

**Fracture-induced fluid migration in  
an Arctic deep water pockmark:  
Porewater geochemistry from the  
MEBO drilling (MSM57) in Vestnesa  
Ridge (Svalbard)**

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During the 2016 MEBO drilling expedition, several sites were drilled in a deep water pockmark (Lunde) from Vestnesa Ridge to investigate gas hydrate dynamics in this region. One of the drilled sites targeted a fracture zone within the pockmark, imaged in seismic records. Lithium and strontium concentrations in pore fluids indicate active fluid flow between 600 and 1000 cmbsf, which corresponds to the depth where the fracture zone was intercepted by drilling. Within this depth interval, we recovered gas hydrate at saturations ranging from 10 to 35% of the pore space. Massive carbonate was recovered from two horizons above and below the zone with anomalous pore fluid data. We present both the concentrations of major/minor porewater species and the isotopic signatures of several key constituents ( $\delta^{13}\text{C-DIC}$ ,  $\delta^{18}\text{O}$ ,  $\delta\text{D}$ ,  $\delta^{11}\text{B}$ , and  $^{87}\text{Sr}/^{86}\text{Sr}$ ) to establish the source of fluid and further establish the role of fractures in controlling deep fluid migration in this pockmark. We discuss the role of fluid migration in accumulation of gas hydrate and development of carbonate cements. This work is supported by the Research Council of Norway through its Centres of Excellence funding scheme (project number 223259) and NORCRUST as well as US Department of Energy (grant DE-FE0013531.). We acknowledge the assistance from the captains and crews onboard RV Maria S. Merian.