RV MARIA S. MERIAN

Cruise MSM 04/3 – HYDROMAR III

Fort de France – Las Palmas
23.01. – 14.02.2007

Short Cruise Report

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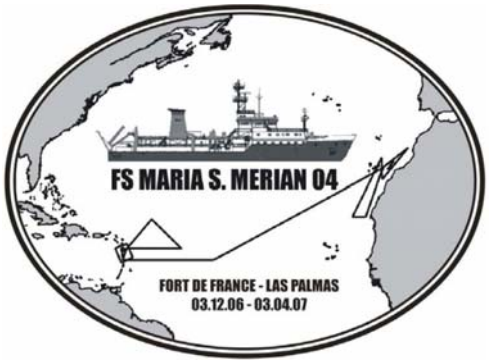


Participating Institutions

MPI-MM	Max Planck Institute for Marine Microbiology, Bremen, Germany
Univ. Bremen	University Bremen, Germany
IFM-GEOMAR	Leibniz Institut for Marine Sciences, Kiel, Germany
JUB	Jacobs University Bremen, Germany
WHOI	Woods Hole Oceanographic Institution, Woods Hole, MA, USA

Scientific Objectives

Maria S. Merian expedition 04/3 (HYDROMAR III) led to the Logatchev hydrothermal vent field (LHF) at 14°45' N on the Mid-Atlantic Ridge (MAR). Logatchev is one key area for the investigation of spatial and temporal heterogeneity of bio-geo interface processes within the DFG priority program SPP 1144 "From Mantle to Ocean: Energy-, Material- and Life-cycles". It was the third in a series of SPP cruises to Logatchev. The overall goal of this cruise was to continue the investigations of spatial and in particular temporal variability patterns of the hydrothermal activity started with RV Meteor cruises M 60/3 and M 64/2 in January 2004 and May 2005, respectively. The main working tool of the cruise was the ROV Jason II from the Woods Hole Oceanographic Institution which was used to recover and redeploy geophysical instruments and geochemical in-situ measurement devices and for accurate

sampling of hydrothermal fluids, sediments, macrofauna and microorganisms. During 12 days of work time in the LHF area, we performed eleven successful dives with a total of 105 hours of bottom time. Other instruments used were the CTD/Rosette water sampler, Miniature Automated Plume Recorders (MAPR, NOAA) and the Kongsberg EM 120 multi-beam echosounder.

One of the major objectives of the cruise was to replace instruments which had been set up in the LHF in May 2005 for geophysical long-term measurements of microseismicity, tilt, acceleration, and temperature of the ocean floor, and temperature and pressure in the bottom-near water column. The data provide unique information on local seafloor motions for a recording period of 8 months. They serve as proxies for changes in the conditions of the fluid regime and for local spatial and temporal variability of habitats, and are essential for time series investigations of hydrothermal fluids and biological activity. With the replacement of the moorings we continue data collection until December 2007 when the instruments will be recovered by the next SPP cruise to the LHF.

By using LBL navigation with Jason II, we recalibrated the geographical positions of the hydrothermal structures and established an accurate map which revealed that the active LHF harbors one more smoking crater than previously recognized. The sampling program performed by the ROV included the recovery of hot and diffuse fluids from all active structures for geochemical and microbiological investigations, push cores from microbial mats and samples of symbiotic and other macrofauna. Other in-situ data collected included high-T-measurements with an 8 channel T-probe and small-scale profiling of physical and geochemical gradients such as T, O_2 and H_2S in hydrothermal sediments, microbial mats and mussel beds with an ROV operated profiler module.

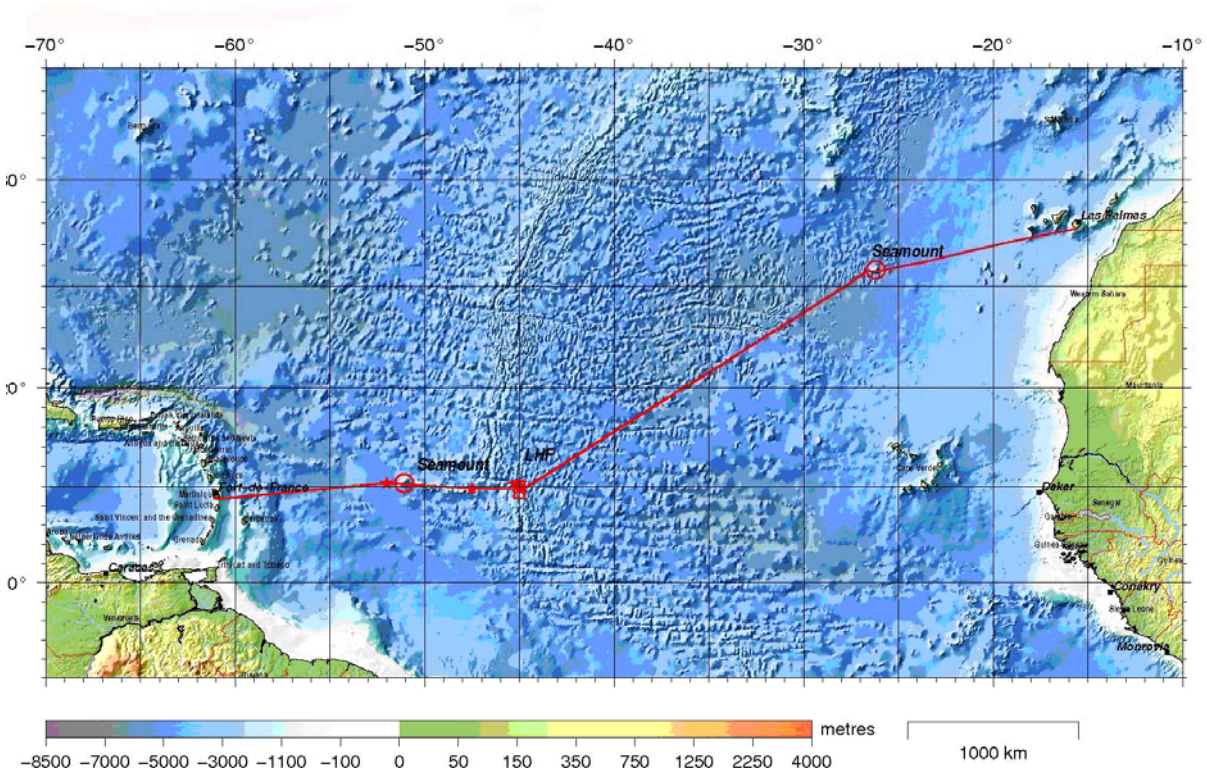
Plume mapping with the CTD and MAPRs revealed that the major direction of the hydrothermal plume extension was N-S. Additional information on the activity patterns in a wider area around the presently known LHF vents is expected from the analyses of high resolution bathymetric mapping using the Kongsbergs EM 120 multibeam echosounder, We continued the mapping program that was started during Maria S. Merian cruise MSM 03/2 in December 2006 and extended the observation area northwards towards the 15-20-Fracture Zone.

Cruise Narrative

Friday 19 Jan. 2007: Chief Scientist, ROV team, WHOI ROV mobilization team of five persons and a winch engineer from SCRIPS had arrived in the previous night and were ready to start mobilizing the ROV Jason II on RV Maria S. Merian which was scheduled to come into port early in the morning. The loading of the ROV and scientific equipment started around 11:30 and the entire process including an adjustment of the 40 t winch on special steel plates was completed some three hours later.
Saturday 20 Jan. – Monday 22. Jan. 2007: Mobilization of the ROV began Saturday 08:00 a.m. with connecting the Jason II high power unit and control van with the rented German 500 kVA generator. These components matched well and the mobilization continued during the next three days by setting up the ROV system and installing data transmission between ROV and ship. The scientific team arrived on Monday and started setting up the laboratories and scientific instruments including the CTD and ROV periphery equipment.
Tuesday 23 Jan. 2007: The ambitious goal of completing the ROV mobilization within only three days was achieved when Jason II, thanks to the very good cooperation between ship and ROV, successfully passed a harbor test in the late morning. We bid farewell to the ROV mobilization team and Maria S. Merian left harbor as scheduled on 23 January around noon time. We rounded Martinique on the south side and took heading towards the Logatchev area at 15°N, 45°W.

Wednesday 24 Jan. – Friday 26 Jan. 2007: During the following three days, we traveled with 12 kn and recorded bathymetry data after leaving the EEZ of Martinique. The shiptrack initially followed a seamount chain at 15°N until 47°20'W where we slightly changed direction towards Logatchev. A first stop for a background cast with the CTD/Rosette in 5000 m water depth was made in the evening of 25 January at 15°7.68'N, 51°22.41'W.
Saturday 27 Jan. 2007: We reached Logatchev in the early morning and began station work with setting out two underwater navigation LBL transponders. Calibration of the LBL transponders took some 6 hours and the ROV Jason II was launched for its first dive (Jason II no. 253) from a German vessel at 14°44.91'N, 44°58.97'W in 3074.8 m water depth. The purpose was to gain orientation in the area around the Irina II structure and start sampling for biota and fluids. This short dive ended successfully after 6 hours. Three CTD/Rosette casts followed during the night.
Sunday 28 Jan. 2007: Jason II dive no. 254 to Irina II and OBT site; purpose: recover moored ocean bottom pressure meter (OBP) and ocean bottom tilt meter (OBT), deploy new OBT, put out in-situ measurement devices, sampling for biota and fluids; dive time 9.5 h. An unusual incident happened in the afternoon when we received a pan-pan call from a sailing boat with a broken mast in only 35 nm distance to the north of us. They asked for support with food, water and diesel in order to be able to continue sailing with reduced speed to their destination in the Caribbean. We interrupted our work in the early evening, reached the boat around midnight and supplied the two sailors with what they needed. After reassuring ourselves that they would be able to safely continue their travel we wished them good luck and spent the rest of the night with bathymetry mapping on the northern flank of the 15-20-Fracture Zone.
Monday 29 Jan. 2007: Jason II dive no. 255 to Irina II and OBT site; purpose: deploy in-situ measurement devices, sampling for biota and fluids; dive time 10.5 h. During the night: plume mapping tow-yo on a SE-NW profile across Logatchev with CTD/Rosette / MAPRs.
Tuesday 30 Jan. 2007: Jason II dive no. 256 to OBT site, Irina II and marker Anya using the elevator for transport of equipment from bottom to surface; purpose: deploy new OBT, recover in situ measurement devices, sampling for biota and fluids; dive time 10.5 hours. After recovery of the elevator, bathymetry mapping of the Logatchev area.
Wednesday 31 Jan. 2007: Jason dive no. 257 to the smoking craters Site B, Irina I and Anna Louise in the southern Logatchev area; purpose: hot fluid sampling, in situ measurements, dive time 11.5 h. During this dive we discovered that the southern hydrothermal structures include four instead of three to this date named smoking craters. All four structures had been visited by earlier cruises as it was evidenced by deep-sea markers deposited on the crater rims, but the two southernmost craters had not been recognized as independent structures. The night was spent with plume mapping by CTD/Rosette / MAPR tow-yo on a S-N profile across the Logatchev field.
Thursday 01 Feb. – Friday 02 Feb. 2007: Jason II dive no. 258 to Irina II and Quest; purpose: in situ measurements, sampling for sediments, fluids and biota using the elevator for equipment transport; dive time 24 h. After recovery of the elevator, bathymetry mapping south of the 15-20-Fracture Zone. In the evening, begin of Jason II dive 259 to OBT site, marker Anya and Quest; purpose: in situ measurements, sampling for sediments, fluids and biota using the elevator for transport of equipment and samples; dive time 13 h.
Saturday 03 Feb. – Sunday 04 Feb. 2007: Recovery of ROV and elevator in the morning. During the day, one plume mapping tow-yo with CTD/Rosette / MAPRs on a NE – SW profile across the Logatchev area. In the evening start of Jason II dive no. 260 to Quest, Irina II and the southern smoking craters; purpose: in-situ measurements, sampling for fluids, sediments and biota using the elevator for transport of equipment and samples; dive time: 23 h. After recovery of the elevator in the evening, bathymetry mapping south of the 15°20’ fractures zone.
Monday 05 Feb. 2007: Jason II dive no. 261 to marker Anya, Irina I, Quest and Site F; purpose: recover T-loggers, in-situ measurements, sampling for sediments, fluids and biota; dive time 12.5 h. In the evening deployment of a 25 m vertical temperature mooring midway between Irina II and Site B.

Tuesday 06 Feb. 2007: During night until morning, two CTD/Rosette casts south of Logatchev. Later in the morning, Jason II dive no. 262 to OBT site, Site F, southern smoking craters and Site A; purpose: deploy OBT, in-situ measurements, fluid sampling, sediment sampling using the elevator for transport of equipment; dive time 12.5 h. After recovery of the elevator, 3 CTD/Rosette casts south of Logatchev.
Friday 07 Feb. 2007: In the morning, deposit wood logs for a long term colonization experiment adjacent to Logatchev field using the deep-sea wire. After that, Jason II dive no 263 to Quest and Irina II; purpose: bring out long-term temperature loggers at Quest, sample fluids and biota; dive time: 6 h. In the afternoon, recovery of the two LBL navigation transponders. End of station work at 19:00 LT. We left Logatchev for transit back to Las Palmas with the EM 120 multibeam echosounder recording bathymetry data.
Saturday 08 Feb. - Wednesday 14 Feb. 2007: Six days of transit at an initial speed of 9.5 kn because of oncoming wind and current. The transit time was used for demounting the ROV and the scientific laboratories and for packing as far as possible. We initially headed towards a seamount at 25°50'N, 26°15'W in order to record its bathymetry. We passed the seamount on Sunday, temporarily reduced speed to 8 kn while crossing it, and continued afterwards with 12 kn speed towards Las Palmas. We reached Gran Canaria in the early morning of Wednesday and waited off the coast of Las Palmas for harbor clearance. Maria S. Merian berthed at early noon time. Unloading of the ROV and scientific equipment started immediately and was completed within the afternoon. The science group and ROV team left the ship on Thursday 15 February.



Cruise track of MSM04-3 from Fort-de-France, Martinique to Las Palmas, Gran Canaria, with the target area, the Logatchev Hydrothermal Vent Field at the MAR, 14:45' N.