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Occurrence, characteristics and formation mechanisms of methane generated micro-pockmarks in Dunmanus Bay, SW Ireland

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Surveying efforts of Integrated Mapping For Sustainable Development of Ireland's Marine Resources (INFOMAR) and its predecessor the Irish National Seabed Survey (INSS) over the past 10 years have revealed numerous pockmarks and other seepage related structures in several locations in the Irish Exclusive Economic Zone (EEZ), i.e. on the Atlantic margin, the Malin Shelf [1], in the Irish Sea [2] and in the Porcupine Seabight. Here we present findings of a thorough investigation of a new pockmark field discovered in the Dunmanus Bay, SW Ireland [3].

A small gas pockmark field in Dunmanus Bay, SW Ireland was surveyed and ground-truthed to assess its activity, geomorphology, explore its formation mechanisms and to investigate its potential influence on the benthic community. The field consisted of 121 circular, shallow units ranging from 5 to 17 m in diameter and not exceeding 1 m in relief. Sub-bottom profiles revealed broad acoustic signatures typical of shallow gas accumulation in the subsurface in addition to vertically elongated signals of ascending bubbles captured in the echo sounder data. The pockmarks show strong correlation with the depth of sub-surface gas fronts. However methane concentrations in the water column and directly above the features were close to typical marine, background values and did not exceed 15 nM. This suggests a very mild, periodic venting scenario. Sediment core samples revealed permeable sandy layers with slightly elevated methane concentrations indicative of stratified, diffusive flow. Pore-water sulphate and chloride data show no sign of pore water freshening and thus suggest that methane gas is the sole fluid responsible for formation of these pockmarks. Benthic infauna distributions showed reduced diversity in pockmarked regions, primarily influenced by the sediment composition. Few species utilising chemosymbiotic associations were identified, and there was little indication of a community influenced by methane venting in Dunmanus Bay.

References:

[1] Garcia X et al. (2014) *Geochem Geophys Geosy* 15(4):867-885

[2] O'Reilly SS et al. (2014) *Mar Geol* 357:139-150

[3] Szpak MT et al. (2015) *Cont Shelf Res* 103:45-59

