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Numerical study of two-dimensional solutal convection JULIEN PHILIPPI, MICHAEL BERHANU, JULIEN DERR, SYLVAIN COURRECH DU PONT, MSC, Paris Diderot University, MSC TEAM — Solutal convection can occur when a dissolving surface is suspended above a water height, initially at rest. Convection increases the erosion velocity and creates dissolution patterns as reported in C. Cohen et al., Phys. Rev. Fluids, 1, 050508 (2016). To resolve the solute concentration boundary layer, which is not possible experimentally, 2D numerical simulations of solutal convection are performed using the open-source code FreeFem ++ (finite elements, adaptive mesh refinement). In a first step, solute flux is transported through a growing diffusion layer. Then after an onset time, once the layer exceeds critical width, convection flow starts under the form of falling plumes. A dynamic equilibrium results in average from births and deaths of intermittent plumes, setting the size of the solute concentration boundary layer at the interface and thus the erosion velocity. Therefore it becomes possible to study quantitatively the relation between the receding velocity of dissolving solids and the concentration field.

Julien Philippi
MSC, Paris Diderot University

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