DGT, microsensor and molecular genetic characterization of biogeochemical processes in an extreme arctic environment

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Here we present data from field-testing of modern geo-biological techniques in the extreme environments of the northernmost arctic warm springs (Jotun springs, 79.5˚N, Bockfjord, Svalbard, Norway). These springs are characterized by ~ 2mm to 4 cm thick layered bacterial communities and mats, which result from extreme redox, biological and inorganic gradients.

High-resolution DGT (diffuse gradient thin film gels), and high-resolution microsensor (pH, O_2 and H_2S @ mm scale) measurements helped elucidate the depth behaviour of metals and redox active species across the interfaces between the 3 main redox zones. In addition, field-based molecular genetic characterization of the bacterial communities and laboratory based microscopic characterization of the inorganic and biogenic components in these layers when combined with the high-resolution DGT and redox measurements helped reconstruct a detailed biogeochemical profile.

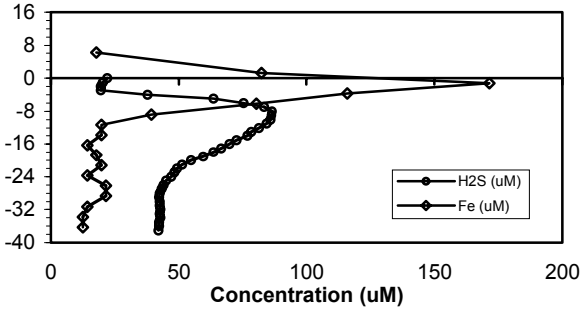

Figure 1. Depth profile in the Jotun3 spring showing the Fe and H_2S behaviour accross the O_2/H_2S interface (at 0 mm)

Viruses from extreme environments

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Viruses are ubiquitous and vastly outnumber microbes and other organisms in all environments studied to date (Brussow and Hendrix, 2002). Viruses from extreme environments have only recently been discovered and are poorly characterized relative to animal viruses and viruses in marine environments. Characterized viruses of extremely thermophilic Archaea have unique morphology unlike any other viruses. Additionally, their genome sequences do not resemble any other known sequences (Prangishvili et al., 2001). Study of these viruses has led to insights into virus origins, evolution and antiquity (Rice et al., 2004), the stability and structure of viruses as well as the development of genetic tools for the study of thermophilic Archaea (Jonuscheit et al,. 2003). These viruses offer unique opportunities to study the role of viruses in hydrothermal environments and their potential for preservation. The current state of knowledge of viruses from extreme enviroments will be discussed.

References

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