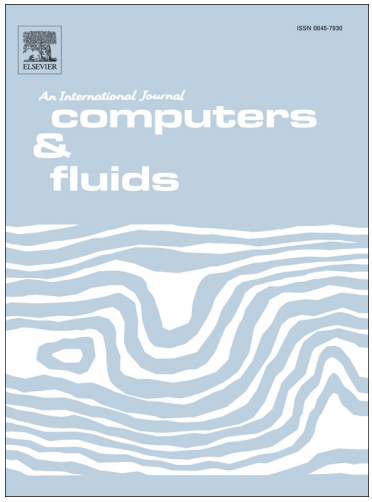

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Direct simulation of the dynamics of two spherical particles actuated magnetically in a viscous fluid

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Abstract

A three-dimensional direct simulation method is developed to describe flows with paramagnetic particles suspended in a non-magnetic fluid. We validate the method by comparing particle motions obtained from our scheme with those from a particle dynamics (PD) method and a theoretical model based on the point-dipole approximation, using a two-particle problem in a uniform field. The critical angle separating the nature of magnetic interaction is found to be affected by the distance between the two particles. When hydrodynamic interactions between particles are not taken into account, trajectories obtained from the PD method show severe deviations from those computed using the direct simulation method even in the simple two-particle interaction problem. The dynamics of a two-particle chain in a rotating field are highly influenced by the Mason number, which is the ratio of viscous force

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