



Contribution ID: 101

Type: **Talk**

Transport and dissipation in neutron star mergers

Wednesday 1 August 2018 16:20 (20 minutes)

Neutron star mergers provide a great opportunity to gather multi-messenger observational information about nuclear matter at high density and moderate temperature. Numerical simulations of mergers are an essential tool for exploiting this opportunity. However, up to now such simulations have generally not included the effects of transport or dissipation, and have focused on measuring the equation of state.

In this talk I will describe rough estimates of the likely role of transport phenomena like thermal diffusion, shear viscosity, and bulk viscosity. The conclusion is that the impact of transport is sensitive to the type of matter occurring in the merger (whether it traps neutrinos, allows direct Urca processes, etc). This opens up the possibility that observations of mergers could provide information about dense matter that goes beyond the equation of state, maybe even telling us about the presence of exotic phases.

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Session Classification: Nuclear and Astroparticle Physics

Track Classification: F: Nuclear and Astroparticle Physics