Talk at Splinter Meeting

Splinter I

Hydrodynamics simulations of the common envelope phase in binary stellar systems

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The common envelope (CE) phase is very important in binary stellar evolution as it explains the formation of compact stars in close binary systems. The most promising scenario for the formation of hot subdwarfs, e.g., involves one or two CE phases, thereby also explaining the large fraction of hot subdwarfs in binary systems.

Here, we present hydrodynamic simulations of the dynamical spiral-in during a CE phase with a new numerical technique. We use the finite volume code AREPO that solves the Euler equations on a moving, unstructured grid, and thus enables us to resolve small-scale flow features in unprecedented detail. We follow the inspiral of a $1M_\odot$ companion into the envelope of a $2M_\odot$ red giant with a $0.4M_\odot$ He core. During the evolution, spiral shocks transport energy and angular momentum outwards. Between these shocks, shear instabilities emerge that eventually merge to form large-scale instabilities dominating the flow. This could mark the onset of turbulent convection in the envelope determining the further evolution of the system.