

Short Cruise Report

METEOR CRUISE M58-3 / 11. - 24. June 2003 / Las Palmas to Ponta Delgada

Introduction

The working program of the third part of the 58th cruise of the RV METEOR was dedicated to scientific and technological work within 3 long term projects, served on a transect from Las Palmas to Ponta Delgada.

1. ANIMATE / DOLAN

In the framework of the European ANIMATE program (Atlantic Network of Interdisciplinary Moorings and Timeseries for Europe) it is proposed to improve the European scattered ocean observing infrastructure for repeated time series measurements, in order to provide an initial network of sustained moored stations for ocean CO₂ and carbon cycle measurements in the eastern Atlantic. Existing infrastructure is upgraded and replaced with autonomous, state of the art moored equipment for relevant CO₂, physical and biological measurements, at three sites (Central Irminger Sea, CIS; Porcupine Abyssal Plain, PAP; European Station for Times Series in the Ocean, Canary Islands, ESTOC). Ocean CO₂ and Carbon observations are imperative for understanding, monitoring, and prediction the oceanic uptake of anthropogenic CO₂. The improved infrastructure will thus provide access to strategic data for climate research to European researchers and policy makers, because a part of the measurements will be transmitted in near real time from the mooring sites to the researcher. At the same time, the moored platforms will be open to outside enhancement with additional sensors. Future extension of the network with more stations is encouraged. On this specific cruise of the RV METEOR, the DOLAN data buoy (Datatransmission in the Ocean and Lateral Acoustic Network) is a basic part of the scientific program, due to the OrbComm satellite telemetry capabilities. The DOLAN moorings belonging to the ESTOC mooring site and are therefore implemented in the ANIMATE framework.

2. ESTOC

Since the ESTOC (European Station for Time series in the Ocean Canary islands) station was started in 1994, biogeochemical monthly samplings have continuously taken place. The philosophy of the station, however, was not only to sample that location but the nearby waters

too. Hence, several cruises have been made to the north of the Canary Islands along the years, and even two to the immediate southern part of the Archipelago, to try to follow the paths of intermediate waters through ESTOC and the islands. Nevertheless, hardly any discrete intense sampling has taken place to the west of the islands, specially between the Canaries and Azores archipelagos. As part of the general ocean circulation, the eastern boundary subtropical gyre enters the area by the Azores and then one branch goes south from there and a second branch moves towards Africa and then turns south through the Canary Islands. The latter has been studied in more detail but the earlier needs deeper “in situ” studies to better know the mixing between intermediate waters in that area.

3. QUEST 5 ROV (Remote Operated Vehicle)

The recently founded Research Center Ocean Margins (RCOM) at the University of Bremen, Germany, decided in the beginning of 2002 to purchase a 4000 msw rated QUEST ROV system as part of the Centers „Marine Science Technology and Infrastructure“ program.

QUEST was chosen for its ideal combination of compact size, highly developed control system, innovative equipment interface concept and high power effectiveness. The overall system will operate on different sized ships, thus compactness of the equipment was a clear defined need. Interfacing varying sensors and scientific equipment packages will be repeatedly necessary, and Alstom Schilling Robotics innovative design concept to strictly separate the vehicle relevant functions from any addons by installing the SeaNet system was found to meet both scientific, operational and maintenance requirements.

QUEST 5 will be installed as an advanced deepwater science platform to serve a number of local, nationwide and EU- and worldwide scientific programs and applications. International collaboration will be a central aim of the center, using the new technology. Scientific tasks will include a huge variety of multi-disciplinary geosciences investigations. The operational system will provide a number of standard oceanographic sensors, cameras, lights, sonars, and manipulators, plus a standard interface for the development of application-specific scientific tooling skids. It is planned to improve worldwide cooperation with international oceanographic institutions by exchanging specific toolskid- and scientific payload ensembles.

Working Program

Regarding these three main topics of the M58-3 cruise, the working program was split also and should start with the maintenance and upgrade of the DOLAN data buoy. This buoy was redeployed during the RV POSEIDON cruise POS 296, in April 2003. During this

redeployment, a new designed CO₂ sensor was attached to the mooring chain below the buoy. For this cruise it was planned to upgrade the data transmission capabilities for this specific sensor and to place several “addon” electronics concerning IRIDIUM and INMARSAT data transmission. In addition, within the framework of the DOLAN program it was planned to test new high speed acoustic underwater modems (TRITECH, UK) at several locations.

With respect to the ESTOC environmental studies, a transect should be made between Las Palmas and Ponta Delgada (Azores) to investigate the variability of water mass distributions in the area. The station at 33°N and 22°W where the mooring 276 (from IfM Uni Kiel) is located should be also sampled since this place has a large record of currents observations taken. The transect should be composed of approx. 10-15 rosette-CTD stations to sample to the bottom, depending on time availability. It was planned to sample and measure physical (CTD, salinity samples at certain depths) and biochemical (oxygen, nutrients, chlorophyll, gelbstoff fluorescence) parameters in order to characterize water masses. Some of the parameters should be analysed on board after sampling and others will be taken frozen to the ICCM. These observations will be used to calibrate more accurately the satellite images obtained for the area during the cruise (AVHRR, SEAWIFS, MODIS, SAC-C).

Finally, during Meteor cruise M58/3 the new remotely operated vehicle (ROV) QUEST 5 of the University of Bremen should be extensively tested and deployed. The electric powered system comes with a mobile electric winch and 5000 m of electro-optic umbilical, allowing a diving depth of maximum 4000 m. During the cruise, acceptance testing and sea trials should be carried out on different stations on the transect between Gran Canaria and the Azores. To achieve this goal, it was planned to run several dives to different depth-levels using the different control and navigation modes, and to perform a variety of technical and operational tests at different pressure levels. In cooperation with colleagues from the Department of Oceanography and Fisheries(DOP), University of the Azores, Portugal, it is intended to visit the hydrothermal vent fields „Menez-Gwen“ or „Lucky-Strike“, located 150 nm west off the Azores. Here, Video- and Sonarobservations can be accomplished by the deployment of zoological experiments to grow mussel species adapted to hydrothermal vent fields.

Narrative of the cruise

During the weekend from 8. to the 10. June the RV Meteor was lying in the harbour of Las Palmas and all the logistics were made to get the equipment of the last cruise from board and bring all new material on board. On the 10. June the scientist from Germany, Spain, Portugal,

France, Canada and USA arrived during the day and in the evening all 24 scientist were on board. The sailing of the RV Meteor at the 11th in the morning was delayed, because the scientists and the master of RV METEOR decided to run the first test with the new QUEST ROV inside the harbour basin, without any disturbance due to bad weather conditions. All things worked fine and RV METEOR left Las Palmas at 08:00 pm with heading DOLAN data buoy. On the way to the first station we run several XBT and rosette watersampler stations. Next, the DOLAN buoy was decoupled from the main mooring, recovered and replaced by a dummy package. Within the next 2 days, all scheduled replacements were done and the maintained buoy was redeployed on the 13th June. Finally, to complete the mooring work a short mooring was deployed nearby the DOLAN buoy. The station at ESTOC were completed by additional XBT, water sampler and plankton net casts. After finishing this station work the RV Meteor moved towards a transect with direct heading to the Azores. On Saturday, the first test with the QUEST ROV was run. All things worked fine, except a communication line to one of the hydraulic compensators. For safety reasons further diving was canceled for the day. During the progress on transect the sailing of RV Meteor was interrupted by XBT stations every 20 miles and a combination of CTD / water-sampler station and plankton net casts roughly every 100 miles. At the next days, the ROV cable was lowered down to 3500 m water depth in order to “un-turn” the cable, because after the first dive a sharp bend was found in the ROV cable. Finally, on Monday 16th June, the acceptance was run with the QUEST ROV and the vehicle reached 4014 m waterdepth without any problems - the deepest dive of a QUEST vehicle. In the next days an additional dive was performed in order to test the manipulators of the vehicle and the RV METEOR reached the Mid Ocean Ridge Area, 150 mile west of the Azores. On the 20th June, QUEST started to its first scientific mission at the MENEZ GWEN hydrothermal vent field. The day before a cage was deployed by the portuguese scientist and this cage should be moved into a target area by the QUEST ROV. Despite several trails in the very complicated and harsh target area at roughly 800 m waterdepth, it was impossible for the scientific crew to locate the deployed cages and the dive was canceled due to safety reasons. In the night several sub bottom profiling tasks were performed completed by water sampling casts. The next day RV Meteor moved farther southwest to LUCKY STRIKE hydrothermal vent field and on the 22nd the last dive for the QUEST ROV was scheduled. The dive was going down to 1700 m waterdepth and all involved participants were completely delighted by the observed hydrothermal underwater environment, build of white and black smokers, large chimneys and sharp basalt structures. At 06:00 pm the dive was terminated and the ROV was recovered. Immediately after recovery of the QUEST ROV the RV METEOR left the

LUCKY STRIKE area with direct heading to Ponta Delgada. The scientific work was finished with the launch of the last 5 XBT's on the first 100 miles back to the Azores. On the 24th the RV METEOR reached Sao Miguel and the third part of the 58 cruise was finished with great success in all disciplines.

Cruise track M58-3
11.06. - 24.06.2003

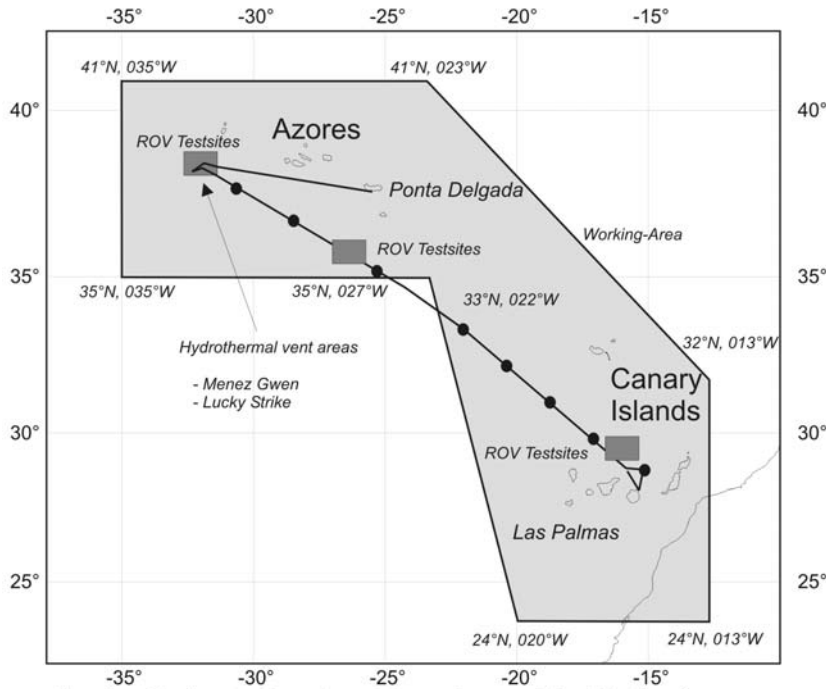


Fig. 1a: Cruise track on transit from Canary Island to the Azores.

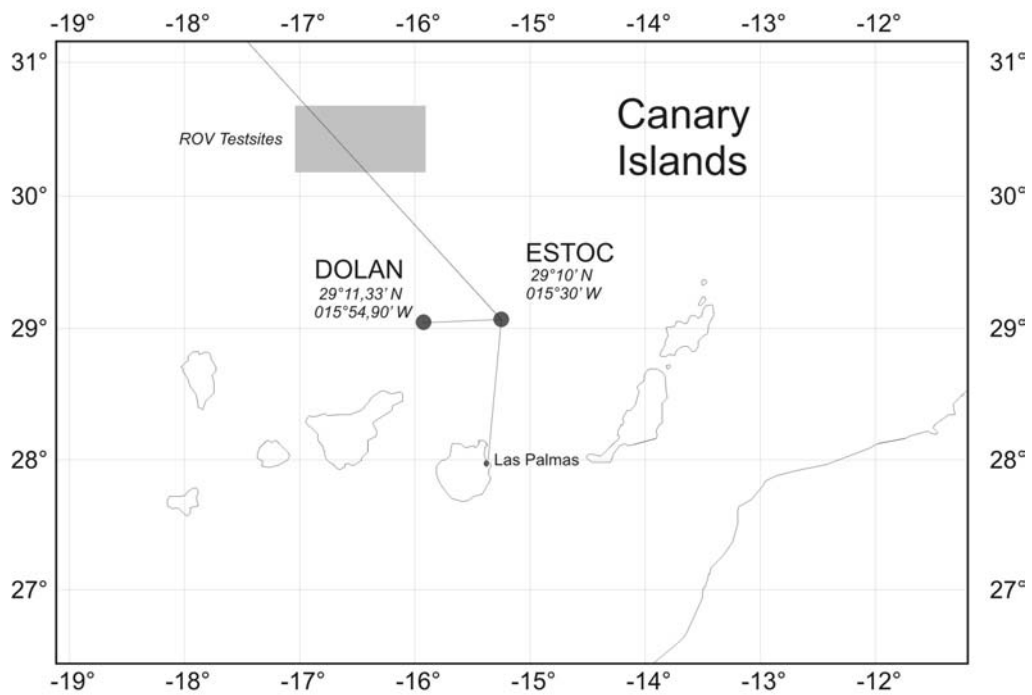


Fig. 1b: Cruise track in the Canary Island area.