Persistent currents and vortices in binary and dipolar condensates

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A dipolar Bose-Einstein condensate that is set rotating in a toroidal trap may act in distinctly different ways, depending on whether it is in the superfluid or in the “supersolid” phase recently discovered. It can support a supersolid persistent current that in part consists of states where a fraction of the condensate mimics solid-body rotation, opposite to that of a vortex. Furthermore, a rotating toroidal supersolid may show hysteretic behavior which is qualitatively different depending on the superfluid fraction of the condensate.
In this talk, I will give a brief overview on some of the recent developments in the field of dipolar supersolids. I will also discuss stacked droplets in anti-dipolar condensates, which offer intriguing possibilities to investigate vorticity and persistent flow in a setting that is rather different from the typical filament structures. The presence of a vortex line impacts on the phase transition into the supersolid region. I will also give an outlook how this setup may be used to study persistent current and distribution of angular momentum in the transition to the supersolid regime.