



Calcite concretions reveal the influence of faulting on a groundwater flow pattern in loose sands

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Understanding the impact of fault zones to determine subsurface hydrology in poorly lithified sediments is fundamentally important for optimizing freshwater exploitation and preservation. Here we present results of a multidisciplinary study on the relationships between the evolution of an extensional fault system in poorly lithified sand, and the associated pattern of carbonate concretions occurring within fault zones and adjacent to them. Fingered profiles of coalescent, elongate concretions provided an estimate of fault-parallel, sub-horizontal fast flow in phreatic conditions, with velocities ranging from ~ 10 to ~ 65 m/yr. Tabular and lens-shaped concretions within fault zones indicate calcite precipitation from stagnant waters (fluid flow < 1 m/yr) in vadose conditions. The concretion pattern visualizes a three-dimensional groundwater flow that is fundamentally driven by fault architecture.