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EVALUATING THE ROLE OF HYDROCARBON SEEPAGE IN CARBONATE MOUND FORMATION (OFFSHORE IRELAND) USING BASIN MODELLING

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The goal of this project was to assess whether deep water coral mound growth on the continental slope of the north Atlantic could be related to active hydrocarbon leakage. The objects of interest are numerous buried and non-buried carbonate mounds, consisting mainly of corals, carbonate crusts and fine grained clastic sediments in the Porcupine Basin, which is located on the eastern Atlantic continental slope 200 km offshore Ireland and contains the sub-commercial Connemara oil field.

To evaluate the possible link between hydrocarbon leakage and mound growth we used 2D and 3D basin modelling in combination with geochemical analysis of sediments from gravity cores. A total of 5 intersecting seismic lines were used as a basis for 2D modelling of basin evolution, hydrocarbon generation and migration. Data from six exploration wells were used for calibration of the basin burial and thermal history using vitrinite reflectance, bottom hole temperatures and apatite fission track data. 3D basin modelling was performed using data provided by UCD in the northern part of the Porcupine Basin.

The results of this study indicate that a link between modelled hydrocarbon leakage and carbonate mound growth is possible both in the Belgica mound province on the eastern flank of the basin where stratigraphic pinch outs of carrier beds can lead to the localised leakage of hydrocarbons to the seafloor, as well as in the Hovland Magellan

mound area in the northern half of the Porcupine Basin, where small-scale structural closures mapped on the main Miocene surfaces correlate roughly to observed mound locations.

This study demonstrates the applicability of basin modelling in testing and identifying geologic processes related to geosphere/biosphere interactions.