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Particle-Laden Viscous Gravity Currents SANDEEP SAHA, LAURENT TALON, Lab. FAST, CNRS, DOMINIQUE SALIN, UPMC 6, Lab. FAST CNRS, POROUS MEDIA TEAM — The extension of a gravity current in lock-exchange problems, proceeds as square root of time in the viscous regime. In the presence of particles, however, this scenario is drastically altered due to sedimentation in a manner similar to the well- known Boycott effect. The spreading of particle-laden gravity currents is investigated with numerical simulations based on a Lattice-Boltzmann method. The settling of particles is modelled using a flux function for capturing sudden discontinuities in particle concentration travelling as kinematic shock waves. Contrary to conventional gravity currents, sedimentation leads to the formation of two additional fronts: a horizontal front descending vertically and a sediment layer that ascends as the particles accumulate. Two regimes emerge in the spreading process: the latter corresponding to the lateral advance of the sediment deposit and the former characterised by the vertical motion of the two fronts. An increase in the initial concentration hastens the time at which the regime change occurs and impedes the overall spreading process. The sedimentation velocity of the particles either slows down or speeds up the edges of the gravity current. A model based on lubrication theory is derived to explain the results and identify scaling laws.

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