

ASTROPHYSICS SEMINAR SERIES

Modelling Low Mach Number Astrophysical Flows

DR. ALICE HARPOLE
Stony Brook University

Low Mach number flows (flows where the speed of propagation is small compared to the fluid's sound speed) occur in a wide range of astrophysical systems, however are challenging to model using conventional techniques. The fast speed of the sound waves limits the timestep that can be taken in standard compressible simulations, making detailed modelling very computationally expensive. Low Mach number methods effectively filter out these sound waves, enabling us to model systems at resolutions and timescales that would otherwise be unfeasible. In this talk, I shall give an overview of low Mach number methods and discuss their use in two astrophysical contexts: Type I X-ray bursts, thermonuclear burning events which occur on the liquid surface layer of neutron stars, and convection in the cores of rotating massive stars prior to core-collapse.

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