Geological settings of hydrothermal vents at 6°15'W and 55°30'E on the Gakkel Ridge, Arctic Ocean

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In 2014 and 2016, RV Polarstern expeditions examined two hydrothermally active areas on the Arctic Gakkel Ridge that had been located during the AMORE Expedition in 2001. We report on results of ship-based bathymetry as well as deep-tow visual and sonar survey data collected with the new Ocean Floor Observation and Bathymetry System (OFOBS). The *Aurora* site at 6°15'W is located at the westernmost end of the western volcanic zone. Black smoker vents were located on a local axial high (1.5 km across and 400 m elevated above the rift valley floor). This *Aurora* mound is made up of fresh pillow lava but is surrounded by much older sedimented seafloor that is locally disrupted by fissures and pock-marks. Although only pillow basalt is exposed, methane-to-manganese ratios of plume waters around unity may indicate the presence of peridotite in the hydrothermal root zone. We suggest that the pillow lavas represent the westernmost extension of an inflated (and hence likely magmatically robust) segment of the western volcanic zone and merely form a thin carapace on top of mantle rocks. Southwest of *Aurora* mound, the depth of the rift valley floor drops markedly where the Gakkel Ridge transitions into the magma-starved Lena Trough.

The second hydrothermally active area visited is located within the Eastern Volcanic Zone of Gakkel Ridge. Along a marked axial volcanic ridge (AVR, 5 km across and 800 m high), basaltic pillow lavas are abundantly exposed and the accumulations of sediments is scarce and discontinuous. Yet, methane:metal ratios of plume water samples are much higher than expected for a basalt-hosted vent. The AVR is cut by E-W trending fissures and hydrothermal plume signals were strongest above one of those features on the northern flank of the ridge.