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Dipolar droplets in bosonic erbium quantum fluids.[1] LAURIANE CHOMAZ, SIMON BAIER, DANIEL PETTER, GIULIA FARAONI, JAN-HENDRIK BECHER, RICK VAN BIJNEN, MANFRED J. MARK, FRANCESCA FERLAINO, University of Innsbruck — Due to their large magnetic moment and exotic electronic configuration, atoms of the lanthanide family, such as dysprosium (Dy) and erbium (Er), are an ideal platform for exploring the competition between inter-particle interactions of different origins and behaviors. Recently, a novel phase of dilute droplet has been observed in an ultracold gas of bosonic Dy when changing the ratio of the contact and dipole-dipole interactions and setting the mean-field interactions to slightly attractive. This has been attributed to the distinct, non-vanishing, beyond-mean-field effects in dipolar gases when the mean interaction cancels. Here we report on the investigation of droplet physics in fluids of bosonic Er. By precise control of the scattering length a, we quantitatively probe the Bose-Einstein condensate (BEC)-to-droplet phase diagram and the rich underlying dynamics. In a prolate geometry, we observe a crossover from a BEC to a single macro-droplet, prove the stabilizing role of quantum fluctuations and characterize the special dynamical properties of the droplet. In an oblate geometry, we observe the formation of assemblies of tinier droplets arranged in a chain and explore the special state dynamics following a quench of a, marked by successive merging and reformation events.

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