



Droplet infiltration and OM composition of intact soil structural surfaces for studying mass exchange

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During rapid percolation through macropores with local nonequilibrium conditions water and solute mass exchange with the porous matrix and sorption of reactive components is both taken place at the surface of preferential flow paths. Aggregate surfaces can be coated by illuviated clayey particles and biopores covered by plant residues or earthworm casts. By controlling wettability and sorption properties, the organic matter (OM) of surface coatings may also affect the transport properties of structured soils. Composition of OM in wall coatings was found spatially distributed at the mm-scale; thus, it remained unclear if water absorption by the soil matrix (i.e. mass exchange) was affected by locally-distributed OM. For samples with intact aggregate surfaces and biopore walls taken at clay-illuvial subsoil horizon of Luvisols developed from Loess and glacial till, the mm-scale spatial distribution of OM composition was measured using diffuse reflectance infrared spectroscopy (DRIFT). Spectra were analysed with respect to alkyl and carboxyl functional groups in OM to obtain an estimate for its potential wettability. The infiltration dynamic of water droplets was evaluated using contact angle measurements and droplet penetration time. The potential wettability of OM differed for coatings and burrow walls and was generally lower for the Loess-derived than for the till-derived samples. The droplet infiltration times were significantly lower only for the Loess Luvisol samples. The results suggest that mass exchange between flow path and matrix can be affected by OM composition of structural surfaces among other factors such as texture, moisture, and chemical status (pH).