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Detailed Simulations of Rigid Fiber Suspensions ANNA-KARIN TORNBERG, Courant Institute of Mathematical Sciences, NYU, KATARINA GUSTAVSSON, Royal Institute of Technology, Stockholm, Sweden — In this talk, we present a numerical method designed to simulate the challenging problem of the dynamics of slender fibers immersed in an incompressible fluid. Specifically, we consider microscopic rigid fibers, that sediment due to gravity. Such fibers make up the micro-structure of many suspensions for which the macroscopic dynamics are not well understood. Our numerical algorithm is based on a non-local slender body approximation that yields a system of coupled integral equations, relating the forces exerted on the fibers to their velocities, which takes into account the hydrodynamic interactions of the fluid and the fibers. The system is closed by imposing the constraints of rigid body motions. The fact that the fibers are straight have also been further exploited in the design of the numerical method. In difference to spheres, isolated fibers can have motion perpendicular to gravity and the velocity depends strongly on the fiber orientation. Also, the forming of clusters, sometimes referred to as flocculation, enhances the settling velocity to a larger value than the maximum speed of an single and vertical aligned isolated fiber. We present results from simulations including a larger number of fibers, and discuss phenomena on the microscopic scale as well as macroscopic properties such as average sedimentation speed and fiber orientation.

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