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Biogeochemical evidence for anoxic oxidation of methane occurrences in the juvenile carbonate mounds from the gulf of Cadiz

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Carbonate mounds are conspicuous features of the European margins. Only fossil examples of these mounds were known when modern giant carbonate mounds were discovered in the S.-W. Irish margin. A decade of thorough studies in this area provided remarkable insight on mound processes and distribution. However, the question of the genesis and stabilization over geological times of these carbonate mounds remain wide open.

Our work hypothesis is that moderate fluxes of low molecular hydrocarbons are oxidized and produces carbonates that may serve as cement for the mound stabilization. The recent discovery and mapping (R/V Belgica 2003, 2005) of the Pen Duick escarpment on the Moroccan margin (Gulf of Cadiz) by swath bathymetry shed light on new carbonate mounds associated with fluid migration markers such as pockmarks, carbonate crusts and mud volcanoes. Pore water biogeochemical profiles show that the sulphate to methane transition zone occurs at 3.5 meters below the sea floor within the mound, whereas the depth of no sulphate is much deeper in the surrounding sediments. At the same depth, carbonates are released with $\delta^{13}C$ values as low as -21 permil indicating a methane and possibly other light hydrocarbons origin. Hence anoxic oxidation of hydrocarbons, and subsequent carbonate production, may play a key role in the mound formation and/or stabilization. Interestingly, *Lophelia* coral rubbles were present all along the sediment column suggesting that this mound is a potential habitat

for cold coral and associated communities.