

## **Sedimentary sulfides in dune sands of Spiekeroog Island, southern North Sea: A biogeochemical study of sulfur isotope partitioning**

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The formation of iron sulfides in sandy sediments and the associated development of stable isotope signatures is still mechanistically not understood. In dune sands under impact of both fresh and saline water several physico-chemical gradients may develop leading to distinctly different biogeochemical zones.

In the present study, a 10 m long core from a dune base at the North Eastern part of Spiekeroog Island, southern North Sea, was investigated for the elemental and stable isotope composition. The pyrite (TRIS) content was quantitatively extracted via an acidic Cr(II) distillation procedure and the stable sulfur isotope composition was determined by means of C-irmMS. The pore waters display a downcore increase in salt contents and a mixing between fresh and salt water. The accumulation of metabolites at depth indicate an increasing superimposition of mixing by microbial decomposition of dissolved organic matter with only limited net sulfate reduction. This indicates an essential open system with respect to dissolved sulfate. The sands were found to be very low in TOC, TIC, and TRIS and dominated by quartz minerals. Under the assumption that North Sea water sulfate was the only substantial sulfate source ( $\delta^{34}\text{S} = +21$  per mil), the sedimentary sulfides indicate an overall sulfur isotope discrimination upon microbial sulfate reduction between 39 and 52 per mil, which is within the range of results from other fully marine sands from the Spiekeroog area and laboratory studies with pure cultures of sulfate-reducing bacteria under low cellular sulfate reduction rates.

Further investigations are on the way to understand the processes leading to the iron sulfide formation in these organic-poor substrates.