Supplementary Material

Mobilization of microspheres from a fractured soil during intermittent infiltration events

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Figure S1. Excavated soil core at the field site. The cracks or inclined bedding planes are visible below the top organic layer.
Injection of dye in soil core to identify preferential flow paths

Dye injection in intact soil core has been used to trace the preferential flow paths in unsaturated soil (Allaire, et al., 2009; Hardie, et al., 2011). We applied a dye (rhodamine B, 90%, Sigma) on top of a different soil core than the one used in our study and assumed that regions around preferential flow paths would be colored by dye. The rhodamine solution (1 mM) was prepared in 8 L of high-purity water. The solution was applied on the top of the soil core at 2.5 cm h⁻¹. The soil core was dried at room temperature for 48 h. A hand-saw was used to cut the soil core horizontally at multiple depths (2.5, 10.1, 15.2, 20.3, and 25.4 cm) from the surface of soil core. The photographs of top and bottom surfaces of the soil core along with top surface of each cross-section were taken using a digital camera. The preferential flow was observed through the cracks in the soil (Figure S2). The region colored by the dye decreased with an increase in the depth.
Figure S2. Rhodamine dye applications on a soil core. The horizontal cross-sections of soil core at multiple depths from surface of soil core are shown. The colored areas indicate preferred flow paths or hydrologically active macropores during dye injection.
Zeta potential of soil and microspheres.

The zeta potential of microspheres and fine soil particles (<75 µm) was measured by laser Doppler microelectrophoresis at four pH values between 2 and 9, following a method outlined elsewhere (Mohanram, et al., 2010). Zeta potentials of microspheres and soil remained negative at a wide pH range (from pH 2-9). The negative charge on the microspheres increased with increasing pH. The 1.8 µm microspheres displayed more negative surface charge relative to smaller (0.5 µm) microspheres. However, the soil exhibited substantially more negative surface charge compared to both sized microspheres.

Figure S3. Zeta potential of soil and microspheres suspended in 10^{-3} M NaCl as measured by Doppler microelectrophoresis. Sodium hydroxide and hydrochloric acid were used to adjust the pH.
References:

