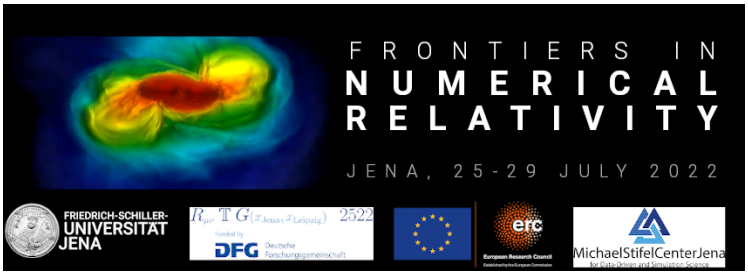

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Entropy as shock indicator in neutron star merger simulations

Wednesday, 27 July 2022 17:00 (15 minutes)

Numerical simulations are the only way to calculate exact gravitational waveforms from binary neutron star mergers and to design templates for gravitational-wave astronomy. Our knowledge about the physical properties of the inspiraling neutron stars, the mechanisms inherent in the inspiral and the massive object produced after the merger depends crucially on the accuracy of these numerical simulations. In this talk, I will present an entropy-based flux-limiting scheme that can be used in high-order, convergent simulations of neutron star spacetimes. First, I will demonstrate how the entropy produced during the inspiral can be used to detect the presence of shocks and will incorporate this idea into the design of a flux-limiter. Next, it will be shown that this entropy based flux-limiting scheme effectively tracks the stellar surface and the physical shocks during the inspiral. Finally, I will present the first neutron star merger simulations with such a method and will demonstrate up to fourth-order convergence in the gravitational waveform phase. The observed convergence rates are two orders higher than the one achieved by state-of-the-art high-order characteristic schemes.

Presenter: Dr DOULIS, Georgios (TPI Jena)

Session Classification: Short talks