Geophysical Research Abstracts
Vol. 14, EGU2012-1986, 2012
EGU General Assembly 2012

Cotransport of clay colloids and viruses in water saturated columns packed with glass beads

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This study is focused on the cotransport of clay colloids and viruses in saturatedcolumns packed with glass beads. Bacteriophages MS2 and Φ174 were used as model viruses, and kaolinite (kGa-1b) and montmorillonite (STx-1b) as model colloids.The effect of three pore water velocities (0.38, 0.74, and 1.21 cm/min) on virus transport and virus-clay cotransport was examined. The results indicated that the mass recovery of viruses and clay colloids decreased as the pore water velocity decreased; whereas, for the cotransport experiments no clear trend was observed. Temporal moments of the breakthrough concentrations suggested that, in the absence of clay colloids, both MS2 and ΦX174 traveled faster than the conservative tracer only at the highest pore water velocity tested. For the other two velocities both viruses were slightly retarded. The presence of clays significantly influenced the irreversible virus deposition. Both MS2 and ΦX174 were attached in greater amounts onto KGa-1b than STx-1b with MS2 exhibiting greater affinity than ΦX174 for both clays. The results suggest that electrostatic interactions play a vital role on virus adsorption onto both glass beads and clay colloids.