Abstract Submitted
for the TSF19 Meeting of
The American Physical Society

What is the longest Gamma-Ray Burst that can be powered when a massive star collapses?[1] VALERIA U. HURTADO, University of California, Santa Cruz, ALDO BATTA, Instituto Nacional de Astrofisica, Optica y Electronica - INAOE, ENRICO RAMIREZ-RUIZ, ARIADNA MURGUIA-BERTHIER, University of California, Santa Cruz, NICOLE LLOYD-RONNING, Los Alamos National Lab, ROSA WALLACE EVERSON, University of California, Santa Cruz — Gamma-Ray Bursts (GRBs) are the most powerful events in the Universe. They are bursts of gamma-rays lasting anywhere from less than a second to thousands of seconds, and are divided into different categories depending on the duration of their gamma-ray emission. Each duration class of GRB is hypothesized to come from a distinct progenitor - for example, GRBs lasting 10's of seconds are believed to come from the collapse of a massive star, while GRBs lasting less than a few seconds are believed to come from neutron star mergers. However, for Ultra-Long Gamma-Ray Bursts (ULGRBs) - GRBs lasting up to thousands of seconds, their progenitors are yet to be confirmed. We study one of the proposed models for ULGRBs: a massive evolved star that fails to go supernova after it collapses into a black hole. We tested our model using semi-analytic and numerical solutions with the hydrodynamical code MEZCAL. We show that the evolved stellar model is not suitable to explain ULGRBs after considering the contributions by the cocoon and feedback energies, which can unbind the stellar envelope on timescales shorter than the duration of ULGRBs. The analysis presented here provides constraints for the longest duration event that can be produced through this stellar collapse model.

[1]Supported by the Danish National Research Foundation (DNRF132)

Valeria U. Hurtado
University of California, Santa Cruz

Date submitted: 29 Sep 2019 Electronic form version 1.4