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SIMULATION OF LAKE'S SEDIMENTARY PHOSPHORUS BALANCE GOVERNED BY BIOIRRIGATION USING REACTIVE MULTI-COMPONENT TRANSPORT MODELING

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Summary. The exchange of phosphorus between the sediment and the surface water of a lake is considerably driven by bioirrigation of macrozoobenthos. Thus, oxygen is transferred into the sediment and leads to an oxidation of iron, following by precipitation processes. Phosphorus can be adsorbed onto the emerging mineral surfaces. In contrast to that, because of oxygen consumption and reduction of iron, phosphorus can be released from the sediment. Based on this conceptual geochemical approach a numerical reactive multi-component transport model was developed to simulate the impact of a macrozoobenthos species (*Chironomus plumosus*), which is living in small tubes in lake sediments. The model considers the relevant hydrodynamic and geochemical processes related to the activity of a given individual. Here, transport processes like diffusion and advection are of importance, and also degradation of organic matter, primary and secondary redox processes, mineral dissolution and precipitation, and sorption of phosphorus. The model calibration is based on laboratory experiments considering the transport of a tracer around the living tube of one individual of *Chironomus plumosus*. Results of bioirrogation-driving transport into the sediment, relevant phosphorus sorption and degradation, parameters and coefficients of kinetics, and exchange rates at the sediment-water interface will be presented. Based on these modelling results for one individual with the help of a simple up-scaling procedure the impact of macrozoobenthos activities for a lake's phosphorus balance can be developed. .