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The interplay between acidity and salinity on reactive transport in porous media

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Salinity and acidity are important drivers in understanding reactive transport processes, specifically, changes in salinity may largely alter the acidity, which indicates that there exists strong coupling effect caused by electrostatic behavior and competitive adsorption of protons on the solid-liquid surface. Such effect is critical in colloidal stability, groundwater remediation and contaminant transport. However, the interplay between salinity and acidity remains unknown in many aspects. In this study, a series of column experiments are performed to investigate the roles of salinity and acidity in transport processes. Using columns packed of silica as the representative porous media and ion in the groundwater sampled from the Qinghai Lake Basin (QLB) as the solute, a group of salinity gradients are tested under different acidity conditions with various flow rates. Breakthrough curves and retention curves are observed, with detailed investigation of mineral precipitation during reactions. On the other hand, due to the complexity of the reaction, although it is difficult to develop reactive transport models to accurately characterize the transport process, simulated results are still qualitatively aligned with experimental data. It is noted that the current experiments and associated analysis also provide implication and motivation for future model development.