

Title: Relativistic Tidal Disruption of Stars: Significance, Tools and Outcomes

Speaker: Pritam Banerjee

Abstract: Tidal disruption events (TDEs) involving relativistic pericenter passages offer a promising probe of strong-field gravity and the spacetime geometry around compact objects. In such encounters, an accurate treatment of stellar self-gravity is essential, particularly for partial disruptions where a stellar core survives. We develop an improved self-gravity prescription for general relativistic smoothed particle hydrodynamics (GRSPH) using local comoving frame transformation. The formulation is implemented in a tree-based GRSPH code and validated using relativistically boosted hydrostatic polytropes.

We apply this framework to TDEs in Schwarzschild black-hole (BH) and exponential wormhole (WH) spacetimes. For comparable impact parameters, we find distinct disruption outcomes, including differences in tidal stripping, the critical impact parameter for complete disruption, and the resulting fallback rates. Our results demonstrate the potential of relativistic TDEs to probe strong-field spacetime geometry and distinguish BH and WH environments through observable disruption signatures.