



Contribution ID: 832

Type: Oral Presentation

Cotransport of clay and microplastics in saturated porous media

Tuesday, 14 May 2024 11:40 (15 minutes)

The widespread use of plastics for various applications lead to their inevitable release into the environment. The disintegrated microplastics particles may ultimately find their way into the subsurface, thereby contaminating soil and groundwater. Hence, it is essential to understand the transport behaviour of microplastics in soil to protect drinking water wells from contamination. The presence of natural colloids such as clays in the subsurface are known to alter the transport behaviour of several contaminants. This study aims to understand the cotransport of clays and microplastics in saturated soil through column experiments and mathematical modeling. Experimental results showed enhanced transport of microplastics and retarded transport of clays during their cotransport as compared to their individual transport. This contrasting transport behaviour of clays and microplastics during their cotransport may be due to the competition between them in finding deposition sites on grain surfaces and also due to the formation of clay-microplastics heteroaggregates which may have different surface properties than individual clay and microplastics particles. The experimental results were successfully simulated using mathematical model which accounted for clay and microplastics retention in soil, heteroaggregation kinetics, and heteroaggregate retention in soil.

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Session Classification: MS08

Track Classification: (MS08) Mixing, dispersion and reaction processes across scales in heterogeneous and fractured media