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Particle Laden Viscous Fluids and the Gulf of Mexico Oilspill¹

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The dynamics of particulates (e.g. sand) in viscous fluids is a complex process involving hindered settling dynamics and dynamics of the fluid such as shear. There is a renewed interest in understanding the dynamics of viscous fluids interacting with particulates due to the large volume of crude oil washing up on beaches in the Gulf of Mexico. I will address both modeling and mathematical challenges associated with this problem. Settling of particles in particle-oil mixtures on an incline can be quantitatively analyzed by a bifurcation that occurs between regimes of particle settling downstream of the flow and clear fluid separating out from the flow. An equilibrium theory compares shear-induced migration due to the bulk flow properties with hindered settling due to gravity, and matches well with laboratory experiments. I discuss current work on dynamic models for such particle-fluid mixtures and possible future work directed at understanding the formation of different classes of oil deposits on beaches in the Gulf.

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