Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Distributed flames and Damköhler "small-scale turbulence" in type Ia supernovae ANDREW ASPDEN, JOHN BELL, Lawrence Berkeley National Laboratory, STAN WOOSLEY, UC Santa Cruz — High-resolution three-dimensional simulations of carbon-burning flames in type Ia supernovae are used to examine the distributed burning regime (high Karlovitz numbers), or the "small-scale turbulence" regime as it was referred to by Damköhler (1940). He predicted that the turbulent flame speed and width are determined by the nuclear burning time scale and a diffusion coefficient prescribed by the turbulence. The scaling predicts its own breakdown when the turbulent Damköhler number reaches unity. We demonstrate that the simulations are in agreement with the scaling predictions, and propose a method for predicting the limiting flame speed and width based on small-scale simulations. This flame speed can then be used to construct a turbulent flame model to study very large scale distributed supernova flames.

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Date submitted: 06 Aug 2009 Electronic form version 1.4