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Helge Løseth¹, Lars Wensaas¹, Børge Arntsen¹, martin hovland² (1) Statoil research centre, Trondheim, Norway
(2) Statoil, Forhus, Norway

Fluid Injection Causing Shallow Mud Diapirism in the Hordaland Group, North Sea

During a regional seismic interpretation study of leakage anomalies in the northern North Sea mounds and zones with a highly chaotic seismic reflection pattern in the Tertiary Hordaland Group were repeatedly observed located above gas chimneys in the Cretaceous succession. The chaotic seismic reflection pattern was interpreted as mobilized sediments. These mud diapirs are large and massive, the largest being 100 km long and 40 km wide. Vertical injections of gas, oil and formation water are interpreted to have triggered the diapirs.

On the eastern side of the Viking Graben, another much smaller type of mud diapir was observed. These near-circular mud diapirs are typically 1 - 3 km in diameter in the horizontal plane. Limited fluid injection from intra-Hordaland Group sands, through sand injection zones, into the upper Hordaland Group is interpreted to have triggered the near-circular diapirs.

This observed "external" type of mobilization was generated at shallow burial (<1000 m) and should be discriminated from the more common "internal" type of mud diapirism that is generated in deep basins (>3000 m). The suggested model has implications for the understanding of the palaeo-fluid system, sand distribution, stratigraphic prediction within the chaotic zone, seismic imaging, and seismic interpretation of the hydrocarbon "plumbing" system.