

Hydrodynamics of superfluid neutron stars

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Neutron stars are an extraordinary laboratory in which to study matter in extreme conditions of density, magnetic energy and gravity. Modelling the interior of these objects requires an understanding of high density physics and phenomena such as superfluidity, which are well known in laboratory settings, but must now be understood in a strong gravity, relativistic setting. This issue is particularly crucial now, as the LIGO and Virgo detectors have made their first detections of gravitational waves, and have opened up an entirely new window to probe the physics of neutron stars.

In this talk I will describe some of the ongoing work at the Nicolaus Copernicus Astronomical Center, and focus on efforts to model superfluidity in neutron stars, also in a relativistic setting. I will also discuss how electromagnetic and gravitational wave observations can be used together to constrain the models and further our understanding of fundamental physics.

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