/12/09	16:20						MOR	mooring sighted	
AL175	13	20/12/09	18:04	17	3.9	42	26.7		MOR	mooring on deck	end recovery mooring LMC8
AL175	14	21/12/09	3:05	17	14.9	43	2.2		MOR	released	start recovery mooring LMC9
AL175	14	21/12/09	3:15						MOR	mooring sighted	
AL175	14	21/12/09	4:20	17	13.9	43	1.4		MOR	mooring on deck	end recovery mooring LMC9
AL175	15	21/12/09	7:07						CTD	CTD out board	calibration SBE sensors
AL175	15	21/12/09	8:43						CTD	CTD on board	
AL175	16	21/12/09	3:22						MOR	float in water	start deployment mooring LMC9
AL175	16	21/12/09	5:21	17	14.7	43	2.1	1478	MOR	anchor released	end deployment mooring LMC9
AL175	17	21/12/09	3:22						MOR	float in water	start deployment mooring LMC8
AL175	17	21/12/09	17:04	17	5.8	42	28.5	2210	MOR	anchor released	end deployment mooring LMC8
AL175	18	22/12/09	3:22						MOR	float in water	start deployment mooring LMC7
AL175	18	22/12/09	4:49	16	59	41	56.2	1978	MOR	anchor released	end deployment mooring LMC7
AL175	19	22/12/09	7:45						MOR	float in water	start deployment mooring LMC6
AL175	19	22/12/09	9:59	16	52.17	41	28.7	2693	MOR	anchor released	end deployment mooring LMC6

Appendix B

Mooring information file of Algoa cruise AL175

Mooring ID	Location of deployment		Water depth (m)	measurement Type	instrument Type	Instr. ID	meters		Recording interval(s)	DSU No.	Deployment Date, time	Oceano AR-861 releases		Argos buoy SN and code	
	Latitude deg, min S	Longitude deg, min E					below surface					Nr.	code		
LMC4 deployment from south cable shortened with 65 m mooring depth adapted accordingly	16°32.81	40°	1288	ADCP	LR	5945?	595		2400		19-Dec-2009	169	04d9	60677	
				CTD	SBE-37-SM	4352	650		600		10:19	148	04c3	code 23005	
				CTD	SBE-37-SM	2667	1000		600						
				ADCP	LR	3616	1278		2400						
LMC5 deployment from south	16° 38.71	40° 36.60	1999	ADCP	LR	3553	592		2400		19-Dec-2009	168	04d8	69021	
				CTD	SBE-37-SM	4349	617		600		5:21	154	04c9?	code 25832	
				currentmeter	RCM11	240	995		1200	11040					
				CTD	SBE-37-SM	2674	1020		600						
				currentmeter	RCM11	404	1495		1200	13741					
				CTD	SBE-37-SM	4351	1520		600						
				CTD	SBE-37-SM	4346	1966		600						
ADCP	LR	3513	1991		2400										
LMC5A deployment from south	16° 47.84	41° 04.72	2415	CTD	SBE-37-SM	4353	110		600		18-Dec-2009	157	04cc		
				CTD	SBE-37-SM	2959	200		600		15:56	149	04c4	code 23004	
				CTD	SBE-37-SM	4348	400		600						
				currentmeter	RCM11	188	481		1200	13525					
				currentmeter	RCM11	48	992		1200	13513					
				currentmeter	RCM11	123	1491		1200	13743					
				CTD	SBE-37-SM	2668	1525		600						
				CTD	SBE-37-SM	2655	1975		600						
				CTD	SBE-37-SM	3623	2375		600						
ADCP	LR	3597	2391		2400										

Mooring ID	Location of deployment		Water depth (m)	measurement Type	instrument Type	Instr. ID	meters below surface	Recording interval(s)	DSU No.	Deployment Date, time	Oceano AR-861 releases		Argos buoy SN and code
	Latitude deg, min S	Longitude deg, min E									Nr.	code	
LMC6 deployment from west	16° 52.17	41° 28.70	2693	ADCP	LR	3514	578	2400		22-Dec-2009	167	04D7	60672
				CTD	SBE-37-SM	2676	602	600		9:59	165	04D5	code 23201
				currentmeter	RCM11	190	978	1200	13528				
				CTD	SBE-37-SM	2657	1003	600					
				currentmeter	RCM11	200	1478	1200	12231				
				CTD	SBE-37-SM	4140	1962	600					
				CTD	SBE-37-SM	4347	2350	600					
LMC7 deployment from west	16° 59.00	41° 56.21	1978	ADCP	LR	NN	614	2400		22-Dec-2009	177	400	60671
				CTD	SBE-37-SM	2656	640	600		4:49	161	04d1	code 23490
				currentmeter	RCM11	193	996	1200	13847				
				currentmeter	RCM11	44	1495	1200	7030				
				CTD	SBE-37-SM	3624	1520	600					
LMC8 deployment from west	17° 05.80	42° 28.50	2210	ADCP	LR	NN	596	2400		31-Jan-2008	178	04E#	60666
				CTD	SBE-37-SM	3622	625	600		17:04	147	??	code 23007
				currentmeter	RCM11	414	994	1200	7321				
				CTD	SBE-37-SM	4345	1025	600					
				currentmeter	RCM11	405	1493	1200	13521				
				currentmeter	RCM11	415	2092	1200	13745				
				CTD	SBE-37-SM	2672	2125	600					

Mooring ID	Location of deployment			measurement Type	instrument Type	Instr. ID	meters		Recording interval(s)	DSU No.	Deployment Date, time	Oceano AR-861 releases		Argos buoy SN and code	
	Latitude deg, min S	Longitude deg, min E	Water depth (m)				below surface					Nr.	code		
LMC9 deployment from north	17° 14.71	43° 02.05	1478	ADCP	LR	bc2785	628	2400			21-Dec-2009	173	04DD	60669	
				currentmeter	RCM11	406	1026	1200	8132	11:02	175	04DF	code 23495		
				currentmeter	RCM11	187	1326	1200	7324						
trap deployment from southwest	16° 42.71	40° 51.30	2250	CTD	SBE-37-SM	2959	1990	600			19-Dec-2009	Benthos		V05-0990	
				datalogger	NIOZ	A3	2010	720			10:03	950			
				trap	PPS5	051	2011	1987200							code
				trapmotor	Technicap	03-235	2011	1987200					1001		HEX:75987/0750035
				currentmeter	RCM11	36	2030	1200	14080						
				currentmeter	RCM11	416	2150	1200	12588						
				datalogger	NIOZ	A9	2244	720							
				trap	PPS5	9-026	2245	1987200							
				trapmotor	Technicap	03-236	2011	1987200							
		ASF													
		bottomframe		NIOZ	010	2244									