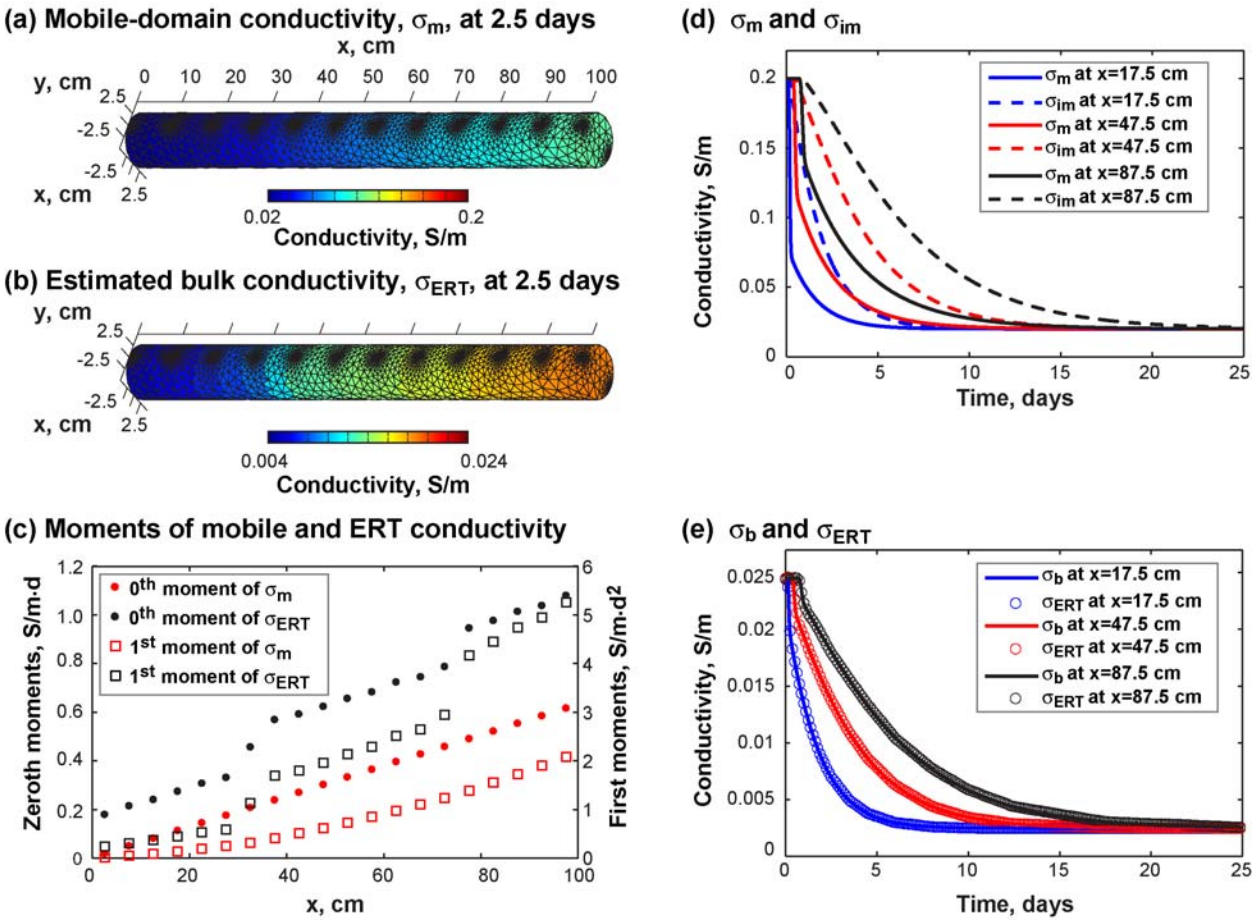

Understanding the rates, scaling behavior, and heterogeneity of rate-limited mass transfer is critical to the reliable prediction of contaminant transport and design of aquifer-remediation schemes. Experimental verification and measurement of the parameters controlling mass transfer is difficult because conventional sampling draws fluid from the mobile domain and provides only indirect information about the concentration of the immobile domain. I demonstrate how electrical geophysical data may be used to back out parameters controlling these processes in situ. (a) Mobile-domain fluid conductivity within the finite-element mesh; (b) estimated bulk electrical conductivity from electrical resistivity tomography (ERT) at 2.5 days; (c) temporal moments of mobile-domain fluid conductivity and estimated bulk electrical conductivity; (d) breakthrough curves of mobile-domain and immobile-domain fluid conductivity at three locations; and (e) estimated and true bulk conductivity at three locations.