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GPE + GLE Calculations for Interaction Between Neutron Quantum Vortices and Proton Flux Tubes in the Outer Core of Neutron Stars

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Neutron stars exhibit sudden changes of its rotational velocity, known as “pulsar glitches”. It has been believed that glitches are mainly caused by superfluid neutron vortices in the inner crust of neutron stars. However, importance of contributions of the outer core has been recently discussed, and further microscopic investigations of quantum vortices and fluxtubes in the outer core of neutron stars are highly desired.

In this study, we investigate the interaction between quantum vortices of 3P_2 superfluid neutrons and fluxtubes of 1S_0 superconducting protons in the outer core of neutron stars, based on a successful bosonic theory of superfluid, the Gross-Pitaevskii equation (GPE). In this talk, we will discuss how the interaction of the 3P_2 superfluid vortices and the proton fluxtubes under a magnetic field in the outer core of neutron star affect the structure of the vortices in the neutron star.

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