Quantum droplets in mixtures of cold atomic gases

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Self-bound, macroscopic, droplets are often observed in various physical systems, with the most familiar example being that of water droplets. Furthermore, droplets appear on microscopic length scales, as e.g., in atomic nuclei and in liquid-helium nanodroplets.

In this talk I will present results on recent experimental and theoretical work on "quantum" liquid droplets in an ultracold mixture of bosonic atoms. These are self-bound states, which become possible due to many-body effects stemming from quantum fluctuations. Quantum fluctuations, which are typically very small, become significant in this system when two different species are mixed, and the couplings for inter- and intra-component interactions are tuned appropriately.

In my talk I will first describe the basic physics of these systems. Then, I will present some recent experimental results. Finally, I will discuss the ground state and the rotational response of quasi-two-dimensional droplets which are confined in a harmonic potential, and also of quasi-one-dimensional droplets which are confined in a ring-like potential.

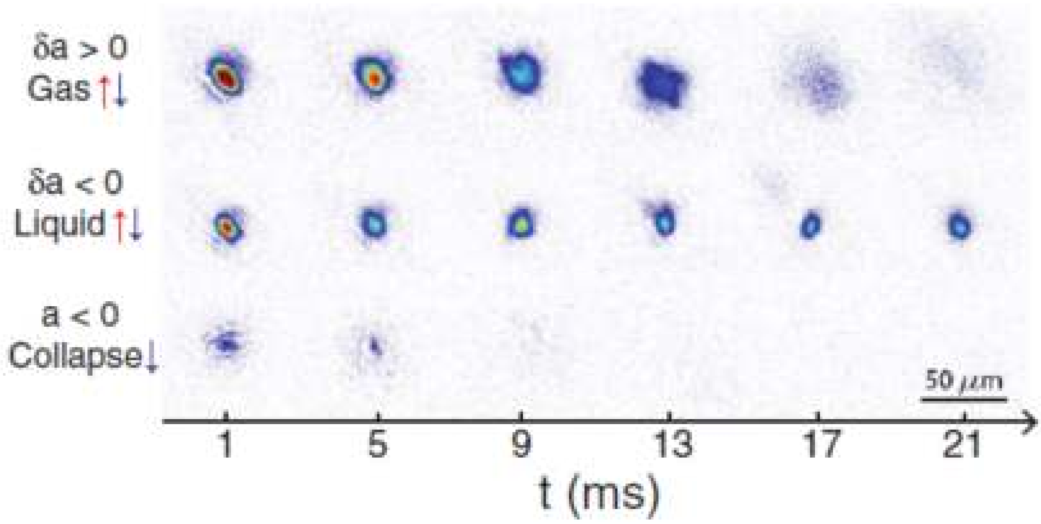

Figure 1: In situ density distribution of the atoms after the removal of the confinement. *C. R. Cabrera, L. Tanzi, J. Sanz, B. Naylor, P. Thomas, P. Cheiney, L. Tarruell, Science* ***359****, 301 (2018)*