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Continuum Level Results from Particle Simulations of Active Suspensions[1] BLAISE DELMOTTE, ERIC CLIMENT, Institut de Mécanique des Fluides de Toulouse - Université de Toulouse, FRANCK PLOURABOUE, Institut de Mécanique des Fluides de Toulouse - CNRS, ERIC KEAVENY, Imperial College — Accurately simulating active suspensions on the lab scale is a technical challenge. It requires considering large numbers of interacting swimmers with well described hydrodynamics in order to obtain representative and reliable statistics of suspension properties. We have developed a computationally scalable model based on an extension of the Force Coupling Method (FCM) to active particles. This tool can handle the many-body hydrodynamic interactions between $O(10^5)$ swimmers while also accounting for finite-size effects, steady or time-dependent strokes, or variable swimmer aspect ratio. Results from our simulations of steady-stroke microswimmer suspensions coincide with those given by continuum models, but, in certain cases, we observe collective dynamics that these models do not predict. We provide robust statistics of resulting distributions and accurately characterize the growth rates of these instabilities. In addition, we explore the effect of the time-dependent stroke on the suspension properties, comparing with those from the steady-stroke simulations.

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Blaise Delmotte
Institut de Mécanique des Fluides de Toulouse - Université de Toulouse

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