Laboratory experiments to determine oxygen transport in a fluctuating capillary fringe

C. M. HABERER & P. GRATHWOHL
Eberhard-Karls University Tuebingen, Institute for Geoscience, Centre for Applied Geoscience, Sigwartstrasse 10, D-72076 Tuebingen, Germany
christina.haberer@uni-tuebingen.de

Abstract Quasi 2-D bench-scale flow-through experiments were conducted to investigate the effect of entrapped air on oxygen transport across the capillary fringe during changing water table levels. We applied a non-invasive fibre-optical sensor technique to measure vertical oxygen concentration profiles in the transition zone between the saturated and the unsaturated zone at high spatial resolution. The characteristics of the oxygen profiles were related to mass flux measurements at the outlet of the flow-through chamber. The results show that transverse vertical dispersion and equilibrium partitioning between the gas and the aqueous phase are sufficient to explain vertical transfer of oxygen into groundwater.

Key words flow-through experiments; capillary fringe; mass transfer; oxygen; water table fluctuations; entrapped air