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Turbulence and Combustion in Type Ia Supernovae[1] AARON JACKSON[2], Stony Brook University, DEAN TOWNSLEY, The University of Alabama, ALAN CALDER, Stony Brook University — Turbulent combustion plays a critical role in Type Ia supernovae, bright astrophysical explosions that serve as cosmological distance indicators. The most successful scenario for reproducing observations involves a deflagration born in the turbulent core a massive C/O white dwarf that subsequently experiences a deflagration-to-detonation transition (DDT) due to turbulence-flame interaction (TFI), although unconfined DDT is poorly understood. Due to the highly non-linear nature of the explosion, the early flame propagation is critically important for determining the explosion outcome. We present full-star, 3D calculations of the deflagration phase of a SNIa explosion. As the flame evolves, it is subject to the Rayleigh-Taylor and Kelvin-Helmholtz instabilities as well as TFI. We analyze the resolved turbulence at the flame front throughout the evolution of the explosion and consider the necessity of modeling unresolved TFI. Furthermore, we consider whether conditions estimated for DDT are likely to occur given the turbulent intensity at the flame front.

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