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4D seismic study of active gas seepage systems on the Vestnesa Ridge, offshore W-Svalbard

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Active gas venting occurs on the Vestnesa Ridge, an elongated sediment drift north of the Molloy Transform and just east of the Molloy Ridge, one of the shortest segments of the slow spreading North-Atlantic Ridge system. The crest of the Vestnesa Ridge at water depth between 1200-1300 m is pierced with fluid-flow features. Seafloor pockmarks vary in size up to 1 km in diameter. High-resolution P-Cable 3D seismic data acquired in 2012 show vertical focused fluid flow features beneath the seafloor pockmarks. These co-called chimneys extend down to the free-gas zone underneath a bottom-simulating reflection. Here, they link up with small fault systems that might provide pathways to the deeper subsurface. The chimney features show a high variability in their acoustic characteristics with alternating blanked or masked zones and high-amplitude anomalies scattered through the whole vertical extent of the chimneys. The amplitude anomalies indicate high-impedance contrasts due to the likely presence of gas or a high-velocity material like gas hydrates or carbonates. We re-acquired the 3D seismic survey in 2013 for time-lapse seismic studies in order to better understand the origin of the amplitude anomalies and in order to track potentially migrating gas fronts up along the chimney structure. Here, we will present the preliminary results of this time-lapse analysis, which will allow us to better understand gas migration and seafloor plumbing systems in continental margins. This work is part of CAGE – Centre of Excellence for Arctic Gas Hydrate, Environment and Climate. Details on the CAGE research plan and organization can be found on www.cage.uit.no to foster opportunities for cross-disciplinary collaboration. Based in Tromsø, at the world's northernmost University, CAGE establishes the intellectual and infrastructure resources for studying the amount of methane hydrate and magnitude of methane release in Arctic Ocean environments on time scales from the Neogene to the present. The Centre of Excellence is funded by the Norwegian Research Council (grant No. 223259) over a period of ten years.