

Reoxidative part of the sulfur cycle in the water column of Lake Kinneret

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The annual sulfur cycle in the water column of monomictic, Lake Kinneret, Israel characterized by sub-millimolar sulfate concentration was studied with an emphasis on sulfur cycling.

Concentrations of sulfate, hydrogen sulfide and sulfide oxidation intermediates as well as the isotopic composition of sulfate, hydrogen sulfide and zero-valent sulfur were measured during six samplings starting at the Lake mixis and continuing through the various stages of water column stratification.

At station A, the deepest point in the Lake, hydrogen sulfide concentrations began to build up in the hypolimnion in May and sulfate inventory has decreases by more than 20% during the stratification period from May to December. During the early stages of stratification the concentrations of sulfide oxidation intermediates were relatively low and sulfur isotope fractionation between sulfate and hydrogen sulfide was low as well (11.6‰). As stratification progressed sulfur oxyanions (e.g. thiosulfate and sulfite) had become the main products of incomplete hydrogen sulfide oxidation. In October the sulfur isotope fractionation increased to the maximal value of 30±4‰ and zero-valent sulfur prevailed over sulfur oxyanions. As the chemocline erosion progressed towards the full mixing of Lake Kinneret water column in January hydrogen sulfide concentration decreased, inventory of sulfide oxidation intermediates increased and sulfur isotope fractionation decreased to 20±2‰.

These trends in the concentration of sulfide oxidation intermediates and of the isotopic fractionation between hydrogen sulfide and sulfate can be explained either only by microbial sulfate reduction in the water column or by microbial sulfate reduction combined with microbial disproportionation of intermediate sulfur species.