

## **Studies of sulfate reduction in marine sediments – past, present and future - *H.C. Urey Medal Lecture***

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Sulfate reduction is the main terminal pathway of organic carbon oxidation in the anoxic seabed and is thereby a gatekeeper between mineralization or burial of organic matter. Decades of research on the rates of this process should have provided a solid basis to estimate its global significance and its control by environmental parameters. Yet, different experimental and modeling approaches still tend to estimate different process rates, and there are biases in our data collection that need to be clarified. A cryptic sulfur cycle due to concurrent sulfate reduction to sulfide and sulfide oxidation to sulfate is rarely addressed. The physiological constraints on sulfate-reducing microbial communities also need to be better understood. The presentation will address some of these problems, including: a) geographic bias in coring sites, b) selectivity in modeled sulfate profiles, c) contamination of sampled pore water, d) simplified assumptions in models of organic matter degradation rates and their control, e) biased conclusions from short-term experiments on temperature regulation, and f) uncertainties about the basal power requirements of sulfate-reducing microbial communities. The aim is thereby to highlight gaps in our current understanding and to point at needs for future research. The conclusions are not limited to sulfate reduction but also have more general implications for sediment biogeochemistry.