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Discovering a new type of oceanic intraplate volcanism: the experience of two PhD students - a beginner and a seasoned marine geologist

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Unearthing transit data from several expeditions with both trained and untrained eyes started a curiosity-driven project that resulted in the discovery of the new type of intraplate volcanism. Author 1 was a first year doctoral candidate with a background in terrestrial volcano geomorphology, trained in the Philippines and was new to the field of seafloor geology. Author 2 was a fourth year doctoral candidate with a background in submarine volcanology and seafloor mapping, trained in Poland and was a seasoned seafloor mapper who served as a guide in the workings of GEOMAR and the Helmholtz Research School for Ocean System Science and Technology (HOSST) Program, as well as in submarine volcanology. Author 1 faced a challenge - learning new techniques used in the submarine environment, including how to acquire and post-process ship-based bathymetric data, and interpret seafloor structures in order to construct geological maps of the seafloor. This transition from on-land to submarine environment was the beginning of the development in understanding the processes shaping the seafloor of the North Atlantic and to focus on new scientific questions.

Already existing ship transit data from multiple cruises were processed and anomalous high acoustic backscatter signals were found on the seafloor where such anomalies theoretically should not exist on 20Ma old oceanic crust. This coincided with later extraordinary findings collected during a more recent expedition (M139 from 2017). Observed high backscatter resembled that of fresh lava flows found along mid-ocean ridge axis. The area is an intraplate setting that do not have a known record of hotspot activity. Participation of both Authors in the expedition M139 provided an excellent environment to learn about submarine volcanology and seafloor mapping by learn-by-doing approach. Together, the authors and the whole team gathered rock samples and mapped the area in detail. Laboratory analysis and geochemical modelling concluded that the lava flows are of a different source from known intraplate volcanism compositions. The results would change the view on subducted plate composition, the geochemical budget of the Earth, and the availability of hard substrate and chemosynthetic environments for organisms in such remote regions of the seafloor.

The Helmholtz Research School for Ocean System Science and Technology (HOSST) has arranged

an opportunity to bring together early career scientists of different initial backgrounds and learning cultures. It has provided a venue for candidates to go through similar experiences not only in conducting research but also in dealing with “PhD life”. It is because HOSST Research School values working in close ties on communal big picture goals for the North Atlantic Ocean and fosters a valuable support group. In this case it was a mentor-mentee relationship that helped contribute to a scientific breakthrough. This is just one example of support relationships that have developed in the HOSST graduate program.