Droplet aggregates as model systems for connecting granular systems to continuum mechanics: how few is too few?

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In recent years we have developed a method to produce microscopic monodisperse oil droplets in an aqueous environment. With an attractive interaction between the droplets, monodisperse droplets form perfect crystalline aggregates, while a blend of small and large droplets allows us to prepare a disordered glass. By carefully tuning the adhesion forces between the droplets, the aggregates provide model systems for studying various physical phenomena that are not accessible by investigating molecular systems. Here I will provide a brief overview of experiments we have carried out to address how a system transitions from a crystal to a glass; and secondly, how a system transition from a few particles, to many particles, where continuum models are valid.