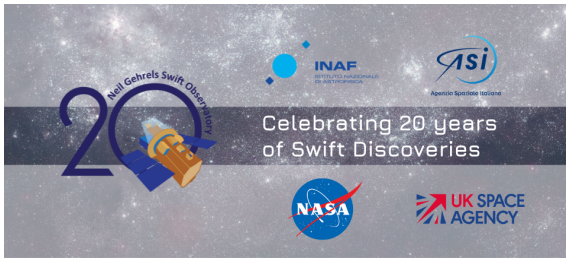

Contribution ID: **31** Type: **Poster**

Do Long Gamma-Ray Burst Engines Speak a Stochastic or Deterministic Language?

Tuesday 25 March 2025 14:29 (1 minute)

A successful description of the inner engine activity of long gamma-ray bursts (LGRBs) holds the key to deciphering the variety and complexity exhibited by their light curves (LCs). Although the knowledge of GRB spectral properties has made huge strides thanks to technological advancement, temporal properties remain mostly unintelligible. In particular, an open question is whether they originate from deterministic (e.g., presence of periodic components?) or stochastic processes. In this respect, we present a common description of LGRB LCs as the outcome of a stochastic pulse-avalanche process, resulting from the refinement of a previous model (Bazzanini et al. 2024). The model parameters were optimised with a genetic algorithm, and tested on three independent datasets of LGRBs detected by three different experiments: Swift/BAT, CGRO/BATSE, and Fermi/GBM. We found that a simple pulse-avalanche process operating in a nearly critical regime can successfully reproduce several average temporal properties of the population of real LCs, providing clues to the dynamical behaviour of the LGRB inner engine. In addition, this model offers a credible tool to simulate from scratch synthetic LCs for future experiments.

Bazzanini et al. 2024, A&A, 89, A266

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