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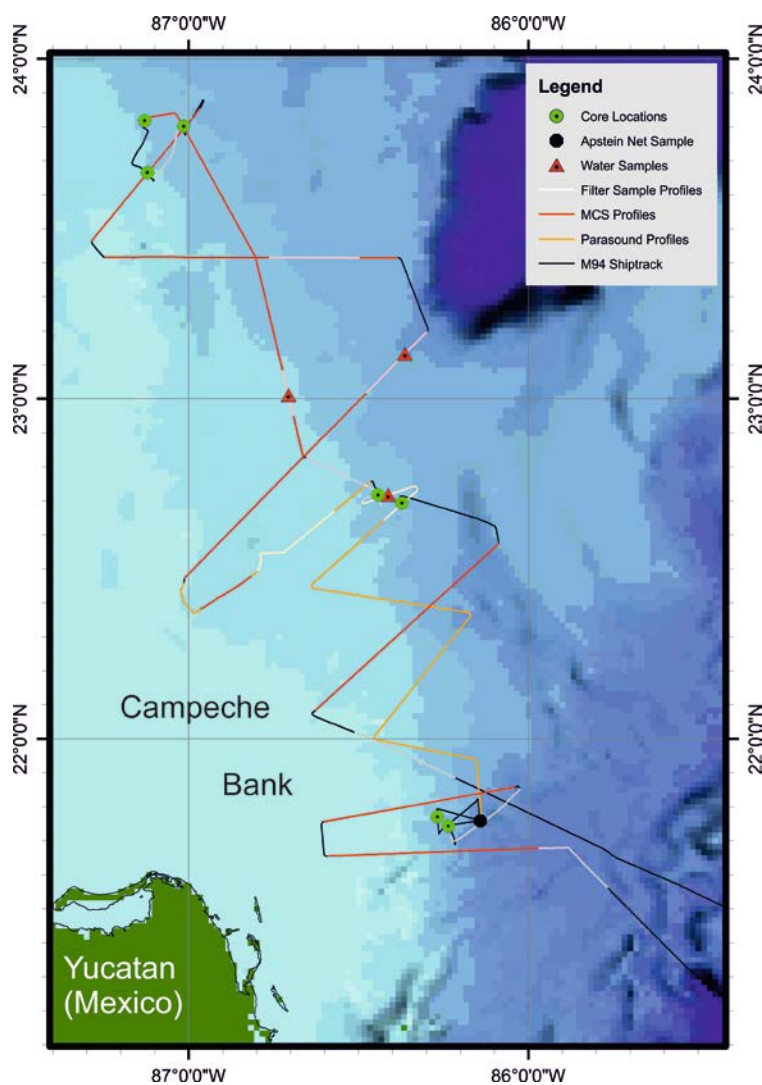
Short Cruise Report RV Meteor cruise M94

Balboa (Panama) – Kingston (Jamaica)

12.3.-26.3.2013

Chief Scientist: Prof. Dr. Christian Hübscher

Captain: Michael Schneider



Objectives

The Loop Current and its associated eddy-shedding in the Gulf of Mexico are mediating the oceanic heat and salt flux from the Caribbean into the Atlantic Ocean via Yucatan Strait. Changes in Yucatan Strait surface and intermediate throughflow over geological timescales in relation to sea level, through flow velocity, and atmospheric circulation are not well constrained to date. Our main objective was to establish spatially and temporally high-resolving reconstructions of the Late Pleistocene surface, subsurface and intermediate water variability, in relation to the Loop Current variations and related eddy shedding, Antarctic Intermediate Water migrations, and changes in the Atlantic Meridional Overturning Circulation. Our combined marine geophysical and marine geological program focussed on the main inflow area of Caribbean waters into the Gulf of Mexico, namely Yucatan Strait, and adjacent areas influenced by the Loop Current, e.g. the northeastern slope of Campeche Bank. We used RV METEOR in order to allow for systematic high-quality hydroacoustic and seismic mapping of current mediated seafloor deposits, which most likely reflect the onset, intensification and reorganisation of the Yucatan Throughflow after the Pliocene closure of the Panamanian Isthmus. The recovery of high-resolution sediment cores from these deposits will allow to produce geochemical proxy records to decipher in high detail the related paleoceanographic and paleoclimatic changes.

Narrative

The unloading of M93 equipment as well as the loading of the M94 gear was initially scheduled for 10th of March. However, there was no berth available and Meteor was on anchor off Panama City until noon of March 11th. The scientific party boarded the vessel on the 12th where they were welcomed by captain and crew. The entire port operations were done the next day until 6 p.m. Four containers were unstuffed on the pier and alongside the vessel by the help of stevedores, crew and scientists. Since the Panama Channel passage had to be postponed by one day we left berth and anchored off the first channel lock. While still on anchor the 13th of March was used to install the equipment in the labs. Around 8 pm the pilot came on board and Meteor approached the Locks of Miraflores. The channel was passed during the night and we all watched the show. After entering the Caribbean Sea next morning the vessel became a bit shaky and a few of the scientific party needed some time to get used to it. Owing to the warm water the cooling system of the ship's engine was clogged by biomass so we had to reduce speed for a couple of hours. The digital streamer was deployed for two hours in order to install the analogue-digital converters. On March 15th and 16th we proceeded with our lab installations while steaming northwards on our transit across the Caribbean Sea.

We reached our first working area on Sunday March 17th in the Yucatan Strait between Yucatan Peninsula and Cuba where we started with two geophysical profiles using multi-channel seismics, the parametric subbottom profiler Parasound and the EM122 multi-beam system in order to investigate depositional processes on the eastern slope of the Campeche Bank between Yucatan and Cuba. Afterwards and on Monday (March 18) we took two piston cores in order to study sediment deposits controlled by the northward flowing Antarctic Intermediate Water and by the southward flowing counter currents. In between, the plankton net has been utilized. Late evening, the sound velocity probe helped to get a detailed sound velocity depth profile needed for the multi-beam system. During the following night the upper and middle slope of the eastern Campeche Bank was surveyed with the hydroacoustic systems in order to understand the impact of the northward flowing Loop Currents on Late-Pleistocene to Holocene sediments as a function of the distance to the Yucatan Strait. One piston core station had been selected for the 19th

based on the previous hydroacoustic surveys on the southern Campeche slope. Late afternoon same day the multichannel equipment was deployed and three seismic profiles zigzagging across the Campeche slope were completed until 21st early morning. Three piston cores were taken in order to get both a high-resolution record of late-Pleistocene strata and to age constrain an unconformity which is considered to represent a marker for a significant change in the Loop Current characteristics and – consequently – for a climatic change at least in the Central American realm. In the night to the 22nd a contour parallel seismic profile crossing three previous profiles was measured in order to link the seismo-stratigraphic sequences identified before. The piston corer was applied a last time during this day and the night to the 23rd was used for a final seismic profile crossing a canyon on the lower Campeche slope and continuing upslope in order to close a gap in the already accomplished profile grid. All scientific measurements stopped on the 23rd at 7:00 am local time when we started our southbound transit to Kingston / Jamaica.

The transit lasted until the 26th in the morning when the ship stopped south-west of Kingston for a person overboard manoeuvre. The Pilot entered the vessel at 13:00 and early afternoon the ship berthed at Kingston harbour. During a reception aboard Meteor we have been honoured by visits of the German ambassador Mr. Beck and, a.o., representatives of the International Seabed Authority ISA and Kingston Port authorities.

Acknowledgements

We like to thank captain Michael Schneider, his officers and crew of RV METEOR for their great support throughout the entire cruise and for creating a very professional working atmosphere on board. The ship time of METEOR was provided by the German Science Foundation (DFG) within the core program METEOR/MERIAN. We like to thank Mr. Wolfgang Mahrle from Foreign Office (Berlin) and Mr. Hubertus von Römer (German Embassy Mexico City) for their persistent support during the preparation phase of this project.

List of Participants

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Station lists

Geophysical profiling:

Profile	Station	Start Lat. (N)	Long. (W)	End Lat (N)	Long. (W)	Length (km)	Shots	Type
1	ME094/472	21°40.7'	85°56.8'	21°39.3'	86°35.5'	67	3868	S/H
2	ME094/472	21°45.4'	86°36.1'	21°51.5'	86°02.3'	60	3954	S/H
3	ME094/477	21°46.1'	86°08.4'	21°56.5'	86°09.9'	20		H
4	ME094/477	21°56.5'	86°09.9'	22°01.0'	86°26.8'	32		H
5	ME094/477	22°01.0'	86°26.8'	22°22.8'	86°13.5'	50		H
6	ME094/477	22°22.8'	86°13.5'	22°26.7'	86°38.2'	50		H
7	ME094/477	22°26.7'	86°38.2'	22°44.5'	86°19.8'	64		H
8	ME094/477	22°44.5'	86°19.8'	22°42.1'	86°29.2'	35		H
9a	ME094/479	22°45.4'	86°27.9'	22°28.7'	86°49.0'	17		H
9b	ME094/479	22°28.7'	86°49.0'	22°22.9'	86°58.0'	19	1282	S/H
9c	ME094/479	22°22.9'	86°88.0'	22°27.6'	87°00.9'	14		H
10	ME094/479	22°28.5'	87°00.7'	23°11.9'	86°17.9'	110	6673	S/H
11	ME094/479	23°24.9'	86°23.1'	23°25.0'	87°15.1'	89	4455	S/H
12	ME094/479	23°27.7'	87°17.2'	23°51.3'	86°58.0'	55	3319	S/H
13	ME094/483	23°49.7'	87°06.9'	22°49.6'	86°39.8'	129	9555	S/H
14	ME094/485	22°34.4'	86°05.3'	22°04.9'	86°37.8'	79	4313	S/H

Type S: Multi-channel seismics + Parasound + Multibeam.

Type H: Parasound + Multibeam.

Geology;

Station	Device	Lat .(N)	Long. (W)	Water depth (m)	Length of core (m)	Recovery (m)	Date (2013)	Time (UTC)
Yucatan Strait								
ME094/473	Piston corer	21°44.646'	86°14.163'	933'	20	2.73	18.03.	17:57
ME094/474	Plankton net	21°44.5'	86°08.5'	1536			18.03	14:45
ME094/475	Piston corer	21°46.277'	86°16.084'	767	10	2.80	18.03	00:20
Southern Campeche Bank								
ME094/478	Piston corer	22°43.059'	86°26.544'	749	10	6.31	19.03	18:04
ME094/484	Piston corer	22°41.635'	86°22.339'	909	20	0	22.03	22:50
Northern Campeche Bank								
ME094/480	Piston corer	23°48.141'	87°00.868'	730	15	12.17	21.03	13:21
ME094/481	Piston corer	23°39.997'	87°07.284'	521	10	2.51	21.03	17:14
ME094/482	Piston corer	23°49.155'	87°07.752'	630	20	8.81	21.03	20:58