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# Methane, pockmarks and Haploops: a bio-geochemical connection

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## Résumé

Geophysical investigations and space time evolution analysis of the pockmarks-Haploops association offshore Le Croisic strictly linked the methane venting activity of the pockmarks to the presence and development of the tube dwelling organism. The nature of this link is yet to be understood. In order to consider how the upward flux of methane from its reservoir influence the geochemistry of the superficial sediment and, in particular, the recycling of nutrients, the first 5 meters of sediment have been sampled in and outside the pockmarks-Haploops area. Well-defined sulfate-methane transition zones (SMTZs) have been observed in and outside the pockmarks-Haploops area. The core sampled inside the settlement showed a shallower SMTZ at 250 cm depth (around 70 cm closer to the water-sediment interface) indicating more intense mineralization processes within the pockmarks-Haploops settlement. Therefore, more important recycling of phosphate and ammonia was observed at depth within the pockmarks-Haploops area. This would normally generate a stronger vertical flux towards the water-sediment interface and therefore an important source of nutrients for primary production that would supply the resource of food for the colony to be sustainable independently of continental sources. However, chemical gradients at the sediment water interface indicated lower diffusive fluxes invalidating such model. Recent developments of porewater high-resolution imagery allowed us to show that the high density of abandoned tubes of Haploops created preferential circulation enhancing advective transport of nutrients that overtook transport by diffusion. Such transport process seems to efficiently transfer ammonium for instance from the sediment to the water column enhancing nitrification at the sediment water interface and possibly primary production within the water column

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