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Phase ordering dynamics in spin-1 ferromagnetic condensates[1]
LEWIS WILLIAMSON, PETER BLAKIE, University of Otago — Spinor Bose-Einstein condensates present rich phase diagrams for exploring phase transitions between states with different symmetry properties. In this work we simulate the approach to equilibrium of a spin-1 condensate quenched from an unmagnetised phase to three different ferromagnetic phases. The three ferromagnetic phases have Z_2, SO(2) and SO(3) symmetries respectively and possess different conservation laws. Following the quench, domains of magnetization form, with each domain making an independent choice of the symmetry breaking order parameter. These domains grow and compete for the global equilibrium state. We find that this growth follows universal scaling laws and identify the dynamic universality class for each of the three quenches. Polar-core spin-vortices play a crucial role in the phase ordering of the SO(2) system and we identify fractal structures in the domain patterns of the SO(2) and SO(3) systems.

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