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Seabed mapping using Synthetic aperture sonar and AUV - important tools for studies of cold seep habitats

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Cold seeps are commonly associated with water column and seabed features. Active seeps form acoustic flares in the water column and can be detected using data from single or multibeam beam echosounders. They may be associated with pockmarks, but the majority of pockmarks on the Norwegian continental shelf have proven to be inactive. Cold seeps are commonly associated with carbonate crust fields exposed at the seabed.

Studies using multibeam echosounder water column data in the Håkjerringdjupet region, underlain by the petroleum province Harstad Basin, have revealed more than 200 active gas flares related to cold seeps. We have studied the seabed around some of these, using the HUGIN HUS AUV equipped with HiSAS 1030 Synthetic Aperture Sonar (SAS) from Kongsberg. The SAS gave a 2 x 150 m wide swath. The primary product is the sonar imagery with a pixel resolution up to c. 3 x 3 cm. For selected areas, bathymetric grids with 20x20 cm grids were produced, giving unrivalled resolution at these water depths. The carbonate crust fields have normally a characteristic appearance, with a low reflectivity and a rugged morphology compared to the surrounding sediments.

The interpretation of the acoustic data was verified by visual inspection using the TFish photo system on the AUV, and at a later stage by ROV video footage and physical sampling. The integration of hullborne echosounder data with AUV-mounted acoustic and visual tools provides a very powerful approach for studies of cold seep habitats and related seabed features.

An important conclusion from the study is that many pockmarks are not associated with active gas seeps today, and that many of the presently active gas seeps are associated with carbonate crust fields which are readily identifiable from synthetic aperture sonar data.