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Surface Detonation Models of Type Ia Supernovae CASEY MEAKIN, FLASH CENTER TEAM — Flame propagation and subsequent detonation in near-Chandrasekhar mass, carbon/oxygen white dwarf stars are studied using multi-dimensional, reactive hydrodynamic simulation. The single off-center bubble ignition models studied by Townsley et al. (2007) are extended through detonation and into the homologous expansion phase. In these models, detonation occurs in a collision region at the stellar surface. Careful attention is paid to accurately calculating the yield of material burned to nuclear statistical equilibrium (NSE) and then frozen out in the expansion following the detonation wave which sweeps over the white dwarf. A self regulating process comprised of neutronization and pre-expansion leads to $\sim$1.1M$_\odot$ of ^{56}Ni synthesized in all of the single point ignition models studied. The yield of intermediate mass elements is $\sim$0.1-0.3$M_\odot$ and the explosion energies are $\sim 1.5\times10^{51}$ ergs, comparable to observed luminous type Ia supernovae (Ia SNe). Multi-point ignition can lead to lower luminosity explosions by releasing more energy in the deflagration which goes into expanding the white dwarf prior to detonation. A suite of pre-expanded surface detonation models are presented which have explosion energies and ^{56}Ni masses spanning those of observed Ia SNe. Synthetic spectra and light curves are being generated from the multi-dimensional models for more direct comparison to observed Ia SNe.

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