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Scientific Ocean Drilling in Norwegian-Arctic Continental Margins To Determine Gas Hydrate Energy and Active Methane Venting

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Global climate change may create a major tipping point in Arctic methane release from oceanic gas hydrates. The Norwegian-Arctic (NA) continental margins host one of the largest oceanic gas hydrate provinces on the European margin. The NA also shows extensive seismic evidence for numerous seep fields, and we thus know that gas migration has occurred or takes place continuously in gas hydrated or hydro-fractured layers of sediments. More than 400 pockmarks that are connected to chimneys (columnar disturbances of parallel-bedded deposits) were identified in the Nyegga pockmark field alone at the mid-Norwegian margin. The pockmarks at the seabed are of postglacial age based on age dating and pore pressure modeling results (e.g. Hustoft et al., 2009). At the NW-Svalbard continental margin and towards the Arctic several hundred gas flares were identified in the outer shelf setting at approx. 400 m water depth in sediments above continental crust and on the continental slope at approx. 1200 m water depth in sediments on < 20 Ma young oceanic crust (e.g. Hustoft et al., 2009). Major efforts have been placed into the understanding of glaciated margin sedimentary processes, geological controls on gas hydrates and fluid expulsions. These observations from the Norwegian to the Arctic continental margins have implications for understanding the dynamics and timing of gas hydrate and fluid expulsions in continental margins where significant changes in p-t gradients occurred in times of postglacial global warming. While this was documented on the mid-Norwegian margin, global warming may allow gas hydrate dissociation and fluid expulsions to happen at Arctic areas. There is evidence that the most dynamic gas hydrate and fluid flow system today exists at the NW Svalbard margin. It is dependent upon a particular condition of pressure, temperature and supply of methane. We observed episodic gas flares in the area, which provides evidence for changes in sub-seabed conditions. We know that without the requested p-t condition for the gas hydrate stability zone, gas hydrates will start to dissolve and release fluids. Long-term ocean seabed observatories (EU-funded European Seafloor Observatory Network of Excellence - ESONET, European Multidisciplinary Seafloor Observations - EMSO, Norwegian Ocean Observatory Network - NOON) integrated with scientific ocean drilling and bore-hole instrumentation would the best way to explore the amount of gas hydrate energy and free gas and what controls their dynamic behavior. Sites of interest will be presented in this context.