High Arctic cold seeps: visual and acoustic imagery reveal spatial heterogeneity in megafaunal communities and sediment geochemistry

Arunima Sen[1], Emmelie K.L. Åström[1], Wei-Li Hong[1], Pavel Serov[1], Alexey Portnov[1], Malin Waage[1], Michael L. Carroll[1,2], JoLynn Carroll[2]

[1]CAGE – Centre for Arctic Gas Hydrate, Environment and Climate, Department of Geosciences, UiT, The Arctic University of Norway, 9037 Tromsø, Norway; arunima.sen@uit.no
[2]Akvaplan-niva, FRAM – High North Research Centre for Climate and the Environment, 9296 Tromsø, Norway

Cold seep communities around gas hydrate mounds associated with seabed methane release in the Western Barents Sea (76°N, 400 m depth) were imaged with an ROV and towed camera. The constituent substrates, seabed features and their associated faunal groups were identified and mapped with georeferenced photomosaics. Our results are among the few to characterize high Artic shelf cold seep habitats and communities in detail. Similar to other cold seeps around the world, the major substrate and habitat types were bacterial mats, soft sediment and methane derived authigenic carbonate concretions. The dominant chemosynthesis based animal community were frenulate siboglinid worms. However, these worms were absent from one of the mounds despite hydro-acoustic and sediment porewater data indicating that this particular mound is still an active seep. Sulfide and methane concentrations at this mound were significantly lower in comparison to the siboglinid hosted mounds, however, sulfide concentrations were still at the millimolar level. High resolution seismic data revealed zones of acoustic blanking, interpreted as gas-saturated sediments below the siboglinid inhabited mounds. No such blanking was seen below the mound where siboglinids were absent; suggesting that sub-surface processes affect the manner of seepage, and therefore the suitability of seepage sites for chemosynthesis based animal communities. Other than the worms, the community overall appears to consist of a diverse array of background species, including commercially important ones (Atlantic cod, haddock, shrimp, etc). The invasive snow crab (Chionoecetes opilio) was also observed, an indication that Arctic cold seep communities are being affected by the warming induced northward expansion of certain animal groups.