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Numerical solution of a multidimensional sedimentation problem using finite volume-element methods*

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Abstract

We are interested in the reliable simulation of the sedimentation of monodisperse suspensions under the influence of body forces observed in many engineering applications and natural systems. At the macroscopic level, the complex interaction between the immiscible fluid and the sedimentation of a compressible phase may be governed by the Navier-Stokes equations coupled to a nonlinear advection-diffusion-reaction equation for the local solids concentration. We propose a versatile and effective finite volume element (FVE) scheme, whose formulation relies on a stabilized finite element (FE) method with continuous piecewise linear approximation for velocity, pressure and concentration.

Key words: Finite volume element method, Sedimentation-consolidation process, Navier-Stokes equations, Inclined channels

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