



Influence of flow conditions and microbial biomass on oxygen consumption in streambed dunes: a flume experiment

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Oxygen consumption rates in stream sediments are influenced by multiple factors. Streambed physicochemical conditions are controlled by the interplay between hyporheic flow rates, nutrient and oxygen supply, and microbial activities. This contribution presents results from a series of laboratory flume experiments in a sandy streambed under high levels of nutrients. The experiments were performed in a 260-cm-long and 29-cm-wide recirculating indoor flume, with a drainage system placed on the channel bottom which enabled to control the magnitude of losing or gaining fluxes. The sediments were manually arranged in dune-shaped bed forms-structures of 15 cm in length and 2 cm in height. The vertical distribution of DO concentrations in the streambed was measured at four different locations across a single bed form using a Clark-type oxygen microelectrode, mounted on a micromanipulator with computerized depth control and a data acquisition system. For each location, oxygen consumption rates were calculated with a 1D numerical model (GRADIENT). Results show that oxygen consumption rates ranged over four orders of magnitude and were highly correlated with the vertical exchange flux between the water and the streambed. Biomass distribution varied across the bed form within one order of magnitude and exerted and was shown to have a secondary influence on oxygen consumption rates.