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Gravity driven effect in flowing particle laden thin films[1] ROBERT GLIDDEN[2], UCLA, CHRISTOPHER FOX[3], Harvey Mudd College, THOMAS WARD, ANDREA BERTOZZI, UCLA — The flow characteristics of an anisopycnic particle-laden thin film flowing down an inclined plane is analyzed experimentally near the maximum packing limit for polydisperse hard spheres. The mutliphase fluid is a mixture of silicone oil and polydisperse heavy glass beads of varying viscosities and bead diameter, respectively. For the high volume concentrations studied, $50\% < \phi < 56\%$, we observe that the elapsed time, t, versus average front position, x_N, still scales with the Huppert solution where $C_N = x_N^3/t$ is a constant [Nature 300(2), 1982]. For very high background fluid viscosities, the particle settling velocity is very slow with respect to the fluid and C_N decreases with increasing concentration. As the background fluid viscosity is decreased C_N remains relatively constant as the particle density approaches the maximum. We propose that the latter effect may be the result of a transition from viscous fluid flow to that of a lubricated sliding solid body. Experiments are performed to test an empirical correlation for the data in this parameter regime based on this hypothesis.

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