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Turbulence-flame interactions in type Ia supernovae ANDREW ASPDEN, JOHN BELL, MARC DAY, Lawrence Berkeley National Laboratory, STAN WOOSLEY, University of California at Santa Cruz, MIKE ZINGALE, Stony Brook University — The small-scale dynamics of nuclear flames in the supernova environment are examined using high-resolution three-dimensional simulations in which the details of the flame structure are fully resolved. The range of densities examined, 1 to 8×10^7 g cm^{-3}, spans the transition from the laminar flamelet regime to the distributed burning regime, where small-scale turbulence disrupts the flame. The use of a low Mach number algorithm facilitates the accurate resolution of the thermal structure of the flame and the inviscid turbulent kinetic energy cascade, while implicitly incorporating kinetic energy dissipation at the grid-scale cutoff. For an assumed background of isotropic Kolmogorov turbulence with an energy characteristic of a type Ia supernova, we find a transition density between 1 and 3×10^7 g cm^{-3}, where the nature of the burning changes qualitatively. This transition from flamelet to distributed burning reveals important consequences for turbulent flame models.

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