



Universität
Basel

Research Project

Astrophysical Processes, their Simulation and Related Nuclear Physics Issues

Third-party funded project

Project title Astrophysical Processes, their Simulation and Related Nuclear Physics Issues

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Department

Project Website <http://phys-merger.physik.unibas.ch/users/group/>

Project start 01.10.2014

Probable end 31.12.2016

Status Completed

Understanding the origin of the elements in the Cosmos, is related (with the exception of H, He, and Li) to stars, their evolution and final explosive endpoints in single or binary systems. This is the main focus of the present project, which describes a continuing effort in explaining and understanding such astrophysical events and the composition of their ejecta. Several fundamental aspects are discussed in subtopics A through D. A covers the understanding of nuclear properties, reactions, and aspects of the temperature-dependent high density equations of state, i.e. nuclear features which enter stellar modeling. B features stellar evolution of low mass stars, including the accretion onto white dwarfs in binary stellar systems, aiming at a precise knowledge of the fuel composition of type Ia supernova progenitors. C describes simulations of core collapse and supernova explosions of massive stars, combining (magneto-) hydrodynamics and radiation transport in 3D calculations of rotating and non-rotating progenitors. D focuses on a specific aspects in binary systems with a compact companion, leading to X-ray bursts and superbursts (but also white dwarf mergers/collosions for specific classes of type Ia supernovae, and neutron star mergers for short duration X-ray bursts and macrovae), E finally focuses on explosive nucleosynthesis processes in the scenarios discussed above, covering all of the classical processes from typical hydrostatic burning, explosive burning, s-, p-, ν p, r-process, as well as the rp-process. Stellar winds and stellar explosions serve as input to galactic evolution.

Thus, this projectl covers topics from subatomic physics to the evolution of galaxies

Keywords nuclear astrophysics, stellar evolution, supernova explosions, explosive nucleosynthesis, nuclei far from stability, chemical evolution of galaxies

Financed by

Swiss National Science Foundation (SNSF)

Follow-up project of [1380102 Astrophysical Processes, their Simulation and Related Nuclear Physics Issues](#)

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