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Self-similarity in particle accumulation at fluid-fluid interface LI WANG, YUN CHEN, RUI LUO, SUNGYON LEE, University of Minnesota — When the mixture of viscous oil and non-colloidal particles displace air between two parallel plates, the coupled effects of shear-induced migration of particles and the secondary flow near the interface lead to the gradual accumulation of particles on the advancing oil-air interface. This particle accumulation results in the fingering of an otherwise stable fluid-fluid interface. While the previous works by Xu and colleagues have focused on the resultant instability, one unexplored yet striking feature of the experiments is the self-similarity in the concentration profile of the accumulating particles. In this talk, we model the system mathematically by considering the depth-averaged particle transport equation and suspension balance model. To capture the physical effect of the particle accumulation, we extract the particle flux as a function of local particle concentration from the experiments and include the secondary flow effect in the transport equation. The numerical results of depth-averaged particle concentration profile are presented and compared with the experiments.

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