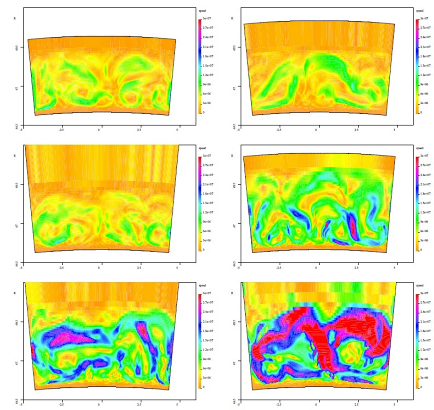
Joint Institute for Nuclear Astrophysics

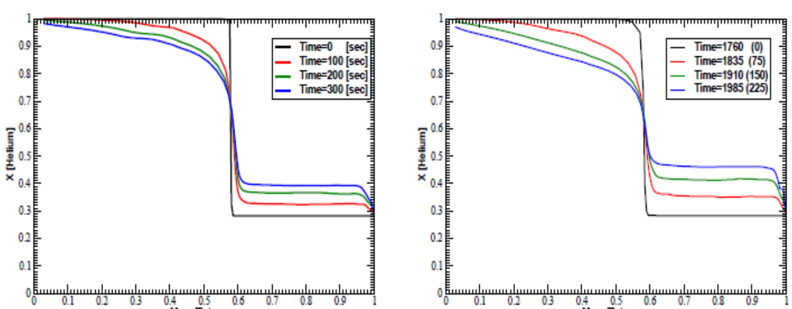
JINA

Title: **Convective undershoot mixing in Nova outbursts: the dependence on the composition of the underlying white dwarf**

Description: We present here, for the first time, a detailed multidimensional study of the undershoot convective mechanism in novae outbursts, for a wide range of possible isotopic compositions of the layer underlying the accreted envelope. Previous surveys studied the mechanism only for solar matter accreted on the surface of a carbon-oxygen white dwarf. Mixing with carbon was found to be crucial for the process, since it dramatically enhanced the burning rates. According both to observations and to stellar evolution theory, the outermost underlying layer of the white dwarfs in classical and recurrent novae can also be composed of ONeMg or pure helium. In all the cases we examined, we found significant amounts of mixing. We present the details of the burning rates and the convective flows for each underlying layer and their implications for the long term debate as to the exact mechanism responsible for the enrichment of novae ejecta. Our results indicate that the undershoot convective dredge-up model is consistent with observations for all the cases we examined, including that of helium enrichment in recurrent nova.



Caption: Color maps of the absolute value of the velocity (speed) in the 2D models at different times along the development of the runaway, for the case of an underlying magnesium layer.



Caption: Mixing for the underlying helium layer: abundance of the helium as a function of the mass coordinate at various times that are indicated on the plot. Left - the model with the default base temperature of 9×10^7K; right - the model with a base temperature of 1.22×10^8K. (Note the times are shifted by 1760 seconds and the 2D time is in brackets.)

Contact Information:
truran@nova.uchicago.edu
Researchers:
S. Glasner E. Livne and J. Truran
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