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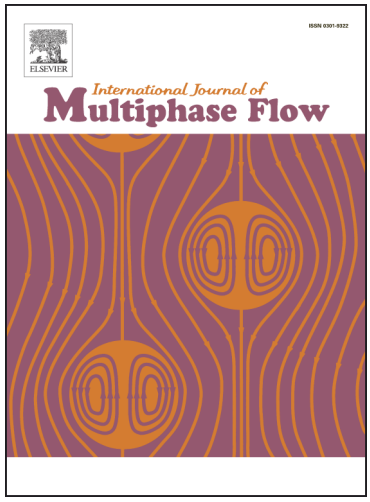

Fluid lubrication effects on particle flow and transport in a channel

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Fluid lubrication effects on particle flow and transport in a channel

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Abstract

The study presented in this paper investigates the effects of fluid lubrication on solid particles flow and transport in slurries at high solids concentrations. Particle-particle and particle-wall collisions influence the behavior of slurries constrained between two parallel walls thereby affecting solids transport and the fluid flow field. As the concentration of the particles increases, collisions become more frequent compared to the dilute flow, and their effect on the flow field cannot be neglected. Particularly, lubrication from a thin fluid layer formed between approaching particles acts as non-linear damper affecting particle kinetic energy and post-collision behaviors. The Discrete Element Method coupled with Computational Fluid Dynamics (DEM-CFD), with a new user-defined contact model that accounts for particle lubrication and as implemented in the commercially available two-dimensional Particle Flow Code (PFC^{2D}), was used to improve the understanding of the micro-mechanical behavior that contributes to particle clogging in a channel. It was found that the balance of fluid drag, related to the pressure drop in the channel and slurry properties such as fluid viscosity, particles volumetric concentration, particles size and

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