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The Gjallar Giant Vent (GGV): A huge cold seep on the Norwegian Margin driven by the reactivation of ancient hydrothermal sites

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A huge complex of basaltic sill intrusions, related to the northeast Atlantic break-up, intruded the Cretaceous sediments of the Vøring and Møre basins at the Paleocene/Eocene transition, 55 million years ago. This period is also characterized by a massive and rapid input of carbon into the atmosphere that led to an extreme global warming. The intrusive volcanism may have caused a rapid release of methane transported to the ocean and atmosphere through more than 3000 hydrothermal vent complexes identified on the Norwegian Margin alone.

A recent 3D seismic survey of the Gjallar Ridge in the central part of the intruded margin segment images a giant fluid seep structure, which is 3 x 5 km wide and connects to Eocene magmatic sills at depth. Since the active hydrothermal system has ceased, buried sediments have reached the peak maturity, producing thermogenic fluids by cracking of the organic matter. Some of the pipes, which have previously fed hydrothermal vents, have probably been reactivated, leading to active fluid venting on to the modern seafloor.

Because of the nature of the fluids and the size of the seep structure, there are considerable fundamental and industrial interests in such hydrocarbon seep: 1) it can be a huge natural source of pollution in the deep sea and a test bed for the effects of anthropogenic pollution in the north Atlantic, 2) it may influence the biogeochemical cycles, 3) it can help in gaining deeper insight into long-term fluid migration processes at con-

tinental margins, and 4) it represents an open-window above the petroleum system.