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Vortex dynamics in neutron stars

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In the superfluid interior of a neutron star the presence of quantized vortex lines defines an intermediate scale (in between the microscopic fermi-scale and the centimeter-scale) ranging from the radius of a vortex core to the typical separation between vortices. This complicates the hydrodynamic description of a neutron star interior. A classical treatment of a vortex moving through the lattice of nuclear impurities in the crust can be achieved by means of the vortex-filament model. Understanding the complex dynamics of vortices by means of vortex-filament simulations can deepen our understanding of superfluidity-related phenomena in neutron stars, like pulsar glitches.

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