RV METEOR

Cruise M176/2 RainbowPlume

1st September – 6th October 2021

Emden - Emden

4. Weekly Report

Reporting Period: 20th - 26th September 2021

Cruise M176/2 has continued its activities in the study area (36°15 N, 33°53 W) at a steady pace, with a daily routine of CTD and tow fish operations. The weather has been good with a swell of up to 3 m, which still allowed us to conduct all daily station plans as scheduled.

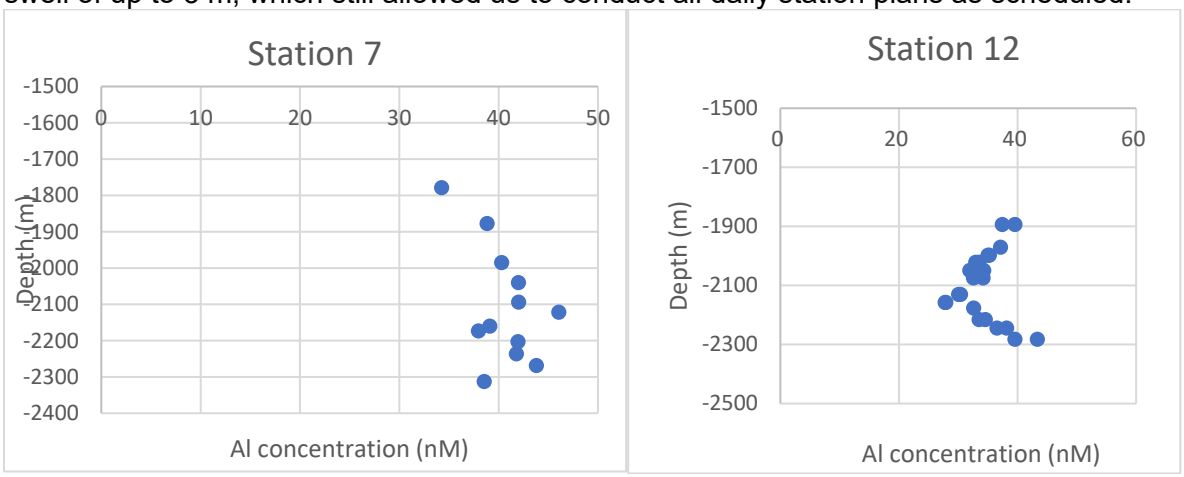

Fig. 1: Dissolved aluminium concentrations in the non-buoyant hydrothermal plume emanating from the Rainbow vent field (data Linbin Zhou).

Our last sampling day will be tomorrow (Monday September 27.9.2021), and tomorrow evening we will steam north back to Emden. We have reached CTD deployment number 100 today, which was achieved by conducting about 6 casts per day. Our technical GEOMAR staff has been great in running the CTDs, MUC and towfish, with the wonderful assistance by the ship's crew. The efforts by Thorsten, André and Dominik have been tremendous; without this team we would not have been so successful.

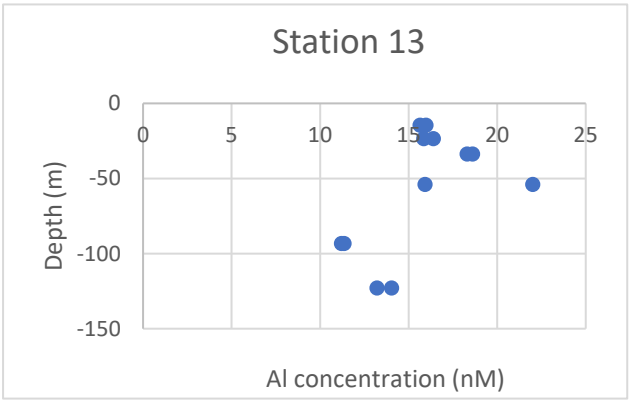

Fig. 2: Dissolved aluminium concentrations in surface waters of our study area (data Linbin Zhou).

The trace metal clean CTDs provided water for Linbin Zhou, who analysed dissolved aluminium on-board ship. Rivers and atmospheric dust provide aluminium inputs to the surface ocean, but often concentrations in vent fluids are strongly enhanced.

In deed at the Rainbow site the vent fluids have reported micromolar concentrations and could provide a signal in the plume. Fig. 1 shows a profile of dissolved aluminium for a station close to the Rainbow vent field, with slightly

enhanced concentrations (up to 45 nM) in the region of the water column where the hydrothermal plume was observed by the turbidity signal. Ten kilometres downstream of the hydrothermal vents we noticed removal of dissolved aluminium (down to 25 nM) in the plume, likely the result of scavenging onto Fe oxide particles which are formed in the plume. We will work up this data in our home laboratory at GEOMAR and combine the dissolved aluminium with particulate aluminium data.

Fig. 3: Filtration set up in our clean container. (Photo: Linbin Zhou)

The dissolved aluminium concentrations in surface waters of our study region are elevated compared to many other ocean regions (Fig. 2). This is caused by atmospheric Saharan dust inputs into the waters. The dust contains about 8% aluminium by weight and 3.5% iron and these elements are released in the surface ocean. Whilst iron is an important micronutrient to surface ocean microbial communities, the aluminium is used as a tracer for dust inputs.

We sample the dissolved and particulate trace elements in our trace metal clean container. The Niskin sampling bottles are taken into the container after each cast and filtered for dissolved elements, whilst the particles are retained on 25 mm filters. Figure 3 shows the filtration set up, whereby at least 4 litres of seawater is filtered over the membrane filters for subsequent particle analysis or synchrotron mineral analysis.

We have one more sampling day tomorrow, after which we will steam back to Emden. We hope to arrive in Emden port on October 6, and disembark to return home.

Follow our Rainbow Plume Blogs:
GEOMAR: https://www.oceanblogs.org/rainbowplume/2021/09/12/hydrothermal-plume-geochemical-study-rainbowplume/
Jacobs University: https://www.jacobs-university.de/blog-posts-research-cruise-m1762

RV METEOR at sea 36°N/33°W

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