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# COMPUTATIONAL FLUID DYNAMICS: TURBULENT CONVECTION INSIDE A HELE-SHAW CELL

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Fluid dynamics inside a Hele-Shaw cell is investigated computationally. A Hele-Shaw cell is a rectangular chamber, filled with fluid, that consists of two closely placed parallel plates, i.e., it is very thin in one direction as compared with the other two. It effectively turns a three-dimensional situation into a "quasi" two-dimensional situation. Whenever a denser fluid is above a less dense fluid, a potentially unstable situation is created. For large enough density differences, convective motion occurs in the chamber. The fluid dynamics that result due to such an odd density arrangement is a specific example of the better known Rayleigh-Benard convection. Whereas, classic Rayleigh-Benard convection is temperature driven, the fluid dynamics in our chamber will be driven by a solute concentration gradient (an isometric problem). The incompressible Navier-Stokes equations in the Boussinesq approximation are used to model and simulate the fluid motion. An additional energy equation is coupled to describe the solute concentration evolution. These equations are addressed numerically using pseudo-spectral techniques that utilize Fast Fourier Transforms. A stability analysis is performed to evaluate the strength of the simulation process.