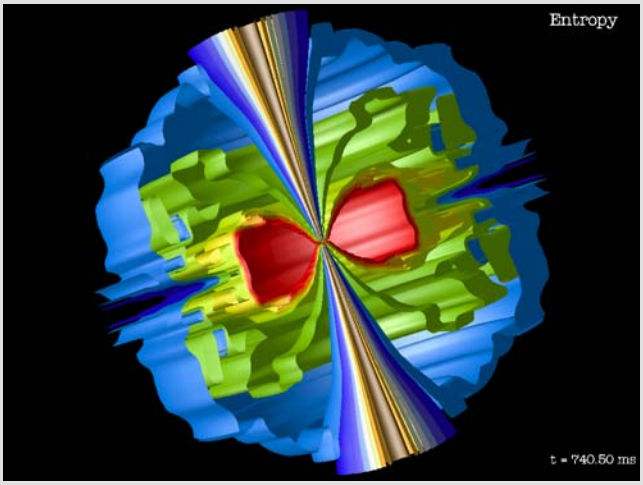
The Joint Institute for Nuclear Astrophysics

Accretion-induced Collapse of a Rotating White Dwarf



The figure shows the supernova-like explosion after the collapse of a rapidly rotating white dwarf due to accretion from a companion star above the critical Chandrasekhar mass. The explosion is bipolar, driven by anisotropic neutrino heating. The inner red region is the newly-born accretion disk. The yellow cones render the cores of the neutrino-driven jets. The sheets are iso-density contours and this snapshot was taken ~750 milliseconds after the onset of collapse (from a publication by the Arizona JINA group, Dessart et al. 2006).

The Arizona group also shows that the accretion-induced collapse (AIC) of a rotating white dwarf explodes easily, and is driven by a polar neutrino-powered wind (Dessart et al. 2006). This is the most thorough published study of rapidly rotating core-collapse performed to date, and, with a uniquely capable code VULCAN/2D, revealed for the first time the degree of anisotropic neutrino emissions that rapid rotation imposes. These AIC models also suggest one class of gamma-ray burst (GRB).

Publications:
Dessart et al. 2006

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