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Do diatoms percolate through soil and can they be used for tracing the origin of runoff?

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Tracers are widely used to study the movement of water in a catchment. Because of depletion of scientific possibilities with most common tracer types, we proposed the use of diatoms as a natural tracer. Paradoxical results on the contribution of surface runoff to the storm hydrograph were obtained in pioneer research on this idea. Diatom transport via the subsurface flow to the stream would explain this paradox. Prerequisite for this is vertical transport of diatoms through soils, which is the topic of this study. Emphasis is on percolation behavior (speed of percolation, speed of percolation over time, and species distribution) of *Pseudostaurosira* sp. and *Melosira* sp. (Bacillariophyceae) through undisturbed soil columns of contrasting substrates. Co-objective is to study the flowpaths of water through the soil columns.

Natural undisturbed soil columns were sampled in the Attert basin (Luxembourg) on schist, marl and sandstone substrates. Rain simulation experiments were performed to study vertical diatom transport. Rhodamine dye experiments were carried out to gain insight in the active flowpaths of water, and breakthrough experiments were performed to study the responses of the soil columns to applied water. Diatoms were transported through the soil columns of the three substrates. A vast majority of diatom percolation took place within the first 15 minutes, percolation hereafter was marginal but nevertheless present. Peaks in diatom percolation corresponded with a high flux caused by the addition of the diatom culture, but seepage of diatoms along the sides is unlikely according to the species distribution and the rhodamine dye experiment. *Pseudostaurosira* sp. percolated significantly better than *Melosira* sp. Significantly more diatoms percolated through the marl columns compared to the schist columns and variance within the sandstone group was very high. Absolute differences between substrates however, were marginal. Most preferential flowpaths were observed in the marl columns, indicating highest active macroporosity in these columns. Although the sample size of this study was small, it is suspected that the highest diatom percolation percentages of the marl columns is linked to its greater macroporosity and most importantly, diatoms can percolate through soil (macro-) pores.