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Heat flux estimates from the Gakkel Ridge 85E vent field from the AGAVE 2007 expedition

C. Stranne (1), P. Winsor (2), R. A. Sohn (3), and B. Liljebladh (1)

(1) Department of Earth Sciences, University of Gothenburg, Gothenburg, Sweden (christian.stranne@gvc.gu.se, +46-31-786 19 86), (2) Institute of Marine Science, University of Alaska Fairbanks, Fairbanks, USA, (3) Woods Hole Oceanographic Institution, Woods Hole, USA

During the Arctic Gakkel Vents Expedition (AGAVE) 2007, abundant hydrothermal venting was discovered on the Gakkel Ridge at 85E. Hydrothermal vents on the sea floor give rise to buoyant plumes which, when reaching neutral buoyancy, spreads horizontally over areas with length scales on the order of several kilometres and are therefore easily detected with a CTD rosette. The detected anomalies are consistent with the findings 6 years earlier during the Arctic Mid-Ocean Ridge Expedition (AMORE) 2001. The horizontal and vertical distribution of the anomalies is considered in order to establish the number of individual plumes detected. The objective of this paper is to estimate the minimum heat input required to reproduce the observed plumes, using a turbulent entrainment model. The model was run with a large number of combinations of boundary conditions (nozzle area, vertical velocity and temperature) in order to see which combinations that give rise to the observed plume characteristics (level of neutral buoyancy and temperature anomaly). For each individual plume, we estimate the minimum heat flux required to obtain the observed temperature anomaly. Adding the minimum heat flux from each vent together, the total heat flux for the vent field is estimated to be $\sim$ 2 GW. The estimated value is comparable or larger than any other known vent field.