Chemosynthesis next to hydrothermal vents: Insights from Manus Basin, Papua New Guinea

Abstract

Spots of life are present even in the most remote location of the planetary ocean, far away from the sun light. In the Western Pacific, deep-sea vent communities are found along spreading centers, on a limited area characterized by sharp physico-chemical (temperature, salinity, pH) gradients, where macro-organisms show adaptations to extreme environments. Only a very small amount of carbon generated by primary production and photosynthesis at the sea surface reaches the deep ocean, vent endemic animals depending on primary production of local symbiotic microorganisms, with life cycles driven by chemosynthesis, instead of photosynthesis. Chemosynthesis depends on the volcanic driven input of hydrothermal fluids enriched in H_2, CH_4, H_2S, NO_3 as well as As and metal ions, which are used as energy sources for bacteria living around vents in order to fulfill their own, and host needs. One of the most extended and active hydrothermal fields are these of the Manus Basin, Papua New Guinea. Shell microstructures, mineralogy, minor element distributions and multiple isotope compositions of several macro-organisms living at depths below 2000 m give insights into type of symbiosis, isotopic discrimination between the anions of the inorganic water pool and organic tissue of organisms as well as temporal and spatial scale of environmental fluctuations.

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