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Agitation dominated rheology of dense granular media MARTIN VAN HECKE, ALEXEI ZANIN, RENAUD BASTIEN, Leiden University — We have studied *stationary granular fluids*, novel states of granular matter which combine a solid-like appearance with a fluid-like response to external stresses, by locally shearing a layer of sand and probing its mechanical response in far away regions where the material remains stationary. Despite this solid-like appearance, intruders of low density exponentially relax to a floating equilibrium depth given by Archimedes' principle – which implies that the yield stress is zero. Denser probes completely submerge into the sand. The drag force on the intruder is found to be proportional to the product of a dynamical viscosity, probe speed and probe dimension, where the dynamical viscosity depends nonlinearly on the applied stress. The vanishing of the yield stress is, we believe, caused by strong fluctuations of the network of contact forces: typical grains are so hard that subtle submicronic agitation of the grains, driven by a flow far away, correspond to large fluctuations in the contact forces which effectively "melt" the material.

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