Three months Report
Meteor M75/1 – ERODER 2 cruise
December 29th 2007 – January 17th 2008

The Leg M 75/1a was one of the 2 foreign legs involved in the M75 campaign via the European ship barter. This was an unprecedented situation that could become more frequent in the next future as european fleet intercollaboration increases. The M75/1, which was the the first leg of the RV Meteor M75 campaign, was **also named** ERODER 2, as it was part of a more complete geological program named ERODER: a high resolution study focused on the submarine slopes of La Réunion Island (Indian Ocean).

This cruise had mainly 3 objectives:

(1) to better understand the geological structure of the volcanic island (the emerged part is only 1/30th of the total),

(2) its evolution through time and

(3) the current dynamics of material transfer processes to the deep-sea.

Two cruises had been performed in 2006 around the island with french oceanographic vessels: FOREVER (N.O. L'Atalante) and ERODER 1 (N.O. Beautemps-Beaupré) ; they led to the discovery of volcanodetritic deep sea fans and new volcanic structures around La Réunion Island.

Recent studies carried out off north western Africa showed that the presence of volcanic islands along the Morocco and Mauritanian passive continental margins increased the complexity of deep-sea sedimentary facies distribution. The growth and the dismantling of these volcanoes modified the pre-existing seafloor topography and produced numerous submarine avalanches. However in spite of the numerous studies led around volcanic archipelagos like Canary and Hawaii. No true volcanodetritic deep sea fan similar to the ones observed in continental context has been observed in these areas.

The main goal of the ERODER 2 cruise was to collect more detailed bathymetric, backscatter and mud-penetrator data on these fans to understand their origin and evolution and to study their present activity. A large number of new seamounts had been mapped during the recent cruises. Some of them must be sampled to understand their origin and ages. That was also an objective of the cruise.

The French scientific team arrived on board the RV Meteor in Port Louis (Mauritius Island) on December 28th. It had the support of german technicians and engineers, who participated to the cruise and helped the team to collect data with the sophisticated echosounders hull-mounted on board the RV Meteor.

The Vessel left Mauritius island on Friday 29th, just before lunch time.

After several hours of transit towards La Réunion Island, scientific operations started by around 4000 m water depth by dredging on a flank of a submarine volcano discovered in 2006. Two small lava debris were catched. They will help to determine the age of lavas and their origin.

Then one long geophysical profile was acquired towards La Reunion island using the EM120 swath bathymetric device, a magnetometer and the parasound subbottom profiler. This first profile was used to define the best acquisition parameters for deep-sea exploration in such a volcanodetritic environment.
The island of La Réunion sensu stricto consists of two juxtaposed volcanic massifs: Piton des Neiges, which is a dormant volcano and Piton de La Fournaise, which is a highly active basaltic shield volcano, that has grown continuously since at least 0.527 Ma. It is currently one of the most active volcanoes in the world. The recent volcanic activity is mainly concentrated inside a caldera that formed less than 5000 years ago. However, outside the caldera, two broad topographic ridges are interpreted as volcanic rift-zones, or preferential pathways for the magma. The present activity in mainly controlled by a magma reservoir located near or just below sea level. From this reservoir, magma injects into the rift-zones and travels from the central part of the volcano to the distal flanks.
Although eruptions along these structures outside of the main caldera of the volcano are not frequent, averaging two or three per century, they are long-lived structures. In the submarine part of the Piton de la Fournaise volcano, these zones depart noticeably in morphology from the other submarine terrains. They are observed near to the coast, have rugged topography and steep slopes at the base but rather smoother morphologies at the top.
Sunday 30th was focused on dredging operations of these submarine rift zones. Strong and unstable surface oceanic currents make dredging operations difficult and longer than expected by the scientific team. The first dredge collected old and alterated lavas (see photo). The second attempt led to the lost of the dredge probably blocked by lava massifs.

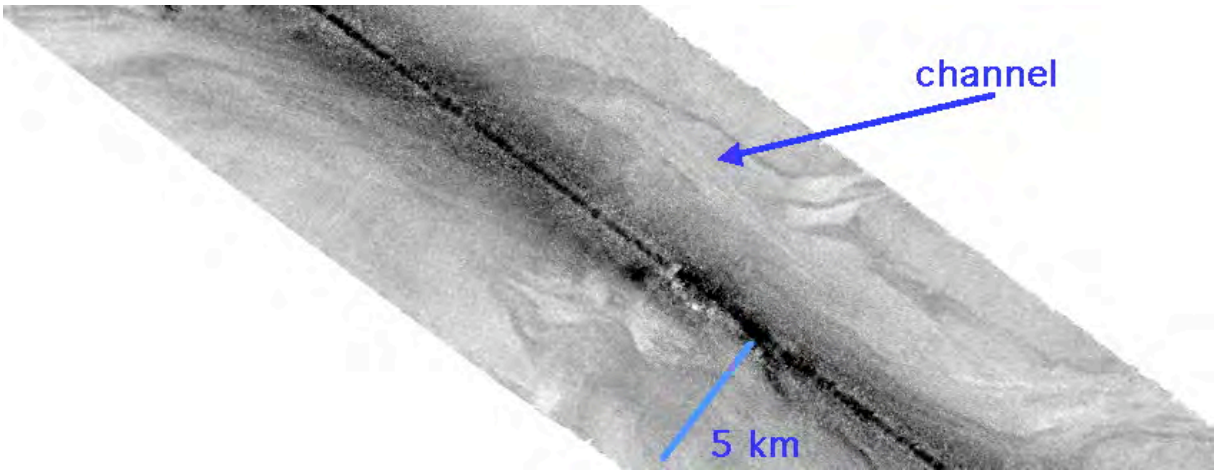
Picture of volcanic lava blocks collected with the dredge on La Fournaise rift zones

The second cruise week was more rainy and windy. The sea became rough (swell up to 3.5 m). However, we worked every day, even if some acoustic data were relatively noisy. We acquired a large amount of geophysical data at 7.5 knots, we did 7 coring and 3 other dredging stations.

A group of seamounts rising above the oceanic plate was identified during the FOREVER campaign in April 2006, located off the west coast of La Réunion, near the Mahanoro trench. The geometry of these seamounts suggested that they were volcanic constructions. The

easternmost of the group was the target for two dredges. It shows a relatively complex morphology with an oval general shape with ridges respectively orientated to the SW and to the E. Its summit was mapped during the ERODER 2 cruise with a minimum depth of 1800 m. Dredges were respectively realized at the depth of 3111 m and 2750 m on its western flank. The first dredge sampled a small piece of basalt and a bigger composite block (40 x 30 x 20 cm) made of a felsic rock (quartz + feldspar + a non-identified brown mineral) coated with sediments and with a Fe–Mn crust. This mineralogical composition suggested a continental origin of this rock, a big surprise for the scientific team !

Most of the second week nights were devoted to the high resolution mapping of the Cilaos deep-sea fan discovered in 2006. All the data were processed on board. The first backcatter images were very impressive (see below). They indicated that the fan is still very active and that submarine avalanches are able to transport sand down to 4400 m water depth at a distance of more than 300 kms from La Reunion island coasts.



Sample of EM120 backscatter image collected during ERODER 2 cruise on the Cilaos fan (4500 m water depth)

We kept tracking the distal end of the submarine channels belonging to the Cilaos fan.

Several cores were collected within channels or on outerbanks. All cores were opened and described on board by sedimentologists (see below). They showed a series of “turbidite” beds, some of them containing medium to coarse sands. We collected massive sand beds which are a few tens of centimeters thick.

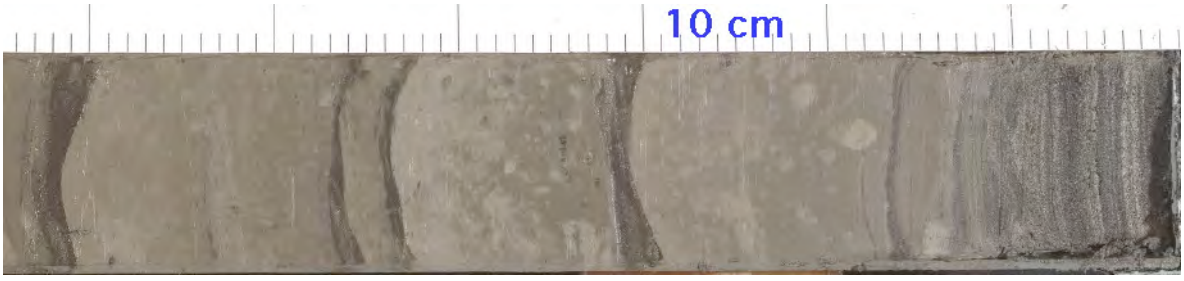
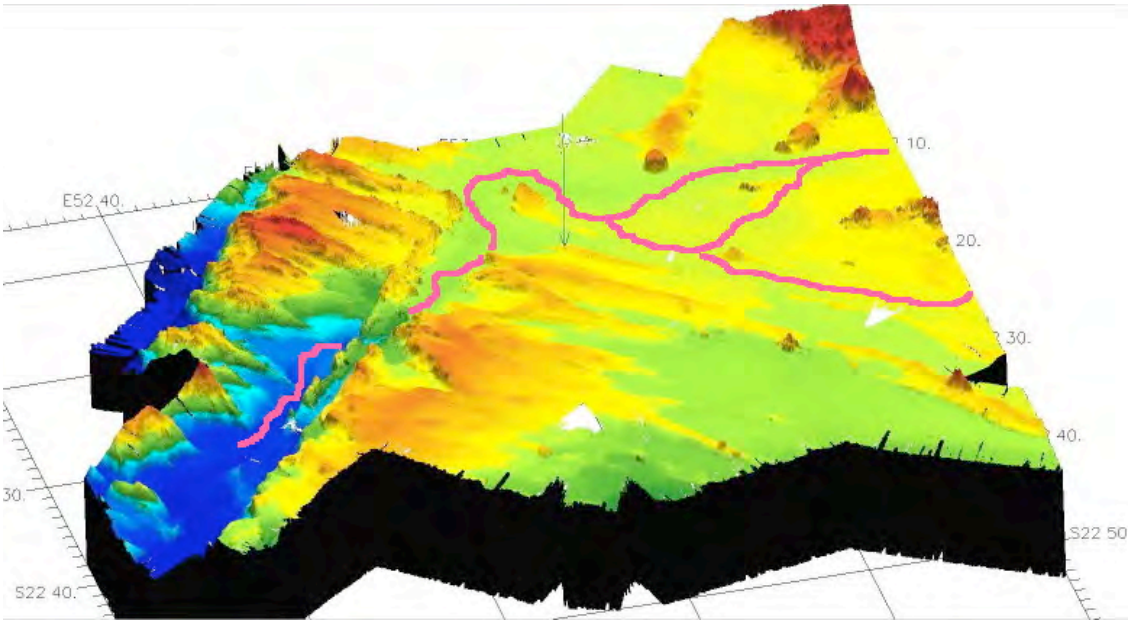


Photo of a core section collected and opened on board during ERODER 2 cruise on the Cilaos fan (4500 m water depth). It shows nice turbidite sequences corresponding to submarine avalanches records

Changing weather and sea conditions characterized our third week on board. We started with 4-5 Beaufort and swell between 2 and 3 meters. At that time, we were exploring the distal part of the Cilaos deep-sea fan between 4000 m and 4500 m water depth. The fan covers an area of more than 15000 km^2, 6 times the island area (2500 km^2) and 40 times its source area on island. Elongated volcanic ridges divide the turbidite system into three parts: western, axial and eastern. The lower western fan, our target, is confined between a volcanic ridge and a submarine volcano massif. It is characterized by one major straight channel branched out downstream. Data collected in 2006 indicated that the main channel was continuing its course beyond the surveyed area. Our goal was to track the path of the channel down to its end. This part of the survey was very exciting, as the course of the channel is largely controlled by pre-existing morphology, the channel changes several times its main course and because we were exploring a “blank area” (no data at all). We successfully tracked the channel to its distal end, which is located at more than 5000 m water-depth in a complex fracture zone linked to the history of the oceanic plate. Our channel hunt pushed us far southward the previous survey, delivering very interesting information on the oceanic structures in the area. Acoustic data suggest that the Cilaos turbidite system is quite sandy. This was confirmed by several cores collected and described on board during that week.



3D view of part of the survey area, showing relief alignments related to the oceanic plate history and the complex interaction between the pre-existing morphology and the today present active Cilaos channel (in pink).

Unfortunately, we had to leave our survey area on January 9th and 10th to go closer to the southern coast of La Réunion Island. A deep low pressure system, located westward the island, generated a tough north flux. The ship was to unstable to be able to acquire good quality acoustic data. The wind increased up to 8 Beaufort, before we left the area. Protected by the volcanic island, we found very good working conditions and used for the first time a circular dredge brought with us form France.

Photo of the circular dredge used during ERODER 2 cruise

Two dredges were realized in the south-western flanks of La Réunion edifices on the co-called “Ride de l’Etang Salé”. This submarine ridge, about 15 km long and a few kilometers wide has an elongated shape radial to the island and was previously interpreted as an ancient rift-zone of Piton des Neiges volcano. Samples of rocks were collected during both dredges. Three other dredges were operated on the Piton de la Fournaise rift-zones. Two dredges were realized on the southern ridge of the NE rift-zone (Ride des Anniversaires), one near the base (many good samples) and one near the top (successful but only two samples). The target of the third dredge was the northern part of the SE rift-zone. In spite of difficult conditions, two samples were collected. On Sunday 13 January, two other dredging operations were successfully conducted on huge seamounts located 170 km westward La Reunion, one seamount already dredged on January 3rd (henceforth called « Lasso ») and the “Moustik” seamount, which is 3200 m high !

The last cruise days were devoted to the mapping of the Mafate dep-sea fan off the NW side of La Réunion Island (see map below).

Technical report

Multibeam System EM120 of the R.V. Meteor

The main characteristic of the deep water sounding system Kongsberg EM120 is a coverage angle of up to 150°, which results in a depth profile with a length of approx. 6 times the water depth perpendicular to the ship's long axis. Depending on the water depth the swath width needed to be reduced to approx. 60° in depths between approx. 2000 m and 5000 m. The acoustic signal, generated by the hull mounted transducer, has a main operational frequency of 12 kHz (frequencies in the range of 11.25 to 12.60 kHz are employed to code the different transmit sectors) and allows measurement up to full ocean depth. Based on the acoustic pulse 191 depth measurements with minimum beam width of about 1° x 2° (in medium and deep water modes) and an accuracy of < 1% of water depth were derived. In addition, the echo amplitude is converted to multibeam sidescan and angular backscatter data.

To correct the refraction of the sonar signal on its way through the water column sound velocity profiles were used, gathered with profiling measurements utilizing the sound velocity probe SvPlus V2 (SN 3498, manufactured by Applied Microsystems Ltd.). To assign the depth measurement to a geographic position, the GPS navigation of the C-NAV GPS system and the ships heading of the fiberoptic compass (NAVIGAT 2100) was used. The ship's motion data to correct the depth measurement for pitch, roll and heave of the vessel were supplied by the Seatex MRU 5 motion sensor.

Piston Cores

- Piston Corer: Kullenberg type, 10 m or 5 m long corer, lest of 2,75 T, 5 m of free fall.
  Core diameter 125 mm
  Pilot core recuperation (1 m long pilot corer)
- IFREMER interface corer: 1 m long

Pilot corer

Piston corer

Interface corer

<u>Core quality</u>

- Good sampling of 40-50 cm thick sand accumulation with a relatively good penetration (most of cores collected with 10 m long corer are more than 6 m long).
- Flowage and piston effect at the base of the most sand rich cores.

- Good sampling of interface with the pilot corer

Work and processes onboard

- Core opening
- Photographs
- Description: - Lithology, sediment type, grain size
  - Sedimentary structure (lamination, sorting, ripples, grading)
  - Preliminary interpretation in terms of sedimentary facies and sequences
  - First evaluation of microfauna and mineralogy

- Collecting slices of sediment (1 cm thick and 7 cm wide) along the core sections for X-Ray Radiography (Scopix). Photographs of thin slices.
  X-Ray images will be acquired at the University of Bordeaux 1

Core opening

Core description

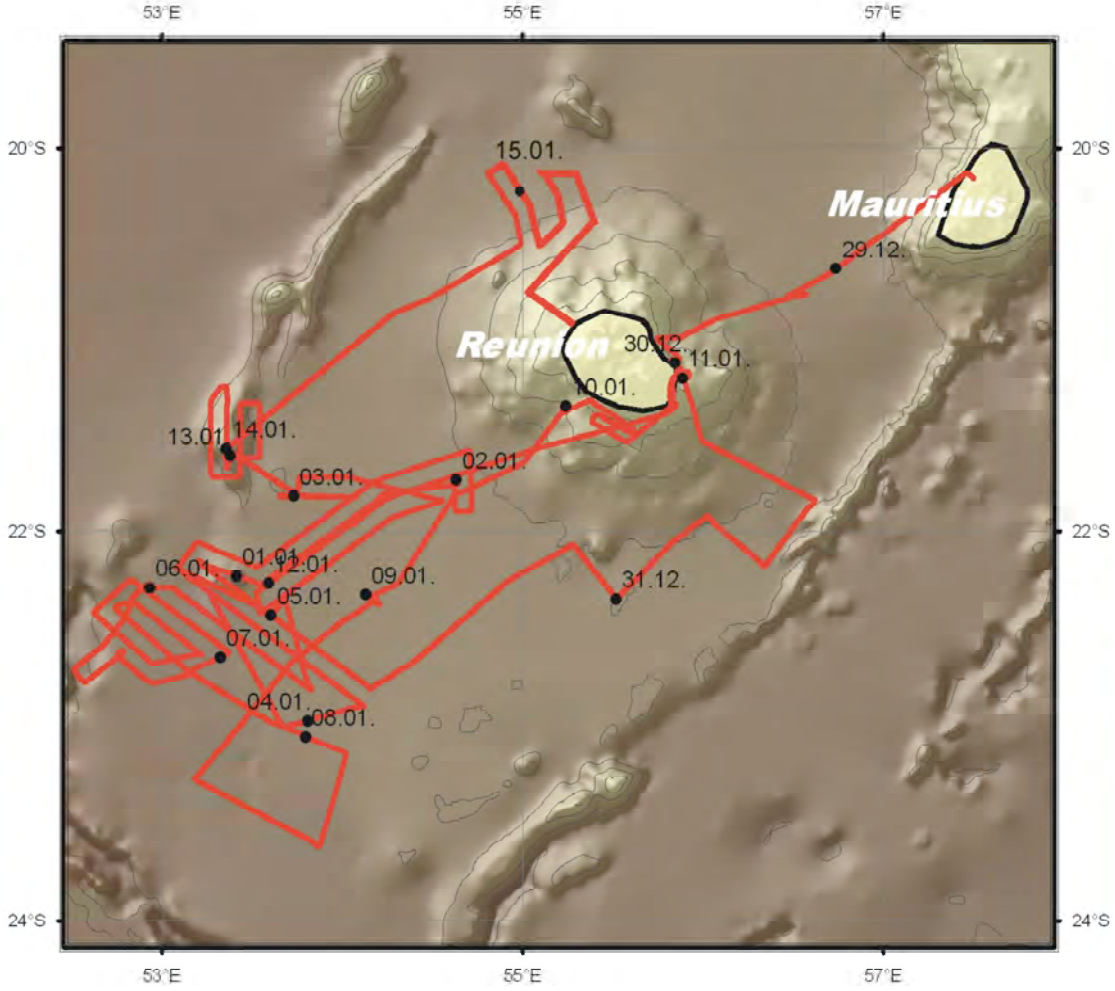
Recapitulative table of piston cores collected during ERODER2

Name and Core Type	**Lat (S)**	**Long (E)**	**Prof** (m)	**Location**	**Pilot recup**	**Length** descrip
KERO-08	S22°20.89	E55°31.12	4126	Distal area, "Les Remparts" Fan	0	6.59
KERO-09	S22°16.347	E53°33.060	4460	Levee, "Occidental Cilaos" Fan	0.91	6.27
KERO-10	S21°50.902	E54°11.00	4346	Channel floor, Occ. Cilaos Fan	0	0
KERO-11	S21°42.31	E54°37.29	4164	Sediment Wave, Up. Cilaos Fan	0	2.65
KERO-12	S22°23.550	E53°32.752	4461	Distal levee, Occ. Cilaos Fan	0.89	6.40
KERO-13	S22°25.98	E53°36.36	4407	Channel floor, Occ. Cilaos Fan	0	0.98
KERO-14	S22°20.50	E53°40.88	4439	Channel floor, Occ. Cilaos Fan	1.01	3.47
KERO-15	S22°17.39	E52°56.10	4529	Distal levee, Occ. Cilaos Fan	0.92	6.68
KERO-16	S22°19.51	E54°07.78	4340	Levee, Central Cilaos Fan	0.71	4.95
KERO-17	S22°22.540	E54°12.267	4353	Channel floor, Cent. Cilaos Fan	?	5.34
KERO-18	S21°22.00	E55°15.22	2056	Canyon floor, St Etienne canyon	sample	sample
IERO-19	S21°22.873	E55°13.669	2221	Canyon floor, St Etienne canyon	0	0
KERO-20						

Cumulated length of piston cores and pilot cores: **47.77 m**
KERO: Kullenberg core (KEROP for the pilot core of the Kullenberg), IERO: Interface corer
KERO-01 to KERO-07 were cores collected during ERODER 1 cruise in 2006.

14 dredging operations had been conducted on seamounts on East and South-West of La Réunion Island.

Cumulated length of geophysical profiles (3900 km)



Geophysical Log **Meteor M75-1 "ERODER2"**

Date	Time	Area	File	Depth	Angle	Comment
29/12/2007	15:00	Transit	1		60/60	start multibeam recording with SVP "M74-4_fuerKongsberg"
29/12/2007	22:56	ERO2-01 NE off Re	11	4233	60/60	start profile ERO2-01, spacing "IN BETWEEN", HDT heading source
30/12/2007	1:19	ERO2-01 NE off Re	15	3600	60/60	change svp profile to "071229_handthinned"
30/12/2007	1:48	ERO2-01 NE off Re	16	3400	60/60	change svp profile to "071229_handthinned2"
30/12/2007	2:44	ERO2-01 NE off Re	17	3300	60/60	passing point C
30/12/2007	4:12	ERO2-01 NE off Re	19	2707	60/60	passing point D
30/12/2007	5:07	ERO2-01 NE off Re	19	1188	60/60	passing point E / end of profile ERO2-01
30/12/20	6:28	EastCoast	22	1841	60/60	wrong seabottom detection, data not usable!

07		Reunion				
30/12/20	10:00	EastCoast	26	1300	60/60	wrong seafloor detection ends without help
07		Reunion				
30/12/20	12:50	EastCoast	28	900	50/50	dredge operation #1158 DR03
07		Reunion				
30/12/20	15:48	EastCoast	32	750	50/50	start transit after loosing dredge
07		Reunion				
30/12/20	18:30	ERO2-02 SE	35	2800	60/60	start profile ERO2-02 #1159
07		off Re				
30/12/20	19:00	ERO2-02 SE	36	3000	60/60	stopover for interference test with PS for approx. 5
07		off Re				min
30/12/20	23:30	ERO2-02/03	41	4087	60/60	end of profile ERO2-02 - start of proflie ERO2-03
07						
31/12/20	2:49	ERO2-03	45	4113	40/40	end of profile ERO2-03 - curve
07						
31/12/20	2:54	ERO2-03/04	46	4113	60/60	start of profile ERO2-04
07						
31/12/20	5;27	ERO2-04	48	3965	60/60	Passing Waypoint L
07						
31/12/20	5:56	ERO2-04	50	3850	60/60	end of profile #1159 ERO2-04 - curve-transit to
07						coring point
31/12/20	9:29	130km South		4124	60/60	coring point Ker08
07		of Re				
31/12/20	12:50	130km South	57	4127	60/60	change time in data to UTC and heading input to
07		of Re				motion sensor
31/12/20	13:31	ERO2-05	58	4127	60/60	start profile ERO2-05 #1161
07						
31/12/20	16:15	ERO2-05	61	4054	60/60	end profile ERO2-05 - start profile ERO2-06 (start
07						turning)
31/12/20	19:15	ERO2-05/06	64	4256	60/60	passing waypoint
07						
31/12/20	21:45	ERO2-06	66	4297	57/57	5 satellites only, change to ping mode "medium" to
07						reduce artefacts
1/1/2008	0:10	ERO2-06	68	4312	57/57	passing waypoint
1/1/2008	2:10	ERO2-08/07	71	4337	57/57	end profile ERO2-06 - start profile ERO2-07 (start turning)
1/1/2008	10:38	ERO2-07	80	4476	57/57	end survey #1161 ERO2-07 - transit to coring station
1/1/2008	13:00	SW Reunion	83	4473	57/57	end transit at coring station #001 KERO-09
1/1/2008	22:18	ERO2-08	93	4461	57/57	start profile ERO2-08 #003
1/1/2008	23:40	ERO2-08	94	4395	57/57	ping mode "deep" to get coverage and good quality, 4 sat's only
2/1/2008	1:30	ERO2-08	97	4390	55/55	change of angle from 57 to 55
2/1/2008	4:15	ERO2-08	100	4348	55/55	end of profile ERO2-08 - Coring station
2/1/2008	8:08	ERO2-09	112	4346	55/55	start profile ERO2-09 #005
2/1/2008	8:30	ERO2-09	114	4236	60/60	open the angle
2/1/2008	10:49	ERO2-09	114	4236	57/57	reduce the angle
2/1/2008	11:23	ERO2-09	115	4197	45/45	reduce the angle and ping mode "very deep"
2/1/2008	11:48	ERO2-09	116	4100	45/45	stop survey and transit to coring station
2/1/2008	14:16	West Reunion	119	4163	45/45	new SVP: 080101, no change in water depth, SV 1538.2 to 1539.8
2/1/2008	15:54	ERO2-10	121	4164	52/52	start profile ERO2-10 #007
2/1/2008	17:39	ERO2-10/11	123	4161	45/45	end profile 10, start profile 11
2/1/2008	18:26	ERO2-11/12	124	4132	52/52	end profile 11, start profile 12

2/1/2008	19:24	ERO2-12	124	4111	57/57	ping mode "deep" to get coverage (limited to 52 deg in "very deep")
2/1/2008	20:50	ERO2-12	126	4046	57/57	ping mode "medium" (to get better side scan images)
2/1/2008	21:00	ERO2-12/13	127	4015	57/57	end profile 12, start profile 13
03/01/08	1:13	ERO2-13/14	132	4333	57/57	end profile 13, start profile 14
03/01/08	2:23	ERO2-14/15	134	4356	57/57	end profile 14, start profile 15
03/01/08	5:30	ERO2-15	138	4190	57/57	end profile 15,turn
03/01/08	5:52	West Reunion DR4	139	4708	57/57	transit to dredge point ERO2 DR4
03/01/08	6:35	West Reunion DR4	140	3105	57/57	dredge station ERO2 DR4
03/01/08	14:38	ERO2-16	150	1955	57/57	start profile ERO2-16 #0010 same way back as 15 heading east
03/01/08	16:06	ERO2-16	152	4323	50/50	start calibration segment (way back of line 134), ping mode "deep"
03/01/08	17:05	ERO2-16	153	4356	50/50	end of calibration segment and profile 16, turn needs 30 Minutes
03/01/08	17:36	ERO2-16/17	154	4355	57/57	start profile 17, ping mode "medium"
03/01/08	22:38	ERO2-17/18	154	4444	57/57	end profile 17, start profile 18
04/01/08	1:22	ERO2-18/19	163	4527	57/57	end profile 18, start profile 19
04/01/08	2:47	ERO2-19/20	165	4524	57/57	end profile 19, start profile 20
04/01/08	3:44	ERO2-20	165	4509	55/55	rough sea, difficult to stay on profile
04/01/08	4:39	ERO2-20/21	167	4371	55/55	course change / end profile 20, start profile 21
04/01/08	10:58	ERO2-21	174	4465	55/55	end profile 21, ping mode "deep"
04/01/08	12:50	Transit to Pr. 22	175	4373	55/55	test: reducing speed to 5 kn to get better quality
04/01/08	13:25	Transit to Pr. 22	176	4373	55/55	test: set yaw stabilization ON, heading filter medium
04/01/08	14:08	Transit to Pr. 22	177	4324	55/55	test: set ping mode "medium"
04/01/08	15:16	Transit to Pr. 22	178	4315	55/55	test: set yaw stabilization OFF
04/01/08	15:22	ERO2-22	179	4315	57/57	start profile 22 #0011 heading north west, speed 8 kn
05/01/08	1:54	ERO2-22	190	4523	57/57	end profile 22/ heading 358, speed 6
05/01/08	2:20	Transit to KERO 12	191	4512	57/57	start transit to KERO 12
05/01/08	6:15	on station KERO 12	194	4460	57/57	reach KERO 12 #0012
05/01/08	10:20	on station KERO 13	199	4469	57/57	reach KERO 13 #0013
05/01/08	15:08	transit	203	4468	50/50	transit/ speed 10.5
05/01/08	15:36	transit	203	4455	50/50	ping mode "deep"
05/01/08	15:58	on station KERO-14	204	4440	50/50	ping mode "medium"
05/01/08	20:41	Transit to ERO2-23	210	4444	55/55	start Transit to ERO2-23 Survey
05/01/08	21:40	Transit to ERO2-23	210	4381	50/50	reducing opening angle bec. loss of outer beams bec. full speed
05/01/08	23:30	Transit to ERO2-23	213	4414	57/57	opening angle
06/01/08	0:30	ERO2-23	214	4410	57/57	start profile ERO2-23 #0015
06/01/08	2:20	ERO2-23	216	4425	57/57	slowing to pick up magnetometer (3 n)

06/01/08	5:21	ERO2-23	21?	4258	57/57	magnetomer at sea
06/01/08	5:28	ERO2-23	219	4429	57/57	stabilisation to 6n (after slowing for magnetometer)
06/01/08	9:14	ERO2-23/24	222	4527	57/57	end profile ERO2-23 - start profile ERO2-24
06/01/08	10:34	ERO2-24	226	4528	57/57	end profile ERO2-24 - start positioning for coring
06/01/08	14:45	KERO-15	231	4529	57/57	end of coring - transit towards ERO-25
06/01/08	16:25	ERO2-25	233	4376	57/57	start profile ERO2-25 #0017
06/01/08	16:48	ERO2-25	233	4500	55/55	reduce opening angle bec bad data
06/01/08	20:38	ERO2-25	238	4529	55/55	end profile 25, start turning
06/01/08	21:01	ERO2-26	239	4529	57/57	start profile 26 #0018
06/01/08	23:11	ERO2-26/27	242	4474	57/57	end profile ERO2-26 - start profile ERO2-27 #0018
07/01/08	2:46	ERO2-28	246	5469	57/57	end profile ERO2- 27-start profile ERO2-28
07/01/08	4:58	ERO2-28	249	4276	57/57	mode medium for seabed image (after 9mn in deep mode)
07/01/08	5:12	ERO2-28/29	250	4231	57/57	end profile ERO2- 28 /turn/ direction profil ERO2-29
07/01/08	5:25	ERO2-28/29	251	4178	57/57	start profile ERO2-29
07/01/08	8:30	ERO2-29			55/55	change station number to #0019
07/01/08	10:55	ERO2-29			55/55	change station number to #0020
07/01/08	11:33	ERO2-29	258	4508	55/55	end profile ERO2-29
07/01/08	11:37	ERO2-30	259	4500	57/57	start profile ERO2-30
07/01/08	13:38	ERO2-30	262	4572	57/57	end profile ERO2-30
07/01/08	13:43	ERO2-31	263	4572	57/57	start profile ERO2-31
07/01/08	17:45	transit to ERO2-32	268	4184	57/57	end profile ERO2-31 transit to next profile
07/01/08	18:30	ERO2-32	?	4100	55/55	start profile ERO2-32, no new line :(
07/01/08	20:16	ERO2-32	271	4816	57/57	change angle
07/01/08	20:45	ERO2-32	271	4927	57/57	passing waypoint
07/01/08	22:15	transit to ERO2-33	274	4926	57/57	end profile 32 transit to 33
07/01/08	22:50	ERO2-33	275	5024	55/55	start profile ERO2-33
08/01/08	0:20	ERO2-33	276	4480	50/50	reducing speed to 6 kn bec bad data
08/01/08	1:03	ERO2-33	278	4330	50/50	end profile 33 (extended to avoid gap)
08/01/08	1:12	ERO2-33	279	4350	50/50	end of turn, transit to startpoint but better data than first crossing
08/01/08	1:30	ERO2-34	280	4230	50/50	start turning
08/01/08	1:36	ERO2-34	281	4268	57/57	start profile ERO2-34
08/01/08	2:36	ERO2-35	284	4675	57/57	end profile 34 and start profile 35
08/01/08	5:36	ERO2-36	286	4570	57/57	end profile 35 and start profile 36
08/01/08	9:32	ERO2-36	291	4400	57/57	change station number to #0021, but same profile
08/01/08	14:04	ERO2-36	295	4257	55/55	end profil36, start turning
08/01/08	14:19	ERO2-37	295	4252	55/55	start profil 37
08/01/08	14:33	ERO2-37	295	4313	57/57	57-57 opening
08/01/08	16:02	ERO2-37	297	4478	57/57	only 2 satellites, no sat fix and no positions (until 16:18)
08/01/08	17:33	ERO2-37	299	4599	57/57	end profile 37 start turning
08/01/08	17:40	ERO2-38	300	4599	57/57	start profile 38
08/01/08	22:37	ERO2-38	305	4604	57/57	end profile 38 - start turning
08/01/08	22:41	ERO2-39	306	4610	55/55	start profile 39
08/01/08	23:18	ERO2-39	306	4610	55/55	decreasing speed to 8 kn for better quality
08/01/08	23:45	ERO2-39	307	4550	55/55	decreasing speed to 7 kn for better quality
09/01/08	0:20	ERO2-39	307	4533	53/53	decreasing speed to 6 kn for better quality
09/01/08	1:03	ERO2-39	309	4533	50/50	decreasing angle to 50 for better quality
09/01/08	5:18	ERO2-39/40	314	4440	57/57	end profil ERO 39/start profil ERO 40/ increasing angle to 57

09/01/08	7:48	ERO2-40	317	4395	57/57	start profil 41
09/01/08	9:25	ERO2-41	319	4353	57/57	end profil 41 transit to Kero-16
09/01/08	13:54	Kero 16 and 17	324	4344	57/57	start transit to Kero-17
09/01/08	14:36	Kero 17	325	4355	57/57	at station Kero-17
09/01/08	19:05	transit to profile	330	4354	57/57	end KERO-17 and transit to profile
09/01/08	19:41	ERO2-42	331	4348	55/55	start profile 42 #0024
09/01/08	19:53	ERO2-42	331		55/55	trying 7 kn
09/01/08	20:09	ERO2-42	331		55/55	trying 6.5 kn
09/01/08	20:35	ERO2-42	331		50/50	8 kn because no good mb quality possible
09/01/08	21:01	ERO2-42	333		45/45	passing waypoint
10/01/08	1:12	ERO2-43	338	4186	45/45	starting giration, passing way point and start profile 43
10/01/08	4:21	ERO2-44	342	3667	45/45	end of profile ERO2-43 - Passing waypoint- Start profile 44
10/01/08	5:41	ERO2-44	342	3105	57/57	open angle to 57/57
10/01/08	7:33	ERO2-44/DR-6	346	2095	57/57	end of profile ERO2-44 - reached dredging site DR-6 #0026
10/01/08	10:20	DR-6	349	1735	57/57	reboot operator PC and restart SIS
10/01/08	12:32	DR-7	349	1919	57/57	start logging again
10/01/08	14:12	DR-7	351	1620	30/30	end of DR-7, transit to coring point
10/01/08	19:32	ERO2-45	357	2168	57/57	start profile 45 #0029
10/01/08	20:24	ERO2-45	357	1270	75/60	change opening angle
10/01/08	20:49	ERO2-45	359	606	75/60	end profile 45, start turning, change ping mode to "shallow"
10/01/08	20:51	ERO2-46	360	565	75/60	start profile 46
10/01/08	22:00	ERO2-46	361	1000	75/75	change opening angle and ping mode medium
10/01/08	22:58	ERO2-46	363	1455	75/66	end profile 46, start turning and transit to next profile
10/01/08	23:15	ERO2-47	364	1444	70/60	start profile 47
11/01/08	0:43	ERO2-47	366	877	75/75	end profile 47, start turning and transit to next profile
11/01/08	1:11	ERO2-48	367	1423	75/75	start profile 48
11/01/08	2:47	ERO2-48-49	369	1815	75/75	end profile 48 - turning- start profile 49
11/01/08	5:05	ERO2-49-50	372	668	75/65	end profil 49- start profil 50
11/01/08	6:05	ERO2-50-51	374	615	75/65	end profil 50- start profil 51
11/01/08	6:29	ERO2-51	375	637	75/65	end profile 51 - Transit to Dredge Station DR08
11/01/08	13:08	DR-08	382	896	75/75	dredge finished and transit to start profile
11/01/08	13:30	ERO2-52	384	430	60/75	start profile ERO2-52 #0032, ping mode "shallow"
11/01/08	15:00	ERO2-52	386	764	60/75	end profile 52, slowing down for taking maggy in
11/01/08	17:35	DR-09	389	1050	60/60	end dredge, start transit to start profile
11/01/08	21:34	ERO2-53	394	3386	60/60	start profile ERO2-53 #0034
12/01/08	4:01	ERO2-53/54	401	4332	60/60	end profil ERO2 53/start profile ERO2-54
12/01/08	5:36	KERO 20	403	4359	60/60	out of profil 54 to go on coring KERO 20 waypoint
12/01/08	6:04	KERO 20	404	4360	60/60	stay on coring position KERO 20
12/01/08	6:19	ERO2-54	405	4363	60/60	coring not possible/put on magneto on water/return to profil ERO2-54
12/01/08	7:17	ERO2-54	406	4359	60/60	next part of profil ERO2-54
12/01/08	12:40	transit	412	4469	60/60	end profile ERO2-54 transit to next profile
12/01/08	13:33	ERO2-55	413	4477	60/60	start profile ERO2-55 #0035
12/01/08	13:33	ERO2-55	413	4477	60/60	start profile ERO2-55 #0035
12/01/08	20:21	ERO2-56	420	4303	57/57	end profile ERO2-55 start profile ERO2-65
12/01/08	22:12	ERO2-56	422	4217	57/57	end profile ERO2-56 start turning
12/01/08	22:18	ERO2-57	423	4220	57/57	start profile ERO2-57

13/01/08	1:43	ERO2-57-58	428	4342	57/57	end profile ERO2-57 start profile ERO2-58
13/01/08	3:24	ERO2-58	429	4135	57/57	end profile ERO2-58 take out the magneto
13/01/08	3:35	transit	430	4153	57/57	transit full speed to the dredgge point DR-11
13/01/08	7:28	transit	434	2260	57/57	transit full speed to the dredgge point DR-12
13/01/08	15:05	ERO2-59	442	2378	60/60	new sound vel prof 080113.asvp - start profile ERO2-59 #0039
13/01/08	17:47	transit	445	4591	60/60	end profile ERO2-59 transit to next profile
13/01/08	18:00	ERO2-60	447	4593	60/60	start profile ERO2-60
13/01/08	18:38	ERO2-61	449	4584	57/57	end profile ERO2-60 start profile ERO2-61
13/01/08	21:16	ERO2-62	453	4389	57/57	end profile ERO2-61 start profile ERO2-62
13/01/08	22:14	ERO2-63	455	4185	65/57	end profile ERO2-62 start profile ERO2-63
14/01/08	0:42	ERO2-64	459	4304	65/57	end profile ERO-63 start profile ERO2-64
14/01/08	1:10	ERO2-64	459	4119	60/60	profile ERO2-64
14/01/08	1:23	ERO2-65	460	4250	60/60	end profile ERO2-64 start profile ERO2-65
14/01/08	3:20	ERO2-66	462	4189	60/60	end profile ERO2-65 start profile ERO2-66
14/01/08	4:25	ERO2-66	463	1904	60/60	end profile ERO2-66/station on dregde point DR13
14/01/08	13:40	ERO2-67	474	1766	60/60	start profile ERO2-67 put maggy to water #0042
14/01/08	21:13	ERO2-67	482	4350	57/57	passing waypoint
14/01/08	22:26	ERO2-67	484	4259	57/57	passing waypoint
15/01/08	2:15	ERO2-67/68	488	3832	57/57	end profile ERO2-67 start profile ERO2-68
15/01/08	3:48	ERO2-68/KERO-20	490	4287	57/57	leave profile route to position for KERO-20
15/01/08	4:12	ERO2-68/KERO-20	491	4327	57/57	stop profile ERO2-68 / station for coring
15/01/08	7:54	KERO-20	495	4320	57/57	end coring operation / transit back to profile
15/01/08	8:29	ERO2-68	495	4300	57/57	start profile ERO2-68 part 2 #0044
15/01/08	10:29	transit	499	4464	57/57	end profile ERO2-68