Suction based profiling approaches to simultaneously assess the redox value, nutrient-, pollutant- and O_2-(pore)water concentrations across sediment water interfaces

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A better understanding of the release, transformation and immobilisation of pollutants and nutrients at the sediment water interface (SWI) is crucial to address key issues in applied and basic environmental sciences. Some questions to be addressed in sediment science are related to system performance- and risk-evaluation. Examples for that, closely linked to human activities, are changes of the aerobic layer thickness, which directly impacts the sediment performance with respect to sink/source functions for nutrients or pollutants.

Several sampling methods to examine the mobile fraction of a variety of chemical species in the SWI are available. Examples are diffusion driven methods (e.g., diffusive gradients in thin films [1] or peepers [2]) and suction based methods (e.g., sediment or fauna incubation experiment [3]). Since 2014 the authors provide information on novel suction based approaches, applying automated profiling systems providing simultaneously samples for ICP-MS analyses and data on pH, redox or O_2 [4,5].

The invited talk addresses: (i) a comparison of the different systems so far available with respect to benefits and limitations. Aim of this part of the presentation is to enable interested scientists to create their own systems or to adopt existing systems to their scientific needs. (ii) The talk is going to demonstrate how powerful these tools can be (for addressing questions on processes at SWI) by summarizing two studies recently performed in the authors' lab - one on fresh water sediments and one on brackish/marine sediments. (iii) Finally, an outlook on potential future system improvements and on questions to be addressed in studies on the release, transformation and immobilisation of pollutants across the SWI is going to be provided.

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