Numerical Studies on the particle migration in complex geometries containing free surfaces

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To understand the free surface flow of suspensions, we investigated a planar jet flow from a parallel channel to the atmosphere using the shear−induced migration model for concentrated suspension by Phillips et al. (Phys. Fluids, Vol. 4(1), p30, 1992). The model equations were solved using a commercial software package (Fluent) with properly implemented user−defined functions for viscosity, boundary conditions and the particle migration equation.

The fully developed profile for the particle concentration inside the die begins to be disturbed before the exit to the air. The exit length is less than on full gap distance between two parallel plates. The fully developed distribution of particles is not uniform even though the velocity profile is already fully developed and flat. The model can be applied to some types of coating and suspension−related processes such as slot coating and drop deformation in inkjet processes.