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Analysis of the spatial and temporal variability of seep occurrences and activity offshore W-Spitzbergen (Svalbard)

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Methane seeps have been located and monitored offshore Svalbard in order to understand the dynamic of methane release as free gas (bubbles) in space and time, the source of it and consequences with respect to the global warming. The Arctic is considered a huge reservoir of methane from terrestrial wetlands but also marine sediments and gas hydrates (Shakova et al., 2010; Biastochi et al., 2011) and rapid release from the marine sources might increase significantly the atmospheric methane concentrations in a short time. The area offshore W-Spitzbergen is impacted by slowly warmer Atlantic waters and thus might experience an increase in seep activity due to gas hydrate decomposition (Westbrook et al. 2008). International cruises in 2009, 2010 and 2011 have been carried out in order to study the phenomena of the methane gas releasing from the seafloor by hydroacoustic and geochemical means.

Hydroacoustics, a non-invasive method, has been used to locate and monitor bubble release from seeps for a decade now. Using single and multibeam echosounder systems a comprehensive data set was acquired. At this time, the acoustic data is been used to study the temporal and spatial variability of the free gas release and spatial comparisons among data from different years have been carried out.

We focused in our study on a shallow area at the edge of the shelf (∼240 m water depth). The echograms shown flare hights with an average of ∼100 m but some of them do reach the surface. Measured rising speed values of single bubbles show a mean of ∼45 cm/s and the rising speed distribution gives additional hints to the occurring bubble size distribution (BSD).

Finally, obtaining all the physical parameters from our observations and combining them, we aim to measure the gas flux rates from the different seeps found. For that purpose, a hydroacoustic method presented by Muyakshin et al. (2010) will be used. The method consist of a mathematical relationship of the flux rate as a function of the backscattering, gas density, rising speed of the bubbles, frequency of the echosounder and the BSD. BSD can also be obtained from visual observations. The results of this process will give us the possibility to estimate the input of methane into the water column and its potential to reach the atmosphere.