



Temporal and spatial variation of sulfide invasion in eelgrass (*Zostera marina*) as reflected by its sulfur isotopic composition

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ABSTRACT: Temporal and spatial variation of $\delta^{34}\text{S}$, total sulfur (TS) concentration, and elemental sulfur concentration (S^0) in leaves, roots, and rhizomes of *Zostera marina* was followed between June 2002 and May 2003 at four locations in Roskilde Fjord and Øresund, Denmark. These were related to temporal changes in sediment sulfide concentrations, sulfur pool size, and sulfur pool $\delta^{34}\text{S}$. The $\delta^{34}\text{S}$ of *Z. marina* was most negative in the roots, followed by rhizomes and leaves, indicating that roots were mostly affected by sulfide. A significant relationship between decreasing $\delta^{34}\text{S}$ and increasing TS in the plant tissues indicated that sulfide accumulated in the plant and, furthermore, a positive relation between TS and S^0 in the plant suggests that part of the sulfide is reoxidized to S^0 . There were marked temporal changes in all variables at all sites, but the pattern of change varied between sites. The temporal and spatial heterogeneity in plant $\delta^{34}\text{S}$, TS, and S^0 depended on a variety of factors, such as sediment sulfide concentrations and the below : aboveground biomass ratio of the plants. This suggests that mechanisms of sulfide invasion are complex, and several factors (plant morphology, environmental variables) acting in concert or against each other need to be considered to successfully predict sulfide invasion in seagrasses.

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