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Plant roots release a highly polymeric blend of substances called mucilage into the soil. Various alterations of soil hydraulic properties in their vicinity (the rhizosphere) have been attributed to the presence of mucilage. Despite its definition as a hot spot of microbial activity and the immense amounts of water (about 40% of all terrestrial precipitation) that cross the rhizosphere the mechanisms how mucilage affects soil hydraulic properties remains unclear.
Mucilage adsorbs water, reduces its surface tension and increases its viscosity. A consequence is the formation of characteristic structures like long filaments (at low concentration) and two-dimensional structures (at high concentration) that span throughout the porous medium during soil drying. The spatial configuration of water impacts the retention and transport properties of the rhizosphere.
During drying, mucilage polymers become increasingly viscous and do not move as fast as the receding water phase, thereby acting as a network holding water and increasing the water retention capacity. This viscous network also increases the connectivity of the liquid phase, which might maintain water and solute transport in drying soils –i.e. the relative unsaturated conductivity drops more gradually.
In this study the spatial distribution of dry mucilage structures was resolved via synchrotron micro X-ray CT. Results provided the basis for our concept of how mucilage affects the soil hydraulic properties of the rhizosphere.

Primary authors: Mr BENARD, Pascal (Chair of Soil Physics; University of Bayreuth); Dr ZAREBANADKOUKI, Mohsen (Chair of Soil Physics; University of Bayreuth); Prof. CARMINATI, Andrea (Chair of Soil Physics; University of Bayreuth)

Presenter: Mr BENARD, Pascal (Chair of Soil Physics; University of Bayreuth)

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