Diurnal variations in sulfur transformations at the chemocline of stratified freshwater lake

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Freshwater Lake Kinneret is thermally stratified during the warm period of the year. In summer months, the water column is forced daily by strong westerly winds that result in c.a. 6 m high internal waves (seiches) along the thermocline. In this study, we have utilized seiches in the Lake Kinneret in order to sample the chemocline with fine spatial resolution. To analyze the concentrations and isotopic composition of sulfur species, we sampled the water column hourly during 24 hours at constant depth (17.1 m), by *in-situ* pump . Basic physical and chemical parameters were measured as well *in-situ* at the same depth. Due to a diurnal cycle of chemocline displacement by seiches, sampling was performed in hypolimnetic and epilimnetic waters during the day and night, respectively. Conductivity, ORP, pH and turbidity depended linearly on temperature, but with different slopes above and below the chemocline. Concentrations of hydrogen sulfide and oxygen changed linearly with depth, below and above the chemocline, respectively. The highest concentrations of thiosulfate and sulfite were detected 1.2-2.5 m below the chemocline. Concentrations of elemental sulfur were dependent not only on the water depth, but also on the time of day. During the photoperiod, concentrations of elemental sulfur were found to be seven times higher than in the dark. We conclude that the sulfur cycle at the chemocline of the lake is controlled by a combination of light-independent processes (microbial sulfate reduction and oxidation of hydrogen sulfide to sulfur oxoanions) and by the light-dependent oxidation of hydrogen sulfide to elemental sulfur (phototrophic sulfide oxidation).