Geophysical Research Abstracts, Vol. 9, 04647, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04647

DOM transport in natural solids: lessons from the behavior of organic pollutants

J.J. Pignatello

Department of Soil and Water, Connecticut Agricultural Experiment Station, and Environmental Engineering Program, Yale University, New Haven; P.O. Box 1106, New Haven, CT, U.S.A.

The transport of dissolved and colloidal organic matter (DOM) in soils and sediments is poorly characterized because it involves complex sorption, diffusion and reaction processes. Much of our knowledge about diffusion in natural solids comes from studies of hydrophobic organic compounds (HOCs), which sorb primarily to soil and sediment organic matter (SOM). Historically, sorption and diffusion of HOCs has been modeled with the assumptions that the solid phase is immutable, that sorption is fully reversible, and that the influence of other solutes that may be present can be neglected. This presentation will discuss recent results of sorption studies of HOCs on SOM that challenge the generality of these assumptions. It will show that physical changes in SOM accompanying sorption (i.e., inelastic swelling) can lead to hysteresis and non-Fickian behavior. It will show that competing solutes can influence rates and the appearance of sorption reversibility if their concentrations change during the sorption-desorption cycle. And it will show molecular sieving (i.e., size exclusion) effects in the sorption of HOCs by charcoal carbon, representing a porous adsorbent component of SOM. Competition, molecular sieving, and irreversible sorption phenomena related to a changing solid phase almost certainly play a role in DOM transport.