High-pressure technologies for the study of the deep marine biosphere

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ABSTRACT

Pressure is a governing factor for the distribution of life in the biosphere. Deep-sea microbial communities are adapted to *in situ* conditions of pressure, temperature, and organic matter availability. Rate measurements using decompressed samples at atmospheric pressure underestimate the metabolic activity of these autochthonous microbial populations with the negative effect of decompression increasing with depth of retrieval[1,2]. Removing the selective factor of hydrostatic pressure will also alter the overall sign and strength of interspecies interactions with subsequent consequences on the microbial community structure; previously rare or dormant taxa at high pressure conditions can become dominant in abundance and metabolic activity at atmospheric pressure. Maintaining elevated pressures throughout sample retrieval, transfer and incubation is thus crucial for the exploration of the deep marine biosphere yet progress in this field is hampered by the technical and financial challenges of high-pressure techniques. As a case study, we present the results of a 3-year project on the degradation of hydrocarbons by deep-water microbial communities in the Eastern Mediterranean Sea at *in situ* conditions of pressure and temperature. Using an affordable high-pressure sampler and experimentation unit of maximum working pressure at 10MPa, we were able to identify and isolate piezotolerant hydrocarbon-degrading bacteria and provide evidence on the negative effect of decompression on microbial diversity and consequently ecosystem function, in this case, the biodegradation of hydrocarbons. Finally, an advanced pressure-maintaining apparatus, currently under construction, that will allow us to sample the full depth range of the Mediterranean Sea (up to 50MPa), will be presented.

REFERENCES

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