

# Research vessel

## MARIA S. MERIAN

MSM109: 06.07. – 03.08.2022

Tromsø – Reykjavik

### 1st weekly report: 06. – 10.07.2022



On Wednesday, 6 July 2022, RV MARIA S. MERIAN left Tromsø bunker pier at 11:00 a.m. local time to set sail for the Norwegian Sea. Marine geological investigations of hydrothermal vents and its distribution at the sea floor of the Knipovich ridge are the focus of mission MSM109. The two main devices, the ROV (Remotely Operated Vehicle) QUEST and the AUV (Autonomous Underwater Vehicle) of the MARUM had to be installed on the research vessel during the port time. For this purpose, 8 containers were delivered from Germany to Tromsø, which were partly set up on the ship's deck with a special crane on land (Fig. 1). This happened on Sunday 3 July and had to be completed in the evening as the ship had to move from pier 24 to pier 25. The arrival of the new scientists and crew members was associated with many short-term changes, since flight operations caused chaotic conditions in some cases due to strikes, threats of strikes, cancellation of flights and a lack of personnel for aircraft and airports. Despite this, the scientists, with the exception of two stragglers, were able to embark on Monday, 4 July after presenting a current negative corona test. Since there are no test centers in Norway some of us were tested for corona by the on-board doctor before boarding the ship. Inside the ship and when people gather on deck, we wear FFP2 masks for the first 7 days on board and have to test ourselves for the corona virus for the first 5 days in the morning before we are allowed to leave our cabin.



**Figure 1:** At Pier 24 in the port of Breivika/Tromsø, a special crane has hoisted the 18 t ROV winch onto the aft deck of RV MARIA S. MERIAN (© Gerhard Bohrmann).



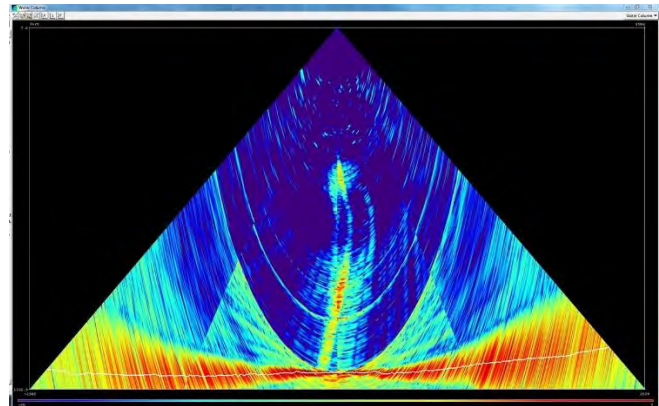
**Figure 2:** After a 6-hour drive through the northern Norwegian fjords, the open sea welcomed us with rather unpleasant weather (© Hauke Büttner).

After two nights on the research vessel in the port of Breivika/Tromsø, on Wednesday, 6 July, it was time to cast off and the MARIA S. MERIAN started to move. A 6-hour journey took us first through the 4-5 km wide passage of Grøtsundet and then about 25 km through the fjord landscape of Fugløyundet before we reached the open shelf sea of the Barents Sea. The rain in Tromsø and the dense clouds within the fjords made us expect bad weather, which we were then exposed when we reached the open sea. Wind speeds of 8 on the Beaufort scale with occasional gusts of up to 9 whipped up the sea (Fig. 2) and caused some of us to feel unwell, which lasted until mid-morning the following day. Towards evening the sea had calmed down and everyone was fine again. On the way to our working area, we overran the Håkon Mosby mud volcano (Fig. 3) on the continental slope to the Barents Sea fan. This mud volcano has been well studied in the past and

appears to be characterized by continuous activity of methane leaks. This time, we were able to detect the active escape of gas in the water column above the mud volcano with the ship's hydro-acoustic systems when crossing it (Fig. 4). We reached our actual target, the Knipovich ridge, on Friday 8 July, starting to the south with a CTD station in an area where signals from a hydrothermal plume could be identified in the water column in previous years. A planned AUV dive to measure the seabed had to be aborted for technical reasons and so we decided to alternatively carry out measurements of the seabed further north after a second CTD station. The Knipovich ridge is about 500 km long and is part of the spreading zone between the North American plate and the Eurasian plate.



**Figure 3:** After leaving the port, our course took us through the fjords of northern Norway, over the shelf of the Barent Sea and the Barent Sea fan to the deep sea. On the continental slope we drove over the Håkon Mosby mud volcano.



**Figure 4:** As shown in previous research, the Håkon Mosby Mud Volcano is a fairly active volcano. It is known for gas emissions, which we could clearly see in the triangular multi-beam swath by several curved "flares" in the center.

Seafloor spreading is associated with volcanism and the formation of new oceanic sea floor. At numerous locations in these spreading areas, the intrusion of seawater into the oceanic crust leads to a hydrothermal fluid circulation, which also leads to the escape of hot fluids on the sea floor. Such emission points or hydrothermal vents on the sea floor have not yet been detected from the Knipovich ridge. The aim of our expedition is to find hydrothermal signs or even spring outlets at the Knipovich ridge in order to understand their impact on processes to the sea floor. What is special about the Knipovich ridge is that it has extremely low spreading rates of only 1.4 cm/year and hydrothermal circulation could therefore proceed differently than at normal or rapidly spreading plate boundaries.

An expedition by the Norwegian Petroleum Directorate north of 77°24'N last year found signs of hydrothermal activity by measuring the redox potential close to the ground, which we now want to examine in more detail. On the way there, we passed previously uncharted areas of the seabed and mapped the seabed with the multi-beam echosounder and the sediment echosounder Parasound. We reached the area of potential hydrothermal activity on Saturday evening and started surveying the water column at midnight with a CTD station and our Eh sensors. At a slow speed of only half a knot, we scanned the water column between the sea floor and a water depth of 2,700 m by yoyo-like movements of the probe with the ship's wire over a profile length of about 4 nautical miles and took water samples. The analysis of the water samples will be carried out in the ship's laboratory today, Sunday morning, 10 July. At the same time, MARUM ROV QUEST dives to the seabed for its first dive during the cruise, where we want to carry out investigations in 3,200 m water depth during the course of the day. We will write about the hopefully exciting results in the next weekly report.

All participants on the ship are healthy.

Greetings on behalf of all participants

Gerhard Bohrmann

FS MARIA S. MERIAN, Sonntag, den 10. Juli 2022