
Tens of thousands of fluid escape structures on the continental shelf of the Gulf of Lions

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Résumé

Natural systems of fluid escape (methane, freshwater of continental origin) from marine sediments are of great international interest due to their multiple environmental, societal, scientific, and economic implications. Methane is a powerful greenhouse gas, while the expulsion of fresh or brackish water from coastal aquifers has a poorly understood impact on the balance of continental water resources.

Numerous geophysical and geological surveys financed by the DGEC have recently been conducted on the Gulf of Lions continental shelf, in anticipation of the installation of floating wind farms. These surveys complement the data acquired by the academic community over the past 30 years, resulting in an exceptional database. The processing of bathymetric and seismic data reveals the existence of a considerable number (> 29,000) of sedimentary deformations linked to fluid outflows, unknown until now.

Two types of deformations have been observed:

- Micro-domes, with positive relief on the order of a meter to a hundred meters in diameter (Fig. 1A).
- Pockmarks, forming depressions of the order of a meter in depth and a hundred meters in diameter (Fig. 1B). These structures adopt different morphologies (simple depression, crater) that could reflect distinct phases of evolution.

It remains unclear whether these two types of deformation are genetically linked and whether they represent different evolutionary phases and/or levels of activity.

The lithology of the underlying deposits appears to play a significant role in the typology and spatial density of these fluid emission systems observed on the seafloor. Both types of deformation are in fine-grained sediments, specifically in the outer part of the Rhône mud-belt and in the canyon's interflaves. This distribution suggests fluids of superficial origin, although a deeper origin cannot be ruled out. The presence of underlying transgressive sand

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bodies such as shoal retreat massifs (Berné et al., session 3.12) also seems to favor the presence of deformations, likely by providing a reservoir sealed by post-glacial muds. At this stage, the nature and source of the fluids, the mechanisms by which the seeps are generated and the degree of activity of the structures remain to be assessed.

Mots-Clés: Fluid expulsion systems, Pockmarks, Micro Domes, Gulf of Lions, Marine sediment deformation