06.10: Fluid flow and salt movement associated with hydrate-filled fractures

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ABSTRACT

Seafloor gas vents are identified on continental margins in regions associated with the presence of gas hydrate. Many studies show that, in fine-grained submarine sediments, hydrate tends to form in thin fractures that can act as highly permeable conduits for vertical gas migration. We present a one-dimensional model describing the water flow and salt movement within the matrix and subsequent hydrate formation in the fracture due to osmotic pressure gradients. Using coupled, numerical, water and salt advection equations, we explore the timescale, dynamics, and limitation of hydrate formation in vertical fractures.

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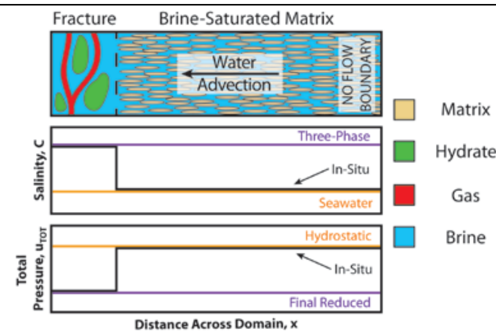
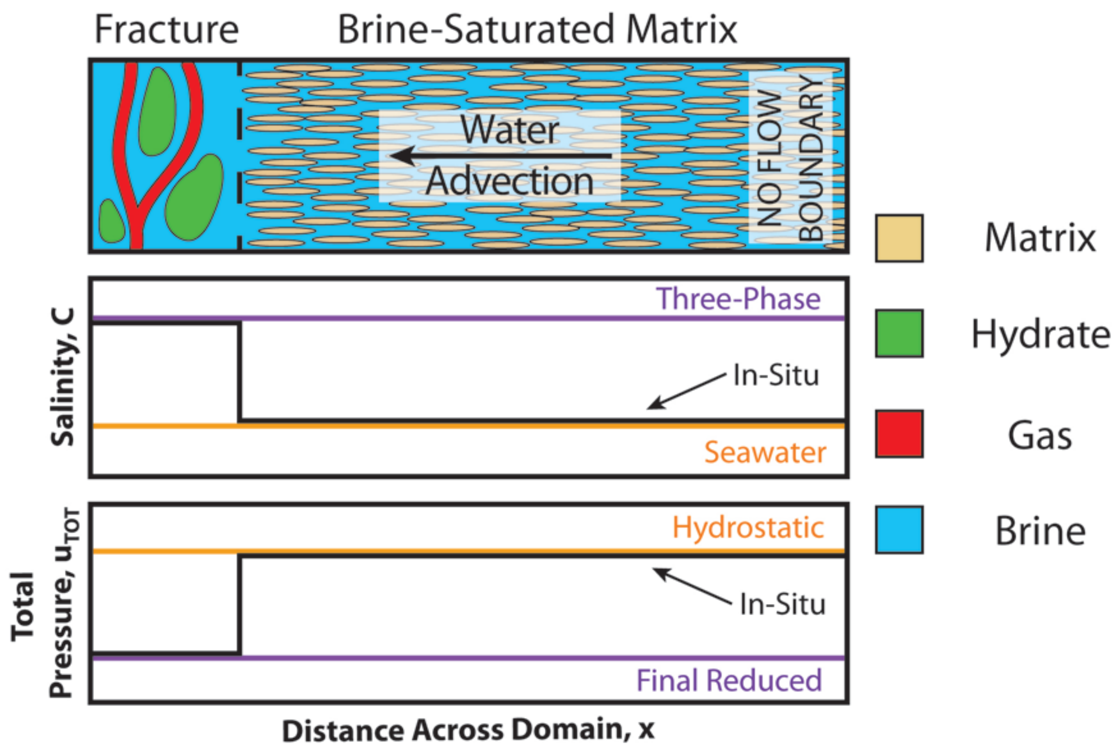


Fig 1: General concept of the model implemented in this study with boundary and initial conditions. The right boundary is at the half-fracture spacing so it is represented by a no flow (q = 0) boundary. A constant, three-phase salinity is imposed at the fracture boundary, which results in a constant, reduced total pressure at the boundary. Initially, in the matrix, the water pressure is assumed equal to hydrostatic. The induced pressure gradient at the left boundary drives fluid from the matrix into the fracture according to Darcy's Law.



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