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Reuse and recycle: how the merging of opportunistic data could be used to produce a 3D model of complex seafloor topography at the Aurora vent field - Gakkel ridge, Arctic Ocean

Tea Isler[1], Tom Kwasnitschka[2], Christopher R. German[3], Michael Jakuba[3], and Autun Purser[1]
[1]Alfred Wegener Institut, Geophysics, Bremerhaven, Germany (tea.isler@awi.de)
[2]GEOMAR Helmholtz Centre for Ocean Research, Kiel, Germany
[3]Woods Hole Oceanographic Institution, Woods Hole, USA

The evidence of abundant hydrothermal activity at the Gakkel ridge, the slowest spreading mid-ocean ridge, led scientists to reconsider the relationship between hydrothermal cooling and the spreading rate of mid-ocean ridges. Beneath the year-round ice-cover of the Artic Ocean, images of active hydrothermal vents have now been recorded at the western-most end of this ridge, at the Aurora seamount. The presence of abundant micro-organisms living in hydrothermal vent sites in such extreme conditions has implications for the habitability of other ocean worlds and, hence, the search of life beyond Earth, given the evidence for submarine venting that has been inferred from Enceladus' ice-covered ocean.

A series of deployments of increasingly sophisticated deep-tow camera and ROV systems over the past decade have resulted in the collection of bathymetric, sonar and optical data sets from the Aurora site. Dives have primarily targeted the sampling of rocks and fluids, with platform cameras mainly used for navigation and identification of new vents and species. Nevertheless, the high number of still images and video footage obtained from that work can also be used for 3D reconstruction of this topographically complex environment: an approach that allows for further investigations (e.g., for habitat mapping) which would not be possible using classic ship based multibeam and backscatter technologies.

This study highlights the usefulness of opportunistic data, especially when surveying in extreme environments, where data collection requires time consuming operations, expensive devices and experienced operators. We describe the methodological steps undertaken to produce a 3D reconstruction of the recently discovered hydrothermal vents from such opportunistic data.

Additionally, the findings of this study highlight the challenges raised by the use of opportunistic data. Regardless of the powerful instrumentation currently available, careful pre-dive planning can help reduce the amount of manual labor required during post-processing steps, which is not only time-consuming but also adds uncertainty and errors to the final product.