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Sedimentation of athermal particles in clay suspensions[1] XAVIER CLOTET, ARSHAD KUDROLLI, Department of Physics, Clark University — We discuss sedimentation of athermal particles in dense clay suspensions which appear liquid-like to glass-like. These studies are motivated by the physics important to a diverse range of problems including remediation of oil sands after the extraction of hydrocarbons, and formation of filter cakes in bore wells. We approach this problem by first considering collective sedimentation of athermal spherical particles in a viscous liquid in quasi-two dimensional and three dimensional containers. We examine the system using optical and x-ray tomography techniques which gives particle level information besides global information on the evolution of the volume fraction. Unlike sediments in the dilute limit - which can be modeled as isolated particles that sediment with a constant velocity and slow down exponentially as they approach the bottom of the container - we find interaction between the particles through the viscous fluids leads to qualitatively differences. We find significant avalanching behavior and cooperative motion as the grains collectively settle, and non-exponential increase in settling time. We discuss the effect of stirring caused by the sedimenting particles on their viscosity and consequently the sedimentation rates as a function of particle concentration.

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