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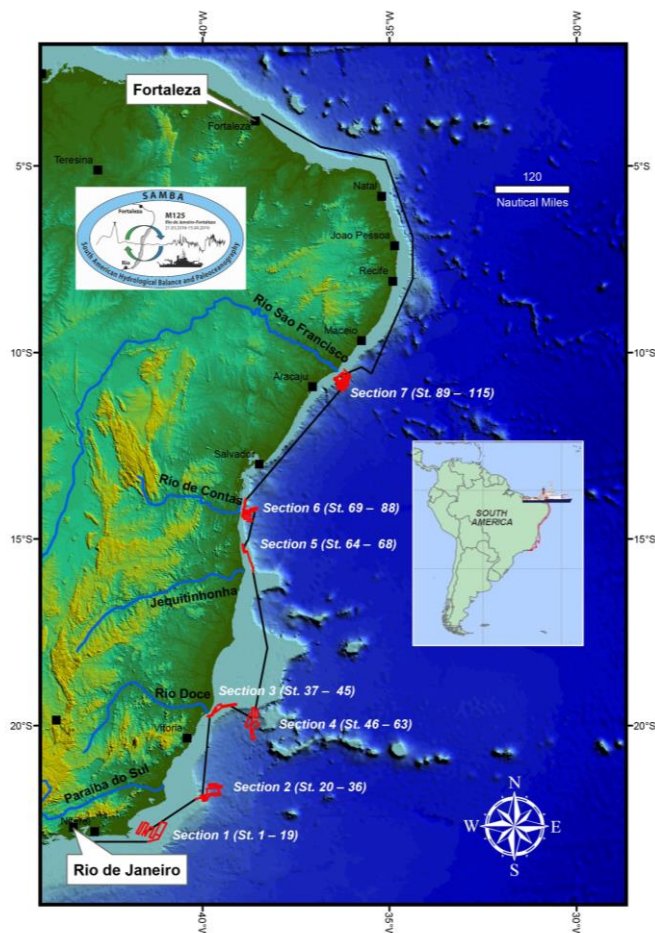
Short Cruise Report M125

Rio de Janeiro (Brazil) – Fortaleza (Brazil)

March 21 – April 15, 2016

Chief Scientist: André Bahr

Captain: Rainer Hammacher



Objectives

The main scientific objective of R/V METEOR cruise M125 was to investigate the influence of changes in ocean circulation and insolation on the continental climate in eastern Brazil. The hydrological cycle in this region strongly depends on the intensity of the South American Summer Monsoon and the latitudinal migration of the Intertropical Convergence Zone. Especially in NE Brazil, precipitation is extremely seasonal with a long (8 months) draught season and a short rainy season. The long dry season make this region highly sensitive to changes in the rainfall amount with potentially severe effects on the terrestrial ecosystems, agriculture and energy supply (90% of Brazil's energy derives from water power). Considering that NE Brazil currently experiences historic droughts, there is an urgent need to better understand the natural climate variability in this region. With the material gathered during METEOR expedition M125 cruise we aim to get insights into the climate dynamics of the past to shed light on the forcings and feedbacks within the South American climate system.

Existing paleo-records demonstrate that orbitally forced modulation of solar irradiation and changes in the mode of the oceanic circulation lead to abrupt shifts in the regional distribution of precipitation. This is evident for the Holocene, and is expressed by large-scale fluctuations during the late Pleistocene. While there is ample evidence for the North Atlantic ocean mitigating climate change in South America, the degree of this northern-hemisphere impact varies strongly between different records. Hence, the spatial expression of the past climate changes as well as the response time of the terrestrial and marine ecosystems to the external forcing are far from being understood.

In the light of the above, we specifically focus on three major aspects within the framework of the M125 cruise:

Topic 1: The sensitivity of the hydrological cycle and environment in Eastern Brazil to external forcing.

Topic 2: What drives surface and deep water mass variability off eastern Brazil, and what is the influence of low- and high-latitudes forcing?

Topic 3: How do strong bottom currents on the Eastern Brazilian margin influence sediment transport, and what drives bottom current variability?

We aim on integrating climatic proxies of terrestrial and marine origin on the same material to develop a comprehensive picture of the climate dynamics in E Brazil. For this purpose, sediment cores from the shelf and continental slope off eastern Brazil (10°S – 23°S) have been obtained. We focused on seven research areas adjacent to the debouchments of the Paraiba do Sul, Rio Doce, Rio Jequitinhonha, Rio de Contas and Rio Sao Francisco. The particular location close to river mouths allows for obtaining terrestrial signals in marine sediment cores, while the N-S extension covered by all sites will provide insights into the spatial variability of past climate change. Additionally, a comprehensive surface sediment, water and plankton sampling program was conducted for a precise local proxy calibration.

Narrative

In the morning of the 21st of March 2016 the R/V METEOR left the port of Rio de Janeiro. As during the entire cruise, the weather conditions were excellent with only sporadic showers but generally calm seas. The first station off Cabo Frio was reached after 9 hours of transit. As in all following research areas we conducted multibeam/Parasound (MBPS) pre-site surveys during the night in the search for accumulations of muddy sediments as coring targets. Subbottom profiling indicates that the shelf off Cabo Frio is dominated by coastal dune-like and channel-fill deposits likely of Pleistocene age with a thin (approx. 2-4 m) Holocene veneer of muddy-sandy sediments. We successfully deployed the multicorer (MUC), however, during 9 attempts of gravity coring, recovery never exceeded 1.40 m, and cores were severely disturbed. Apparently, the low recovery is likely due to the indurated and coarse grained-sediment texture. In addition to sediment sampling, we routinely deployed the CTD to get insights into the water column structure and to sample water. As during the following days until the end of the voyage, we took samples from the ship's pump for plankton filtering twice a day, between 8–10 am and 5–7 pm, respectively. On the 24th March, we started a downslope echosounder transect at the slope off the Paraíba do Sul. Aside of channel/levee systems and drapes of hemipelagic sediments we found mound-like structures concentrated in a patch in about 850 to 870 m water depth, with occasional strong acoustic backscatter on the top. Box coring confirmed the presence of dead cold water corals on the top of these structures. Further, we took 3 gravity cores on the slope, accompanied by MUC, CTD, and multinet deployments.

On the 28th March we entered the area on the shelf south of the Doce River mouth. MBPS surveys on the shelf indicated a blanket of up to 8 m of Holocene sediments. We deployed in total three gravity cores, complemented by MUC and CTD casts in varying distances to the river mouth. Surface samples close to the river mouth clearly showed the presence of reddish clay on top (max thickness: 4 cm) that relates to the collapse of a dam of an ore mine in the upper reaches of the Rio Doce in November 2015, which lead to the discharge of enormous amounts of heavy metal-enriched sediment and water into the sea. Strict measures have been taken to avoid contamination of man and material by this potentially hazardous mud.

On the 29th March we steamed to the fourth working area, the southern slope of the Abrolhos Bank east off the Rio Doce. Here, we successfully deployed 6 gravity and piston cores on the slope, that based on the preliminary shipboard stratigraphy comprise sediments with a maximum age of approx. 250 kyrs. As in the previous sections, coring was complemented by CTD and MUC casts, as well as multinet hauls in station deeper than 700 m.

On the 2nd of April we steamed to the shelf off the Rio Jequitinhonha (Section 5) where we concentrated on finding a suitable coring position on the shelf. On April 3rd, after the successful retrieval of 5 m of Holocene mud, we steamed further northward to the shelf and slope off the Rio de Contas. The very narrow shelf and steep slope made the identification of undisturbed sediment packages challenging, however, after long MBPS pre-site surveys we obtained 5 cores on the slope and one on the shelf. As the de Contas delivers only limited suspension load, both shelf and slope are characterized by low sedimentation rates. While this prohibits high resolution studies (at least on the slope), the cores from the deeper slope (ca. 2000 m water depth) appear to comprise continuous sediment records of the last almost 900 kyrs.

After steaming for 22 h, we arrived our final research area off the Rio Sao Francisco on April 7th. It turned out the shelf in this area had the thickest Holocene sediment cover of all

research areas (almost 20 m). This is in accordance with the Sao Francisco being the biggest river in terms of sediment and water load we investigated during the M125 cruise. Hence, we had no problems to sample surface sediment and obtained an almost 8 m long gravity core on the shelf. Contrary, the slope exhibited a very active topography, with abundant channel-levee systems and only limited places of undisturbed, continuous hemipelagic sedimentation. Finally, we obtained a total of 5 cores on the slope retrieving sediment of the last glacial period. On a NW-SE trending ridge between deeply incised channels, we further identified a position with potential cold water mounds on top of a pinnacle (927 m) with high acoustic backscatter. This site (M125-107) was probed via box corer, however, without retrieving coral specimens. One reason for not retrieving corals might be that the required exact positioning of the corer was impeded by strong bottom currents and a non-functioning POSIDONIA transponder. After completing our last station, we started with steaming to Fortaleza at 12:30 am on the 11th. We arrived at Fortaleza in the morning of the 14th April, and after one day on anchorage, entered the harbor at 8:30 am on the 15th, where we could start with unloading our samples and equipment.

Acknowledgements

We would like to express our gratitude to Captain Rainer Hammacher and his team of the RV METEOR. Their great support and expertise made this cruise a successful voyage. We thank Joachim Schönfeld, Martin Frank, Dirk Nürnberg, and Jutta Heinze (GEOMAR) for their immense help during the preparation of the cruise. Leitstelle Deutsche Forschungsschiffe, Reederei Briese, and LPL/Klaus Bohn, and Ira Weigert (Contiways) have provided great logistic and organizational support. We finally would like to thank the Brazilian authorities for their permissions to work in their national waters and the German Federal Foreign Office for pathing the diplomatic ways for obtaining the research permissions and visa.

M125 Participants

Name	Discipline	Institution
1. André Bahr	Fahrtleiter / Chiefscientist	UH
2. Silke Voigt	Sedimentology	GUF
3. Ana Luiza Spadano Albuquerque	Paleoceanography	UFF
4. Stefan Reissig	Paleoceanography	GEOMAR
5. Sietske Batenburg	Paleoceanography	OXF
6. Philipp Munz	Paleoceanography	TÜ
7. Nancy Taniguchi	Paleoceanography	USP
8. Igor Martins Venancio	Paleoceanography	UFF
9. Ulrich Sebastian	Mapping, GIS	FST
10. Lisa Egger	Geology	UH
11. Tobias Fischer	Geology	UH
12. Alexander Wachholz	Geology	GUF
13. Julia Hoffmann	Paleoceanography	GUF
14. Jacek Raddatz	Paleoceanography	GUF
15. Stephanie Kusch	Water geochemistry	UC
16. Rut Diaz Ramos	Pore water chemistry	UFF
17. Maria Carolina Catunda	Geochemistry	USP
18. Eva Niedermeyer	Organic geochemistry	BIK-F
19. Margret Beyer	Technician, multinet	TÜ
20. Alessandro Conforti	Geophysics	IAMC
21. Anne Osborne Grüne	Water geochemistry	GEOMAR
22. Barbara Hennrich	Micropaleontology	UH
23. Nicolò Ardenghi	Organic geochemistry	BIK-F
24. Bruna Borba Dias	Micropaleontology	UFF
25. Sandra Jivcov	Organic geochemistry	UC
26. Kenji Hatsukano	Sedimentology	UH
27. Florian Evers	Technician	GEOMAR
28. Tenente Jose Celso	Observer	
29. Andreas Wolfgang Raeke	Bordwetterwarte	DWD

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Stations

Station No.		Date	Gear	Time	Latitude	Longitude	Water Depth	Remarks/Recovery
METEOR	M125-			[UTC]	[°N]	[°W]	[m]	
Off Cabo Frio								
403-1	1-1	21/03/16	CTD	21:49	23°06.704'	041°28.719'	80.1	9 bottles
404-1	2-1	21/03/16-22/03/16	MBPS	10:05	22°51.084'	041°15.002'	70.0	first file: SLF1603212202, last file: SLF1603220933
	3-1	22/03/16	Pump	14:49	22°51.546'	041°05.583'	79.0	
406-1	4-1	22/03/16	CTD	11:28	22°51.345'	041°05.585'	78.4	7 bottles
406-2	4-2	22/03/16	VVG	11:53	22°51.546'	041°05.584'	79.2	samples: forams, trace elements, biomarker; fauna on sediment surface
406-3	4-3	22/03/16	MUC	12:54	22°51.545'	041°05.585'	79.6	number of filled tubes: 11
406-4	4-4	22/03/16	GC	14:50	22°51.546'	041°05.583'	79.5	liner length: 5m; recovery: 1m
407-1	5-1	22/03/16	CTD	n/a	n/a	n/a	n/a	14 bottles
407-2	5-2	22/03/16	VVG	17:30	23°04.774'	041°21.378'	80.9	EMPTY
407-3	5-3	22/03/16	VVG	17:45	23°04.774'	041°21.377'	80.6	stopped at 61 m rope length; samples: trace elements, forams, biomarker, forams (Munz, test sample)
407-4	5-4	22/03/16	MUC	18:18	23°04.773'	041°21.379'	81.0	number of filled tubes: 12
408-1	6-1	22/03/16	VVG	19:27	23°06.204'	041°26.780'	80.7	samples: biomarker, forams, trace elements, forams (Munz)
408-2	6-2	22/03/16	MUC	19:49	23°06.204'	041°26.781'	80.5	number of filled tubes: 12
408-3	6-3	22/03/16	GC	21:48	23°06.204'	041°26.782'	79.8	no recovery
408-4	6-4	22/03/16	GC	20:57	23°06.204'	041°26.780'	79.8	no recovery
	7-1	22/03/16	Pump	20:08	23°06.204'	041°26.780'	81.5	
409-1	8-1	22/03/16	CTD	23:42	22°55.972'	041°38.287'	62.7	4 bottles
410-1	9-1	22/03/16-23/03/16	MBPS	11:45	22°54.116'	041°16.500'	85.0	first file SLF163222353; last file SLF163221145
	10-1	23/03/16	Pump	13:17	22°37.315'	041°27.945'	47.6	
411-1	11-1	23/03/16	CTD	12:56	22°37.317'	041°27.944'	46.2	4 bottles
411-2	11-2	23/03/16	MUC	13:11	22°37.314'	041°27.945'	46.6	number of filled tubes: 11
411-3	11-3	23/03/16	GC	13:50	22°37.314'	041°27.945'	46.9	no recovery
411-4	11-4	23/03/16	GC	14:18	22°37.315'	041°27.944'	48.2	no recovery
412-1	12-1	23/03/16	CTD	15:25	22°42.399'	041°29.642'	52.8	
412-2	12-2	23/03/16	MUC	15:42	22°42.395'	041°29.651'	52.4	number of filled tubes: 12
	13-1	23/03/16	Pump	20:14	22°44.730'	041°31.077'	54.7	
413-1	14-1	23/03/16	CTD	16:20	22°44.731'	041°31.077'	54.7	no samples
413-2	14-2	23/03/16	MUC	16:46	22°44.728'	041°31.078'	55.7	number of filled tubes: 12
413-3	14-3	23/03/16	GC	17:28	22°44.729'	041°31.078'	55.9	no recovery
414-1	15-1	23/03/16-24/03/16	MBPS	07:52	22°57.713'	041°08.533'	90.0	first Parasound file: SLF1603232147; last Parasound file: SLF1603240733
416-1	16-1	24/03/16	CTD	09:06	22°54.932'	041°17.234'	69.6	6 bottles
416-2	16-2	24/03/16	MUC	09:22	22°54.932'	041°17.233'	69.4	number of filled tubes: 12
416-3	16-3	24/03/16	GC	10:02	22°54.930'	041°17.228'	69.2	core length: 1.4m
	17-1	24/03/16	Pump	13:35	22°49.263'	041°27.739'	58.2	
417-1	18-1	24/03/16	CTD	10:56	22°50.544'	041°21.340'	60.5	2 bottles
417-2	18-2	24/03/16	GC	11:15	22°50.544'	041°21.341'	60.8	no recovery
417-3	18-3	24/03/16	MUC	11:43	22°50.545'	041°21.340'	60.1	number of filled tubes: 12
418-1	19-1	24/03/16	CTD	12:36	22°49.261'	041°27.738'	58.5	2 bottles
418-2	19-2	24/03/16	MUC	12:47	22°49.263'	041°27.739'	58.6	number of filled tubes: 11
418-3	19-3	24/03/16	GC	13:23	22°49.263'	041°27.735'	58.3	no recovery
Off Paraiba do Sul								
	20-1	24/03/16	Pump	20:36	22°10.484'	040°30.475'	63.0	
419-1	21-1	24/03/16	CTD	23:18	21°58.375'	040°11.130'	64.0	
420-1	22-1	24/03/16-25/03/16	MBPS	11:37	21°53.170'	040°04.00	605.0	first file: SLF160324329; last file: SLF1603251124
	23-1	24/03/16	Pump	13:25	21°55.927'	039°54.122'	870.7	

421-1	24-1	25/03/16	CTD	13:25	21°55.927'	039°54.122'	870.0	12 bottles
421-2	24-2	25/03/16	BC	14:24	21°55.927'	039°54.121'	871.2	samples: 3x surface samples Brazil, 2x surface samples Munz, 2x Liner Raddatz
421-3	24-3	25/03/16	GC	16:04	21°55.930'	039°54.097'	869.3	core length: 6.86m
422-1	25-1	25/03/16	CTD	17:43	21°51.461'	039°53.181'	954.4	13 bottles
422-2	25-2	25/03/16	MUC	18:44	21°51.533'	039°53.065'	961.0	number of filled tubes: 11
422-3	25-3	25/03/16	PC	20:28	21°51.533'	039°53.065'	961.3	tool not deployed due to technical failure
422-4	25-4	25/03/16	GC	21:57	21°51.534'	039°53.064'	959.3	core length: 6.52m
	26-1	25/03/16	Pump	20:51	21°51.534'	039°53.065'	958.5	
423-1	27-1	25/03/16-26/03/16	MBPS	09:39	21°33.440'	039°38.295'	n/a	first file: SLF1603252337. last file: SLF1603260939
	28-1	26/03/16	Pump	13:11	21°48.764'	039°32.025'	2018.1	
424-1	29-1	26/03/16	CTD	12:38	21°48.763'	039°32.024'	2017.7	24 bottles
424-2	29-2	26/03/16	MN	13:27	21°48.760'	039°32.020'	2017.0	shallow cast: 100-80m, 80-60m, 60-40m, 40-20m, 20-0m; samples to be stored in Tübingen; preserved with ethanol
424-3	29-3	26/03/16	MN	14:24	21°48.760'	039°32.020'	2017.0	deep cast: 700-500m, 500-300m, 300-200m, 200-100m, 100-0m; samples to be stored in Tübingen; preserved with ethanol
424-4	29-4	26/03/16	CTD	16:04	21°48.761'	039°32.024'	2018.0	16 bottles
424-5	29-5	26/03/16	MN	16:29	21°48.760'	039°32.020'	2018.0	shallow cast: 100-80m. 80-60m, 60-40m, 40-20m, 20-0m; samples to be stored in Kiel; preserved with ethanol
424-6	29-6	26/03/16	MN	17:26	21°48.740'	039°32.070'	2018.0	deep cast: 700-500m, 500-300m, 300-200m, 200-100m. 100-0m; samples to be stored in Kiel; preserved with ethanol
424-7	29-7	26/03/16	PC	18:34	21°48.729'	039°32.029'	2020.7	tool not deployed due to technical failure
424-8	29-8	26/03/16	GC	20:16	21°48.732'	039°32.030'	2019.0	length <5.52 m
424-9	29-9	26/03/16	MUC	21:59	21°48.731'	039°32.029'	2023.8	number of filled tubes: 9
	30-1	26/03/16	Pump	20:12	21°48.732'	039°32.030'	2019.2	
425-1	31-1	26/03/16	CTD	n/a	n/a	n/a	n/a	9 bottles
425-2	31-2	27/03/16	MUC	01:43	21°49.328'	039°41.861'	1875.1	number of filled tubes: 9
426-1	32-1	26/03/16-27/03/16	MBPS	13:05	21°51.464'	039°52.920'	30.0	
	33-1	27/03/16	Pump	13:18	21°59.955'	039°52.653'	1329.9	
427-1	34-1	27/03/16	BC	14:32	21°56.959'	039°53.113'	873.5	samples: 3x coral samples (Raddatz), 2x Liner, 3x surface samples Brazil, 1x surface sample Munz, 1x surface sample Niedermeyer
427-2	34-2	27/03/16	GC	15:40	21°56.957'	039°53.117'	866.3	core length: 5.83m; no samples (corals)
428-1	35-1	27/03/16	CTD	n/a	n/a	n/a	n/a	7 bottles
428-2	35-2	27/03/16	MUC	17:46	21°53.607'	040°00.281'	429.4	number of filled tubes: 10
428-3	35-3	27/03/16	GC	18:42	21°53.606'	040°00.279'	430.6	core length: 4.25m
428-4	35-4	27/03/16	GC	19:41	21°53.610'	040°00.280'	429.4	no recovery
	36-1	27/03/16	Pump	20:15	21°50.733'	039°59.920'	540.6	
Off Rio Doce (Shelf)								
429-1	37-1	28/03/16	MBPS	16:24	19°46.575'	039°48.677'	n/a	depth range: 20/35m; first file: SLF1603280902, last file: SLF1603281622
431-1	38-1	28/03/16	CTD	17:02	19°44.277'	039°50.756'	17.2	2 bottles
431-2	38-2	28/03/16	MUC	17:20	19°44.284'	039°50.738'	16.7	number of filled tubes: 8
431-3	38-3	28/03/16	GC	19:07	19°44.283'	039°50.738'	17.5	core length: 4.72m
432-1	39-1	28/03/16	CTD	20:25	19°42.058'	039°45.776'	23.6	1 bottle
432-2	39-2	28/03/16	MUC	20:43	19°42.050'	039°45.775'	23.6	number of filled tubes: 12
433-1	40-1	28/03/16	CTD	21:55	19°35.224'	039°41.706'	21.7	3 bottles
433-2	40-2	28/03/16	MUC	22:05	19°35.226'	039°41.706'	22.7	number of filled tubes: 11
434-1	41-1	28/03/16-29/03/16	MBPS	10:13	19°25.454'	039°34.230'	46.0	first file: SLF1603290058, last file: SLF1602191012
435-2	42-1	29/03/16	CTD	11:09	19°28.308'	039°37.759'	16.7	0 bottles
	42-2	29/03/16	CTD	11:29	19°28.280'	039°37.717'	17.3	1 bottle
435-3	42-3	29/03/16	MUC	11:36	19°28.276'	039°37.711'	16.7	number of filled tubes: 12
436-1	43-1	29/03/16	CTD	13:12	19°27.994'	039°26.374'	38.2	2 bottles
436-2	43-2	29/03/16	MUC	13:23	19°27.987'	039°26.332'	37.5	number of filled tubes: 9
436-3	43-3	29/03/16	GC	14:09	19°27.990'	039°26.332'	37.6	no recovery

436-4	43-4	29/03/16	GC	14:47	19°27.989'	039°26.333'	38.2	core length: 1.71m
437-1	44-1	29/03/16	CTD	16:11	19°26.376'	039°17.211'	48.7	3 bottles
437-2	44-2	29/03/16	MUC	16:23	19°26.691'	039°17.210'	48.6	number of filled tubes: 12
Off Rio Doce (Slope)								
438-1	45-1	29/03/16	MN	21:07	19°47.356'	038°40.389'	1031.2	shallow cast
438-2	45-2	29/03/16	MN	22:08	19°47.356'	038°40.389'	1031.0	deep cast
438-3	45-3	29/03/16	CTD	22:49	19°47.356'	038°40.389'	1032.1	24 bottles
438-4	45-4	29/03/16	MN	23:20	19°47.356'	038°40.389'	1032.3	shallow cast
438-5	45-5	29/03/16	MN	00:16	19°47.356'	038°40.389'	1033.2	deep cast
438-6	45-6	29/03/16	CTD	01:22	19°47.356'	038°40.390'	1029.0	24 bottles
439-1	46-1	29/03/16-30/03/16	MBPS	11:07	19°32.327'	038°31.824'	200.0	first file: SLF1603300139, last file: SLF1603301105
	47-1	30/03/16	Pump	13:39	19°34.314'	038°40.576'	448.0	
440-1	48-1	30/03/16	CTD	12:14	19°33.068'	038°36.160'	263.2	9 bottles
440-2	48-2	30/03/16	MUC	12:38	19°33.068'	038°36.159'	264.2	number of filled tubes: 11
441-1	49-1	30/03/16	CTD	13:54	19°34.313'	038°40.576'	447.6	4 bottles
441-2	49-2	30/03/16	MUC	14:25	19°34.313'	038°40.577'	447.6	number of filled tubes: 12
441-3	49-3	30/03/16	GC	15:13	19°34.315'	038°40.577'	448.4	core length: 7.16m
442-1	50-1	30/03/16	CTD	17:12	19°42.620'	038°35.987'	903.2	17 bottles
442-2	50-2	30/03/16	MUC	17:59	19°42.620'	038°35.979'	903.7	number of filled tubes: 12
442-3	50-3	30/03/16	PC	19:32	19°42.621'	038°35.978'	902.7	core length: 13.16m
	51-1	30/03/16	Pump	20:01	19°42.622'	038°35.978'	902.5	
443-1	52-1	30/03/16	CTD	21:34	19°35.946'	038°36.062'	644.7	18 bottles
443-2	52-2	30/03/16	MUC	22:18	19°35.946'	038°36.062'	643.9	number of filled tubes: 12; pore water: backup
443-3	52-3	30/03/16	GC	23:30	19°35.946'	038°36.062'	644.8	core length: 8.42m
444-1	53-1	30/03/16-31/03/16	MBPS	10:19	20°06.169'	038°40.313'	1300.0	
	54-1	31/03/16	Pump	13:26	20°21.807'	038°37.386'	1960.5	
445-1	55-1	31/03/16	CTD	13:12	20°21.808'	038°37.387'	1960.4	19 bottles
445-2	55-2	31/03/16	MN	13:32	20°21.808'	038°37.387'	1960.3	shallow cast
445-3	55-3	31/03/16	MN	14:27	20°21.808'	038°37.388'	1960.8	deep cast
445-4	55-4	31/03/16	CTD	16:02	20°21.808'	038°37.388'	1959.7	15 bottles
445-5	55-5	31/03/16	MN	16:24	20°21.808'	038°37.388'	1960.3	shallow cast
445-6	55-6	31/03/16	MN	17:17	20°21.808'	038°37.386'	1960.0	deep cast
445-7	55-7	31/03/16	PC	19:35	20°21.808'	038°37.387'	1960.1	core length: 11.75m
445-8	55-8	31/03/16	MUC	21:19	20°21.808'	038°37.389'	1961.2	number of filled tubes: 12
	56-1	31/03/16	Pump	20:09	20°21.808'	038°37.388'	1962.2	
446-1	57-1	31/03/16-01/04/16	MBPS	09:32	19°42.032'	038°44.606'	1100.0	first file: SLF1603312317, last file: SLF1604010924
	58-1	01/04/16	Pump	13:46	20°01.043'	038°50.859'	1763.5	
447-1	59-1	01/04/16	CTD	12:44	20°01.044'	038°50.858'	1763.0	8 bottles
447-2	59-2	01/04/16	MUC	13:57	20°01.046'	038°50.859'	1763.5	number of filled tubes: 12
447-3	59-3	01/04/16	PC	15:51	20°01.044'	038°50.858'	1762.9	
	60-1	01/04/16	Pump	21:10	20°02.373'	038°34.798'	1328.2	
448-1	61-1	01/04/16	CTD	19:05	20°02.371'	038°34.789'	1328.5	22 bottles
448-2	61-2	01/04/16	PC	20:40	20°02.372'	038°34.748'	1328.7	core length: 10.17m
448-3	61-3	01/04/16	MUC	22:02	20°02.372'	038°34.798'	1328.9	
	62-1	02/04/16	Pump	13:21	17°20.355'	038°23.700'	1181.5	
	63-1	02/04/16	Pump	20:18	16°03.334'	038°37.412'	24.8	
Rio Jequitinhonha								
449-1	64-1	02/04/16	CTD	21:25	15°52.965'	038°39.208'	30.5	no bottles fired; sound velocity profile only
450-1	65-1	02/04/16-03/04/16	MBPS	09:32	15°19.308'	038°46.696'	50.0	first file: SLF1604022140, last file: SLF1604030959
	66-1	03/04/16	Pump	13:25	15°11.345'	038°52.394'	29.6	
451-1	67-1	03/04/16	CTD	11:20	15°16.965'	038°54.800'	27.7	11 bottles
451-2	67-2	03/04/16	VVG	11:38	15°16.965'	038°54.801'	28.4	3x surface samples Brazil, 1x surface samples Munz, 1x organic Niedermeyer
451-3	67-3	03/04/16	MUC	11:56	15°16.964'	038°54.801'	28.4	number of filled tubes: 12
451-4	67-4	03/04/16	GC	12:37	15°16.965'	038°54.801'	28.3	core length 4.97m
Off Rio de Contas								
	68-1	03/04/16	Pump	20:15	14°15.445'	038°36.061'	1860.6	
452-1	69-1	03/04/16	CTD	20:27	14°15.447'	038°36.061'	1858.3	24 bottles
452-2	69-2	03/04/16	MN	20:44	14°15.447'	038°36.061'	1859.2	shallow cast
452-3	69-3	03/04/16	MN	21:40	14°15.445'	038°36.060'	1859.3	deep cast
452-4	69-4	03/04/16	CTD	n/a	n/a	n/a	n/a	24 bottles
452-5	69-5	03/04/16	MN	22:42	14°15.446'	038°36.061'	1859.3	shallow cast
452-6	69-6	03/04/16	MN	23:38	14°15.446'	038°36.061'	1860.1	deep cast
453-1	70-1	03/04/16-04/03/16	MBPS	10:07	14°12.134'	038°48.137'	1022.0	first file: SLF1604032358, last file: SLF1604041003
	71-1	04/04/16	Pump	13:39	14°12.774'	038°38.530'	1737.3	
454-1	72-1	04/04/16	CTD	12:19	14°12.775'	038°38.530'	1735.6	24 bottles
454-2	72-2	04/04/16	MUC	13:30	14°12.774'	038°38.529'	1738.6	number of filled tubes: 12

454-3	72-3	04/04/16	PC	15:24	14°12.776'	038°38.529'	1738.1	core length 13.43m
455-1	73-1	04/04/16	CTD	18:18	14°10.605'	038°32.176'	2111.0	21 bottles
455-2	73-2	04/04/16	MUC	19:44	14°10.607'	038°32.178'	2107.6	number of filled tubes: 7
455-3	73-3	04/04/16	PC	21:50	14°10.608'	038°21.178'	2106.9	core length 12.49m
	74-1	04/04/16	Pump	21:13	14°10.608'	038°32.178'	2107.6	
456-1	75-1	04/04/16-05/04/16	MBPS	10:09	14°14.553'	038°48.130'	1099.0	
	76-1	05/04/16	Pump	13:31	14°23.200'	038°43.551'	1393.9	
457-1	77-1	05/04/16	CTD	12:22	14°23.200'	038°43.551'	1393.1	24 bottles
457-2	77-2	05/04/16	MUC	13:19	14°23.200'	038°43.551'	1393.0	number of filled tubes: 8
457-3	77-3	05/04/16	GC	14:36	14°23.201'	038°43.551'	1394.4	core length 6.00m
458-1	78-1	05/04/16	CTD	16:20	14°24.359'	038°50.067'	842.8	24 bottles
458-2	78-2	05/04/16	MUC	17:05	14°24.356'	038°50.070'	842.9	number of filled tubes: 8
458-3	78-3	05/04/16	PC	18:39	14°24.357'	038°50.068'	840.5	core length 13.86m
	79-1	05/04/16	Pump	20:23	14°24.560'	038°53.367'	421.9	
459-1	80-1	05/04/16	CTD	20:28	14°24.559'	038°53.307'	422.4	24 bottles
459-2	80-2	05/04/16	GC	21:07	14°24.559'	038°53.307'	421.3	core length 8.55m
459-3	80-3	05/04/16	MUC	21:44	14°24.559'	038°53.307'	420.5	number of filled tubes: 12
460-1	81-1	05/04/16-06/04/16	MBPS	10:18	14°29.238'	038°56.423'	50.0	first file: SLF1604052222, last file: SLF1604060957
	82-1	06/04/16	Pump	13:26	14°15.708'	038°55.278'	52.5	
461-1	82-2	06/04/16	CTD	12:46	14°17.517'	038°55.509'	58.9	12 bottles
461-2	82-3	06/04/16	MUC	12:59	14°17.516'	038°55.511'	59.0	number of filled tubes: 12
462-1	83-1	06/04/16	CTD	11:11	14°24.285'	038°57.024'	38.0	11 bottles
462-2	83-2	06/04/16	MUC	11:23	14°24.284'	038°57.024'	37.0	number of filled tubes: 11; surface samples
	84-1	06/04/16	Bucket	12:32	14°17.517'	038°55.514'	59.3	114-2
	85-1	06/04/16	Bucket	14:08	14°10.631'	038°54.536'	42.3	
463-1	85-2	06/04/16	CTD	14:21	14°10.633'	038°54.534'	42.2	10 bottles
463-2	85-3	06/04/16	MUC	14:32	14°10.633'	038°54.534'	n/a	number of filled tubes: 11; surface samples
	86-1	06/04/16	Bucket	15:30	14°04.766'	038°53.195'	34.8	
464-1	86-2	06/04/16	CTD	15:43	14°04.757'	038°53.190'	36.1	10 bottles
464-2	86-3	06/04/16	MUC	15:53	14°04.756'	038°53.187'	34.9	number of filled tubes: 11; surface samples
465-1	87-1	06/04/16	CTD	16:50	13°58.647'	038°52.116'	46.4	8 bottles
465-2	87-2	06/04/16	MUC	17:05	13°58.646'	038°52.115'	47.0	number of filled tubes: 12
465-3	87-3	06/04/16	GC	17:55	13°58.646'	038°52.116'	47.0	core length: 2.55m
	88-1	06/04/16	Pump	20:16	13°38.037'	038°34.353'	597.2	
Off Rio Sao Francisco								
	89-1	07/04/16	Pump	13:55	11°08.733'	036°26.519'	2116.9	
466-1	90-1	07/04/16	CTD	16:21	10°57.520'	036°17.005'	2002.4	23 bottles
466-2	90-2	07/04/16	MN	16:42	10°57.848'	036°17.620'	2038.9	shallow cast
466-3	90-3	07/04/16	MN	17:35	10°57.100'	036°14.263'	2011.3	deep cast
466-4	90-4	07/04/16	CTD	18:39	10°57.098'	036°17.146'	1950.2	24 bottles
466-5	90-5	07/04/16	MN	19:05	10°57.687'	036°17.396'	2142.1	shallow cast
466-6	90-6	07/04/16	MN	20:02	10°56.562'	036°16.635'	1760.9	deep cast
	91-1	07/04/16	Pump	21:13	11°00.246'	036°18.156'	2223.3	
467-1	92-1	07/04/16	MBPS	10:05	10°38.820'	038°26.489'	40.0	first file: SLF1604072049, last file: SLF1604080949
468-1	93-1	08/04/16	CTD	12:16	10°51.786'	036°22.394'	949.2	23 bottles
468-2	93-2	08/04/16	MUC	13:17	10°52.117'	036°22.686'	952.7	number of filled tubes: 12
468-3	93-3	08/04/16	GC	14:18	10°52.122'	036°22.855'	939.1	core length: 6.56m
	94-1	08/04/16	Pump	13:23	10°52.054'	036°22.602'	954.5	
469-1	95-1	08/04/16	CTD	17:07	10°56.490'	036°12.234'	1916	
469-2	95-2	08/04/16	MUC	18:29	10°56.674'	036°12.324'	1906.8	number of filled tubes: 10
469-3	95-3	08/04/16	PC	20:23	10°56.465'	036°11.953'	1990.6	core length: 10.40m
	96-1	08/04/16	Pump	21:19	10°55.851'	036°10.858'	2012.2	
470-1	97-1	08/04/16	MN	21:53	10°56.720'	036°11.356'	2078.6	shallow cast
470-2	97-2	08/04/16	MN	22:51	10°56.060'	036°10.870'	2014.5	deep cast
470-3	97-3	08/04/16	CTD	23:44	10°57.145'	036°11.668'	2010.0	
470-4	97-4	08/04/16	MN	00:03	10°57.069'	036°11.630'	2051.6	shallow cast
470-5	97-5	09/04/16	MN	00:56	10°56.480'	036°11.201'	2045.2	deep cast
471-1	98-1	09/04/16	MBPS	10:59	10°27.865'	036°12.647'	25.0	first file: SLF1604090200, last file: SLF1604091050
	99-1	09/04/16	Pump	13:19	10°37.592'	036°15.036'	72.9	
	100-1	09/04/16	Bucket	11:54	10°34.975'	036°16.024'	54.8	
472-1	100-2	09/04/16	CTD	12:02	10°34.946'	036°16.021'	55.9	14 bottles
472-2	100-3	09/04/16	VVG	12:23	10°34.940'	036°16.020'	55.1	3x surface samples Brazil, 1x surface samples Munz
472-3	100-4	09/04/16	MUC	12:44	10°34.937'	036°16.020'	54.6	number of filled tubes: 9
473-1	101-1	09/04/16	CTD	13:40	10°37.643'	036°14.975'	74.2	10 bottles
473-2	101-2	09/04/16	MUC	13:53	10°37.637'	036°14.975'	73.6	no recovery; very soft sediment
473-3	101-3	09/04/16	MUC	14:21	10°37.619'	036°14.967'	71.9	number of filled tubes: 2;

								samples: forams (geochem), bulk geochem
474-1	102-1	09/04/16	CTD	16:48	10°40.394'	036°03.877'	1327.7	19 bottles
474-2	102-2	09/04/16	MUC	17:58	10°40.812'	036°03.193'	1296.1	no recovery
474-3	102-3	09/04/16	MUC	19:03	10°40.773'	036°03.145'	1310	number of filled tubes: 1; samples: forams (geochem)
474-4	102-4	09/04/16	GC	20:21	10°40.626'	036°03.161'	1285.1	core length: 6.56m
474-5	102-5	09/04/16	MUC	21:30	10°39.822'	036°02.771'	1355.1	number of filled tubes: n/a
	103-1	09/04/16	Pump	20:53	10°40.312'	036°03.188'	1212.3	
475-1	104-1	09/04/16- 10/04/16	MBPS	09:34	11°00.125'	036°24.422'	1659.0	first file: SLF1604093254; last file: SLF1604100932
	105-1	10/04/16	Pump	14:13	10°42.614'	036°08.358'	1073.5	
476-1	106-1	10/04/16	CTD	12:51	10°41.990'	036°07.858'	1141.3	21 bottles
476-2	106-2	10/04/16	MUC	14:03	10°42.397'	036°08.199'	1039.2	number of filled tubes: 6; samples: forams (geochem), bulk geochem., mineralogy/ sedimentology, organics
476-3	106-3	10/04/16	PC	15:40	10°42.593'	036°08.305'	1022.6	core length: 4.75m
477-1	107-1	10/04/16	BC	17:36	10°41.643'	036°09.058'	957.6	2x surface sample, 1x liner (60cm)
478-1	108-1	10/04/16	CTD	18:56	10°39.702'	036°10.589'	691.2	21 bottles
478-2	108-2	10/04/16	MUC	19:38	10°39.670'	036°10.529'	692.9	number of filled tubes: 12
478-3	108-3	10/04/16	GC	20:39	10°39.699'	036°10.552'	694.1	core length: 3.87m
	109-1	10/04/16	Pump	20:32	10°39.767'	036°10.625'	695.2	
479-1	110-1	10/04/16	MN	21:32	10°41.779'	036°09.744'	1004.2	shallow cast
479-2	110-2	10/04/16	MN	22:30	10°41.310'	036°09.238'	943.6	deep cast
479-3	110-3	10/04/16	MN	22:49	10°41.440'	036°09.420'	938.5	shallow cast
479-4	110-4	10/04/16	MN	23:47	10°40.789'	036°09.096'	981.1	deep cast
480-1	111-1	11/04/16	MBPS	09:50	10°40.170'	036°26.115'	53.0	first file: SLF1604110052; last file: SLF1604110946
481-1	112-1	11/04/16	Bucket	10:47	10°36.060'	036°19.203'	59.7	
481-2	112-2	11/04/16	CTD	11:11	10°36.065'	036°19.204'	59.7	12 bottles
481-3	112-3	11/04/16	MUC	11:19	10°36.063'	036°19.202'	61.2	number of filled tubes: 12; surface samples
	113-1	11/04/16	Pump	14:15	10°41.301'	036°26.607'	47.2	
482-1	114-1	11/04/16	Bucket	12:07	10°38.952'	036°23.202'	58.0	
482-2	114-2	11/04/16	CTD	12:21	10°38.952'	036°23.201'	56.8	9 bottles
482-3	114-3	11/04/16	MUC	12:32	10°38.951'	036°23.202'	54.6	number of filled tubes: 12; surface samples
483-1	115-1	11/04/16	Bucket	14:05	10°41.296'	036°26.606'	46.7	
483-2	115-2	11/04/16	CTD	14:20	10°41.297'	036°26.606'	46.6	8 bottles
483-3	115-3	11/04/16	MUC	14:32	10°41.301'	036°26.608'	46.3	number of filled tubes: 12
483-4	115-4	11/04/16	GC	15:20	10°41.297'	036°26.590'	45.8	core length: 7.76m
481-3	112-3	11/04/16	MUC	11:19	10°36.063'	036°19.202'	61.2	number of filled tubes: 12; surface samples
	113-1	11/04/16	Pump	14:15	10°41.301'	036°26.607'	47.2	
482-1	114-1	11/04/16	Bucket	12:07	10°38.952'	036°23.202'	58.0	
482-2	114-2	11/04/16	CTD	12:21	10°38.952'	036°23.201'	56.8	9 bottles
482-3	114-3	11/04/16	MUC	12:32	10°38.951'	036°23.202'	54.6	number of filled tubes: 12; surface samples
483-1	115-1	11/04/16	Bucket	14:05	10°41.296'	036°26.606'	46.7	

Abbreviations

BC	box corer
GC	gravity corer
MBPS	multibeam/Parasound
MN	multi closure net
MUC	multicorer
PC	piston corer
Pump	ship's pump filtrate
VVG	Van Veen Grab