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Studying Neutron Star Oscillations with General Relativistic Smoothed Particle Hydrodynamics[1] BING-JYUN TSAO, OLEG KOROBKIN, HYUN LIM, IRINA SAGERT, INGO TEWS, JULIEN LOISEAU, Los Alamos National Laboratory — With the recent detections of neutron star mergers via gravitational waves, such as GW170817 and GW190425, future gravitational-wave observations, and their electromagnetic counterparts, it has become important to have robust and accurate numerical simulations of neutron stars to interpret the gravitational wave signal. Smoothed Particle Hydrodynamics (SPH) is especially suitable to study compact object mergers as it can handle extreme matter deformation and material ejection. However, simulations of neutron star mergers with SPH that include effects of general relativity are highly non-trivial. In this poster, we present the implementation of general relativistic hydrodynamics into the new LANL SPH code FleCSPH, which allows us to study oscillations of single compact stars in the dynamical and non-linear regime. We simulate spherically symmetric and rotating neutron stars and compare our results to oscillation modes in the literature. This approach presents a venue to study the dynamical behavior of the solid neutron star crust with the long-term goal to simulate deformation and shattering of the crust during a merger event.

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