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Turbulence in Type Ia Supernovae Simulations

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Type Ia supernovae are among the most energetic explosions in the known universe, releasing 10^{51} ergs of kinetic energy in their ejecta, with 0.7 solar masses of radioactive Ni-56 synthesized during the explosion. The discovery of the Phillips relation enabled the use of Type Ia supernova (SN Ia) as standardizable cosmological candles, and has ushered in a new era of astronomy leading to the discovery of the acceleration of the universe, leading to the 2011 Nobel Prize in physics. The nature of the Type Ia progenitors, as well as their precise explosion mechanism, remains a subject of active investigation, both observationally as well as theoretically. It is known that the progenitors of Type Ia supernovae are near-Chandrasekhar mass white dwarfs in binary systems, though competing models suggest the companion is either a red giant or main sequence star (the so-called "single-degenerate channel") or another white dwarf (the "double-degenerate channel"). In this talk, I will present recent results of three -dimensional models of the single-degenerate channel of Type Ia supernovae. I will also discuss prospects for modeling the double-degenerate channel of Type Ia supernovae, which have recently enjoyed increased favor from observers and theorists.