Contribution ID: **792**   Type: **Talk**

Detection of the third class of gamma-ray bursts: magnetar giant flares.

Wednesday 14 July 2021 19:18 (12 minutes)

Around 11.4 million years ago a young, highly magnetized neutron star, a magnetar, in the Sculptor galaxy released an enormous amount of energy in the form of a giant flare. On April 15th 2020 some of the emitted photons were detected by a number of gamma-ray telescopes around Earth and Mars. While the analysis of this event, GRB 200415A, was interesting in its own right, it resulted in broader implications for both magnetar and gamma-ray burst (GRB) science.

The resulting population study of magnetar giant flares (MGFs), led to the unambiguous identification of a distinct population of 4 local (<5 Mpc) short GRBs. While identified solely based on alignment to nearby star-forming galaxies, their rise time and isotropic energy release are independently inconsistent with the larger short GRB population at >99.9% confidence. These properties, the host galaxies, and non-detection in gravitational waves all point to an extragalactic MGF origin. The inferred volumetric rates for events above 4×10^{44}erg of $R = 3.8^{+4.0}_{-3.1} \times 10^5 \mathrm{Gpc}^{-3}\mathrm{yr}^{-1}$ place MGFs as the dominant gamma-ray transient detected from extragalactic sources. As previously suggested, these rates imply that some magnetars produce multiple MGFs, providing a source of repeating GRBs. The rates and host galaxies favor common core-collapse supernova as key progenitors of magnetars.

Keywords

GRB, magnetar; giant flares;

Collaboration

other Collaboration

Subcategory

Experimental Results

Primary authors: NEGRO, Michela (CRESST-GSFC);   Dr ERIC, Burns (Louisiana State University);   Dr DIM-ITRY, Svinkin (Ioffe Physical-Technical Institute);   Dr KEVIN, Hurley (Space Sciences Laboratory, University of California);   Dr WADIASINGH, Zorawar (NASA GSFC);   Dr GEORGES, Younes (Department of Physics, The George Washington University);   Ms RACHEL, Hamburg (Department of Space Science, University of Alabama in Huntsville);   Dr DAVID , Cook (IPAC/Caltech)

Presenter: NEGRO, Michela (CRESST-GSFC)

Session Classification: Discussion

Track Classification: Scientific Field: GAD | Gamma Ray Direct