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Comments on the paper of Gay et al. (2006) Seafloor facies related to upward methane flux within a Giant Pockmark of the Lower Congo Basin. Marine Geology 226:81–95

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The paper by Gay et al. describes a giant pockmark on the basis of geological and biological data collected during ROV dives. The description of seep communities based on a transect across the pockmark includes some mistakes. Part of the description of the fauna is attributed to Olu-Le Roy et al. (2003) and includes data that have not been presented in this oral communication. An "evolutive model" is proposed, based on these data and on an incorrect interpretation of symbiotic species requirements (classification of methane vs sulfide dependent species). In this note, I would like to point out the mistakes of this paper and express why their model cannot be used to describe the reality of the seabed.

In the results section, the Facies A is described as "biologically depauperate" … and to "corresponds to the regional seafloor". However, no submersible data were available to compare this facies and the regional deep-sea floor in terms of faunal density. For the Facies C, the authors report "patches of black reduced sediments partly covered by whitish bacterial mat that are often populated by wide communities of clams of the genus Vesicomyidae (Olu-Le Roy et al. 2003)". However, bacteria mats and Vesicomyidae were not generally observed together. The Facies D is, according to Gay et al., "populated by lush benthos life (sea anemones, sea pens, sponges, shrimp, octopus, small sharks, eel-like fish, holothurians, sea urchin, gastropods) (Olu-Le Roy et al. 2003)". However, **no sea pens, sponges, octopus, or small sharks were observed at the REGAB site.** We can also read that "stacked authigenic carbonate crusts, pitted by worms or bivalve boring" but **Mytilidae of genus *Bathymodiolus* are not boring bivalves**. They were just observed on or around the crusts. Finally, we observed very few areas of "pavements and domes" and I am not sure that the centre of the pockmark is covered by such a facies.

The authors based part of their discussion and the model on the assumption that the mussels and the vestimentiferans are dependent on methane ("endemic methane-dependent life: Vestimentiferan tube worms and mussels of the genus Mytilidae") while vesicomyids are considered to be sulphide-dependent. However, this opposition between methane-dependent and sulphide-dependent taxa is not valid, as **vestimentiferan tube worms** (now referred as Siboglinid polychaetes) **harbour sulfide-oxidizing bacteria and use sulfide produced in the sediment, like vesicomyids.** Furthermore**,** methanotrophy of the mytilid symbionts is attributed with reference to Childress et al. (1986) describing another mytilid from the Gulf of Mexico seeps However, not all the seep mussels are associated with methanotrophic symbionts: some have sulphide-oxidizers (*Tamu fisheri* Gustafson et al. (1998)), and others have a dual symbiosis (Fisher et al. 1993, Fiala-Médioni et al. 2002). This is also the case of the mussel living at the REGAB site (Duperron et al. 2005), therefore able to live using methane or sulphide via its different symbionts. The isotopic values of this species (-62 ‰) indicates that it mainly uses methane (Olu-Le Roy et al. 2003). These data should have been indicated to validate the discussion. The authors could have mentioned them, referring to Ondréas et al. (2005) where they are reported.

The model that concludes that "the methane-dependent assemblage is located in the centre of the depression although the sulphide-dependent assemblage is located on the outer border" is therefore based on a video transect including mistakes, as vesicomyids were observed in the central part of the pockmark, erroneous data on the fauna improperly attributed to Olu-Le Roy et al. (2003), and incorrect interpretation of the requirement of symbiotic species (methane-dependent vs sulphide-dependent) and cannot be use to describe the bio-chemical features on the giant pockmark. This model could nevertheless be applied at a smaller scale to explain the distribution of symbiotic species in an individual pockmark on depression, with mussels at the centre and sulphide-dependent species (both vestimentiferans and vesicomyids) in areas of lower fluid fluxes, but this was not the objective of this paper.

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