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Hydrate pingoes at Nyegga: some characteristic features

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Hydrate pingoes were observed on the seafloor during two different remotely operated vehicle (ROV)-dives, conducted by Statoil at complex-pockmark G11, at Nyegga, off Mid-Norway. Confirmation that these structures actually represent hydrate ice-cored sediment mounds (pingoes), was done by other investigators (Ivanov et al., 2006). Because it is expected that hydrate pingoes represent relatively dynamic seafloor topographic structures and that their shape and size most probably will change over relatively short time, it is important to know how to recognise them visually.

Hovland and Svensen (2006) highlighted five different characteristic aspects that define hydrate pingoes on the sea floor:
1) They are dome- or disc-shaped features, which may attain any size from $\tilde{0}$.5 m in height and upwards. Inside pockmark G11, they were up to 1 m high.
2) They are circular or oval in plan view and may attain lateral sizes on the seafloor ranging upwards from $\tilde{0}$.5 m. Inside G11 they had lengths of several metres and widths of up to 4 m.
3) They have dense communities of organisms growing on their surfaces. At G11, they were overgrown with small pogonophoran tube-worms.
4) They have patches of white or grey bacterial mats growing on their surface, indicating advection (seepage) of reduced pore-waters.
5) They have small pits and patches of fluidized sediments on their surface, indicating pit corrosion of the sub-surface gas hydrate.
Because gas hydrates often form in high-porosity, near-surface sediments, where water is readily available, it is thought that they will build up at locations where gases are actively migrating upwards from depth. However, gas hydrates are not stable in the presence of ambient seawater, as seawater is deficient in guest molecule gases (normally methane). Therefore, they tend to build up below surface above conduits for gas flow from depth. But, the near-surface hydrate ice-lenses will continually be corroded by seawater circulating into the sediments from above. It is, therefore, expected that hydrate pingoes continually accrete from below and ablate from above, processes which cause a continuous change of size and shape over time, as long as fluid migration is active. These active (mainly inorganic) processes also stimulate organic life, by the continuous release of: a) dissolved methane and other reduced chemical species, and b) low-salinity and/or high-salinity water, released by active hydrate formation and dissociation.