

## **Chemical eyes: Visualization and interpretation of chemical gradients in stratified water bodies**

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Elements involved in biogeochemical cycles undergo rapid turnover at the oxic/anoxic transition of stratified lakes. Here, the presence or absence of O<sub>2</sub> governs abiotic and biotic processes and their rates. Analyzing low-level O<sub>2</sub> concentrations at the transition from oxic to anoxic conditions is therefore an important goal of analytical biogeochemistry. In the past, it was difficult to precisely locate and investigate the oxic/anoxic interface due to a lack of fast, drift-free sensors with submicromolar detection limit.

A first study demonstrated that common amperometric microsensors as well as microoptodes, and thus two completely different O<sub>2</sub> sensing systems, allow a reliable resolution of the fine structure of the oxic/anoxic interface down to the 10 nmol L<sup>-1</sup> range. Since then, the submicromolar O<sub>2</sub>-distribution was found to be highly variable and it was shown that N-cycling and the redox gradients of Mn, Fe and CH<sub>4</sub> are controlled by O<sub>2</sub> distributions down to the nanomolar concentration range. The profiles revealed that apparent gaps between the oxic zone and the sites of CH<sub>4</sub> and Mn oxidation are bridged by zones with 0.01-1 mmol L<sup>-1</sup> O<sub>2</sub> concentrations and thus CH<sub>4</sub> and Mn oxidation clearly occur at oxic conditions.

The results expand the oxic zone up to several meters downwards and imply that substantial parts of "suboxic zones" characterized by the absence of both O<sub>2</sub> and H<sub>2</sub>S may actually belong to the realm of oxic processes if more sensitive measurement techniques are used for their characterization.