

FS Meteor



Expedition M203 “BOWTIE”

10. August 2024 — 24. September 2024 | Mindelo — Bridgetown

2 . Weekly Report (12.08.2024 — 18.08.2024)

While it was hoped that they would arrive on August 12th, the five containers with scientific equipment and provisions for the ship did not arrive in Mindelo until August 14th, due to crane problems on the container vessel. They were loaded onto FS Meteor on the morning of August 15th. The setup and calibration of the Raman Lidar system started immediately and continued through the night, and we were able to finally leave Mindelo on the morning of August 16th, a delay of 6 days. Scientists and crew were eagerly anticipating this moment and were looking forward to beginning the cruise. The biggest loss due to the late departure was two coordinated meetings with ORCESTRA research aircraft associated with two orbits of the EarthCare satellite. Unfortunately, we also had to start the expedition without the drones, which were not delivered on time to the ship, due to large delays in airfreight.

Directly after leaving port, we activated all of our atmospheric measurement systems and underway ocean sampling and started heading south towards the moist tropics and the ITCZ. Except for the weather balloons, which are launched every three hours to obtain information about the vertical structure of the atmosphere, all other atmospheric measurements will operate continuously until we reach Barbados. First, we headed towards the Pirata buoy at 11.5°N, 23.0°W, just outside the exclusive economic zone of the Cape Verde Islands. We reached the working area just south of buoy late on Saturday evening (August 17). Due to winds and waves, we waited to deploy a glider, a drift buoy and a WireWalker - a drifting instrument which profiles the upper 750m of the ocean - until the next morning. A second bio-glider was deployed several miles north of the other

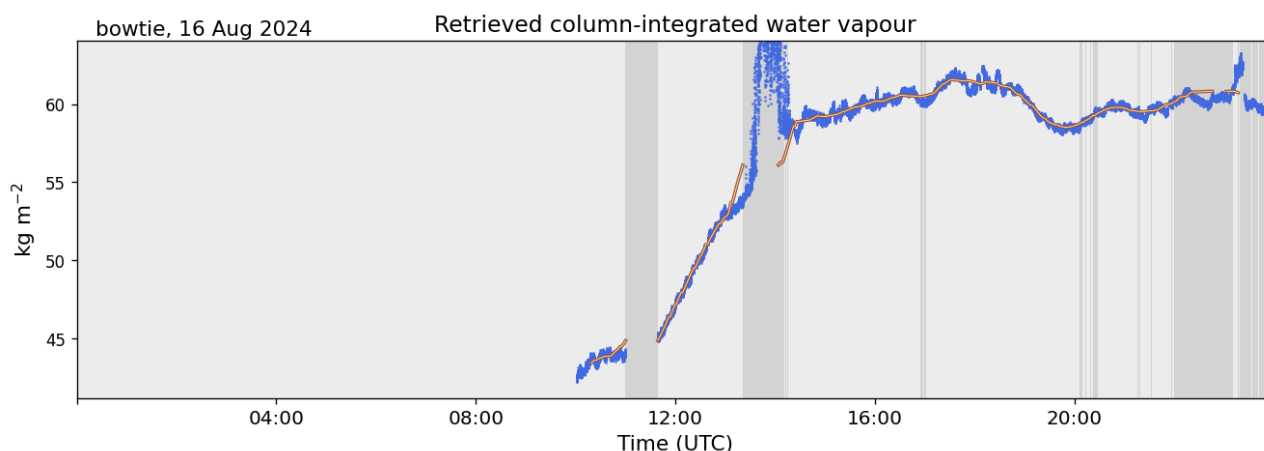


Figure 1: Total column water vapour measured with the HATPRO microwave radiometer. The sharp increase in total column water vapour coincides with FS METEOR entering the moist tropics when steaming south from Mindelo.

instruments. All instruments will sample the upper ocean state continuously for about two weeks, after which the instruments will be collected to be taken to the central Atlantic.

Several hours after leaving Mindelo we reached the moist tropics, marked by exceeding the 48 kg/m² threshold of total column water vapour (Figure 1). We were greeted by widespread stratiform clouds associated with a tropical wave moving from Africa across the Atlantic along with some embedded moderate convective activity. With the modern SEA-POL radar system, and with financial support from the American National Science Foundation, an advanced and powerful radar system is being deployed on a German research vessel for the first time. SEA-POL features a stabilization system that compensates for the ship's movements, allowing for high-quality radar measurements of cloud and precipitation structures. With the FS METEOR M203 expedition, we will be able to conduct such measurements in the tropical Atlantic for the very first time. We tested several different maneuvers with FS METEOR in combination with different radar scanning patterns of the SEA-POL radar to fill in the blank viewing angles caused by the ship's superstructure (Figure 2). Both options (driving the ship in a zigzag pattern or executing a small circle) in combination with a shorter scan period that included a long-range (up to 245 km) scan worked very well to get a full 360-degree view of convective activity in a large area around

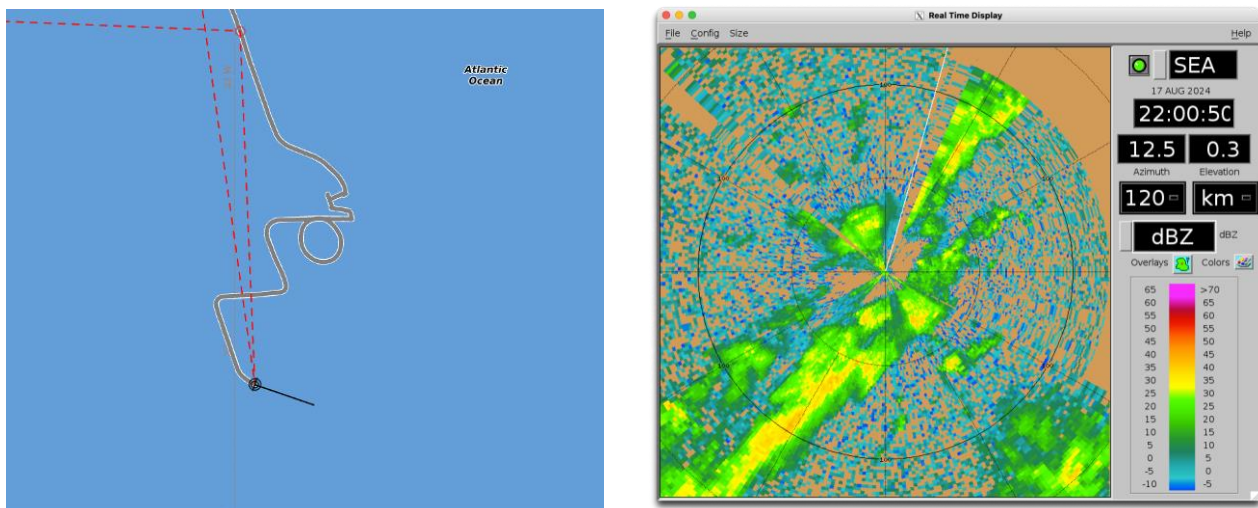


Figure 2: Testing of maneuver (left, circles and zigzag) and scan strategies to fill out the blind areas of the SEA-POL radar due to the ship's superstructure. Yellow and red colours are radar reflectivities that indicate moderate precipitation.

the ship.

In the following week, we will continue to transect the ITCZ while measuring ocean and atmospheric states and have planned coordinated meetings with the EarthCare satellite and the German research aircraft HALO.

We are hoping for smooth sailing from here on and are excited to finally be doing science. Greetings from all participants of M203 from aboard the FS Meteor in the tropical Atlantic.

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