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Life and element cycling in the hadal realm - *Endowed Biogeochemistry Lecture*

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The hadal zone represents the deepest and most scantly explored marine habitats on Earth. The hadal ocean covers >2 million km^2 and include 27 long, narrow trench systems, that stretch along tectonic subduction zones. Hadal exploration is challenging, but recent technical advances have widened our knowledge on life and biogeochemistry in the deepest oceanic realm.

It has been documented that tranches act as depocenters for organic material, and they appear to represent globally important sites of carbon sequestration, but at the same time they act as biological hots spots for deep sea life flourishing at extreme hydrostatic pressure. Microbial mineralization rate along trench axes is highly intensified as compared to adjacent abyssal plains, and in the most active trench systems early diagenesis include the complete redox sequence of anaerobic mineralization know from coastal sediments. The intense mineralization is mediated at extreme hydrostatic pressure by largely unexplored microbial communities. Preliminary investigation suggests that hadal biomes are distinct but surprisingly diverse. Recent findings also document that trench act as depositories for anthropogenic pollutants and can hold surprisingly high inventories of persistent organic pollutants.

Hadal trenches are unique but highly dynamic deep-sea environment, and their function or importance cannot be understood by extrapolating findings from the ambient ocean. The Lecture will provide an overview on the status of hadal biogeochemical research and discuss the many unresolved questions and paradigms that will spark hadal research in the coming years.