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Gas hydrate stability zone and associated seafloor mounds, offshore West Africa

Christophe Serié (1), Mads Huuse (1), and Niels Schødt (2)
(1) University of Manchester, SEAES, United Kingdom (christophe_serie@hotmail.com), (2) Maersk Oil, Denmark

The occurrence of BSRs in a recently acquired three-dimensional seismic survey offshore West Africa indicates the likely and widespread existence of gas hydrates. BSRs are predominantly observed within salt withdrawal mini-basins. Toward salt diapirs, BSRs occur progressively shallower, up to depths very close to seafloor when directly overlying salt diapirs. In addition, mounds have been identified over topographic highs associated with underlying salt diapirs. These mounds are approximately 20 m in height and 200 m in diameter and are characterised by high amplitude seafloor reflections. Despite the absence of continuous BSRs, the mounds are directly underlined by strong reflections with inverse polarity and cross cutting relationship.

Depth variations of BSRs are likely to be associated with local variation of the regional geothermal gradient, either linked to the presence of highly conductive salt diapir, upward migration of warm fluids along diapir flanks, or a combination of both. The origin of mounds is still uncertain, although the presence of BSRs-like reflections and strong geomorphological similarities with previous studies suggest a potential link with the formation and accumulation of gas hydrate in the shallow subsurface.

Improved understanding of the presence of hydrate-bearing sediments at the surface and in the subsurface will help to better constrain their occurrence with respect to local variation of the geothermal gradient and fluid flow migration pathways.