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Beyond solutes - Mobile matter and its role for the properties, processes and functions of natural porous media

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This presentation will focus on the vastly neglected but rather fascinating aspects of mobile colloidal and particulate materials in natural porous media. The substance spectra of mobile matter in soils, sediments and aquifers will be introduced. Besides clay minerals, carbonates and the oxides and hydroxides of Si, Al, Fe and Mn, these materials comprise in particular organic and biotic material of diverse provenience. Of particular importance are the neo-formations of nanoparticles in the presence of organic matter by means of heterogenic nucleation and growth. Beside the adsorption of mobile organic matter to mineral surfaces, it is this is process that results in the production of organo-mineral phases that differ dramatic in their properties from the pure minerals. Release and formation processes and their role for solute transport will be discussed. The manifold reactions and interactions within and in between the involved immobile and mobile solid, liquid and "biotic" phases are highlighted. Special consideration is given to the interdependence of mobile matter, fluids, physical structure, fluid properties and transport. Among others, this comprises the interplay of mobile matter and aggregation, surface inversion, and fluid properties.
Based on lab and field experimental evidence and theoretical concepts, the "solutes and solution" approach will be challenged and the need to theoretically and experimentally step beyond will be justified.