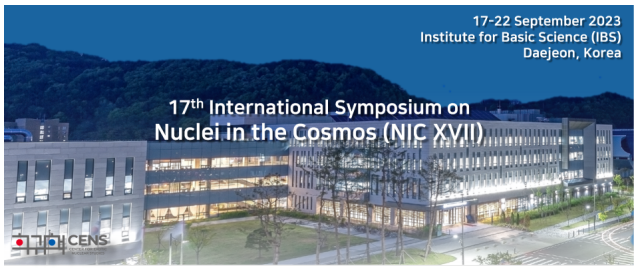

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Recent Advances in the Modeling of Type I X-Ray Bursts and Nova Outbursts

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Type I X-ray bursts (XRBs) are thermonuclear explosions in the H/He-rich envelopes accreted onto neutron stars in close binary systems. These events constitute the most frequent type of thermonuclear stellar explosion in our Galaxy (the third, in terms of total energy output after novae and supernovae). To date, most of the efforts undertaken in the modeling of XRBs have relied on non-rotating, 1D hydrodynamic simulations. Here, we present pioneering XRB models computed with different angular velocities (up to 80% of the critical value) and discuss the differences obtained in the lightcurves and in the associated nucleosynthesis with respect to non-rotating models.

It is worth noting that, while all XRB hydro simulations performed to date report that ejection from a neutron star is unlikely, radiation-driven winds during photospheric radius expansion have been suggested to lead to the ejection of a tiny fraction of the accreted envelope. Here, we will report our results of the coupling of a non-relativistic radiative wind model with a series of XRB hydrodynamic simulations, quantifying the expected contribution of XRBs to the Galactic abundances.

Classical novae (CNe) are a related class of thermonuclear explosions that involve mass-accreting white dwarfs, rather than neutron stars. The low-mass, main sequence companion (or a red giant, particularly for recurrent novae) overfills its Roche lobe and matter flows through the inner Lagrangian point of the system. While nova simulations have focused on the early stages of the explosion and ejection, a fraction of the ejecta will collide, first with the accreting disk that orbits the white dwarf, and later with the secondary star. As a result, part of the ejecta is expected to mix with the outermost layers of the secondary. The resulting chemical contamination may have potential implications for the next nova cycle, once mass transfer from the secondary resumes. New multidimensional simulations of the interaction of the ejecta with the accretion disk, and ultimately with the stellar companion, will also be presented.

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