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Relativistically Induced Supernovae M. DOLAN[1], Univ. of Notre Dame, D. DEARBORN, LLNL, G. MATHEWS, Univ. of Notre Dame, J. WILSON, LLNL, Univ. of Notre Dame — It has been proposed that the relativistic interaction between a black hole and a white dwarf could result in a new form of Type Ia supernovae. The objective of the research reported in this talk has been to determine if under similar conditions a hot red-giant core could be induced to ignite carbon and lead to a supernova explosion. Using a 1-D hydrostatic stellar evolution code, a red giant was evolved from a protostar, and then placed in the gravitational field of a supermassive black hole. During the evolution, helium shell flashes emerged as a serious nuisance causing the numerical calculations to be cumbersome, and at times impossible. However, as the red giant approached, ignition conditions appeared to have robustly occurred. This ignition is a result of the relativistic compression due to the enhanced self gravity as induced by the gravitational field of the black hole and would not have occurred outside this field. The 1-D relativistically compressed model was then mapped into a 3-D hydrodynamic code called Djehuty, capable of simulating whole stars including the appropriate thermonuclear reactions. The Djehuty simulation has shown that ignition had occurred in multiple locations simultaneously. Continuing Djehuty simulations will demonstrate how the ignition propagates through the star leading to a supernova. Prelimminary results indicate that the explosion is forming as an atypical Type II supernova.

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