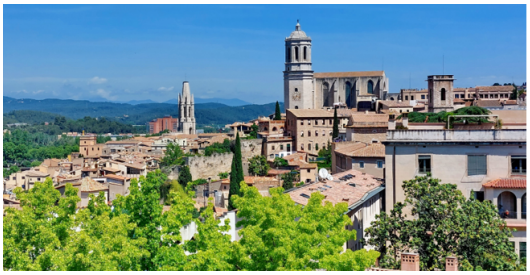

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3D Simulations of White Dwarf-Main Sequence Star Collisions

Thursday 19 June 2025 09:00 (15 minutes)

Stellar collisions have garnered renewed attention for their role in the formation of peculiar objects, such as blue stragglers, and their potential to explain explosive transients with atypical observational and spectroscopic signatures. Among these, white dwarf-main sequence (WD-MS) collisions are particularly intriguing due to the diverse evolutionary pathways they can produce—ranging from peculiar red giants to novae or sub-Chandrasekhar supernovae. In this talk, we present 3D smoothed particle hydrodynamics (SPH) simulations of WD-MS collisions, exploring a range of stellar mass ratios, velocities and impact parameters. We discuss the overall dynamics, energetics, gas morphology and mass loss, and in addition, using a 34-isotope nuclear network, we estimate the nucleosynthesis products generated during these collisions. Our models suggest that at early times the ejecta have a bipolar structure and, along with the stellar remnant, may be enriched in isotopes such as ^{13}C, ^{15}N, and ^{17}O. In the case of near head-on collisions, the ejecta may also show an overabundance of ^{7}Li relative to solar values.

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