Searching for galactic sources in the *Swift* GRB catalog

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Abstract

Since the early 90s Gamma Ray Bursts have been accepted to be of extra-galactic origin thanks to the isotropic distribution observed by BATSE and the redshifts observed in some of their optical or infrared counterparts. Nevertheless, there have been a few cases that upon further examination have turned out to be of galactic origin. In this work we will conduct several statistical analyses to determine the degree of contamination by galactic sources of different samples taken from the Swift GRB catalog. This poster details the proposed methodology.

Sample Selection

We will select several Gamma Ray Bursts samples observed by Swift since its launch date, using criteria based on publications that determined that sources were previously thought to be GRBs were in fact galactic sources.

To quantify the degree of anisotropy with respect to the galactic plane we will use indicators like the mean dipolar moment of the samples' latitudes, among others.

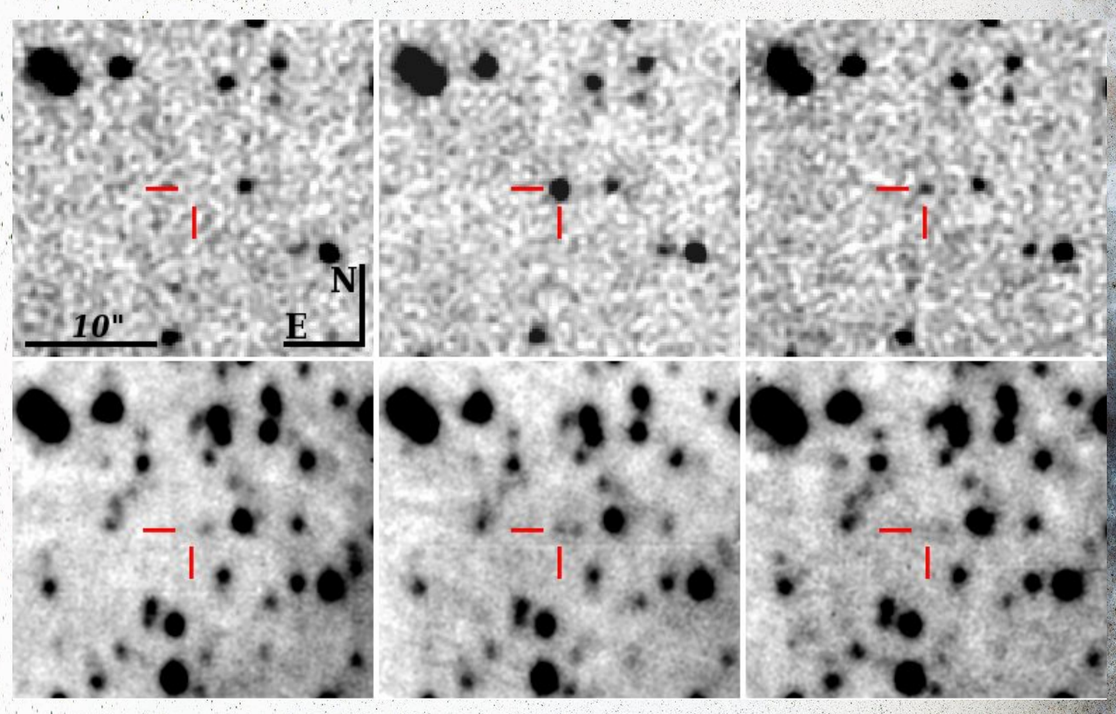

Illustration 1: Flaring activity of GRB 070610/Swift J1955+2604, a Galactic source mimicking a 8s long-duration GRB which is proposed to be either an evolved magnetar or an ultrashort low-mass X-ray binary (Castro-Tirado et al. 2008, Rea et al. 2011, Simon et al. 2011)

Isotropic distributions

We will consider the distribution of probability of the anisotropy indicators of a randomly generated isotropic sample. To ensure that the sample is generated isotropically we first ensure that it generates an homogeneous density of sources per solid angle. We will then compare the indicators of our samples to see if they deviate with statistical significance from the isotropic distributions.

Swift exposure map

The anisotropy of Swift's exposure will also taken into account by integrating the exposure masks of the BAT instrument since its operational start (Veres et al., 2010).

This will be crucial as the exposure is higher at the galactic poles and less at the galactic plane. We will weight the random isotropic sources using this map.

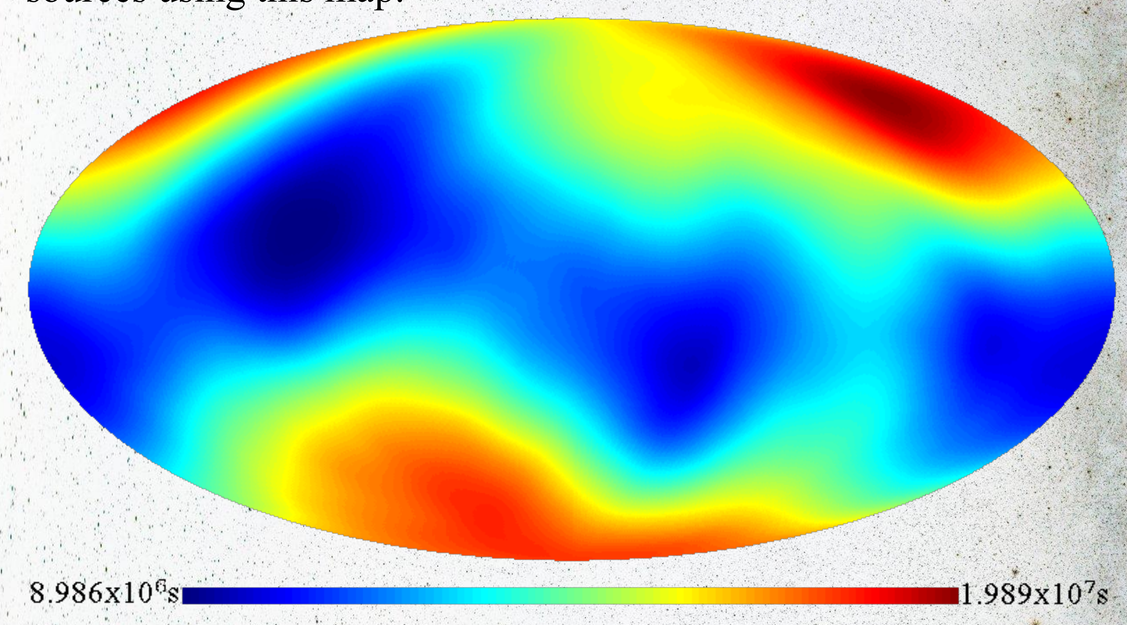

Illustration 2: Exposure map of Swift's BAT instrument in galactic coordinates. Red denotes higher exposure, where blue denotes lower exposure.

Contamination by galactic sources

The galactic sources will be generated by weighing the randomly generated isotropic sources with the galactic dust map (Schlegel, Finkbeiner & Davis, 1998). This dust map gives a good estimation of the density of galactic material which is why we believe it's a good indicator of density of galactic sources.

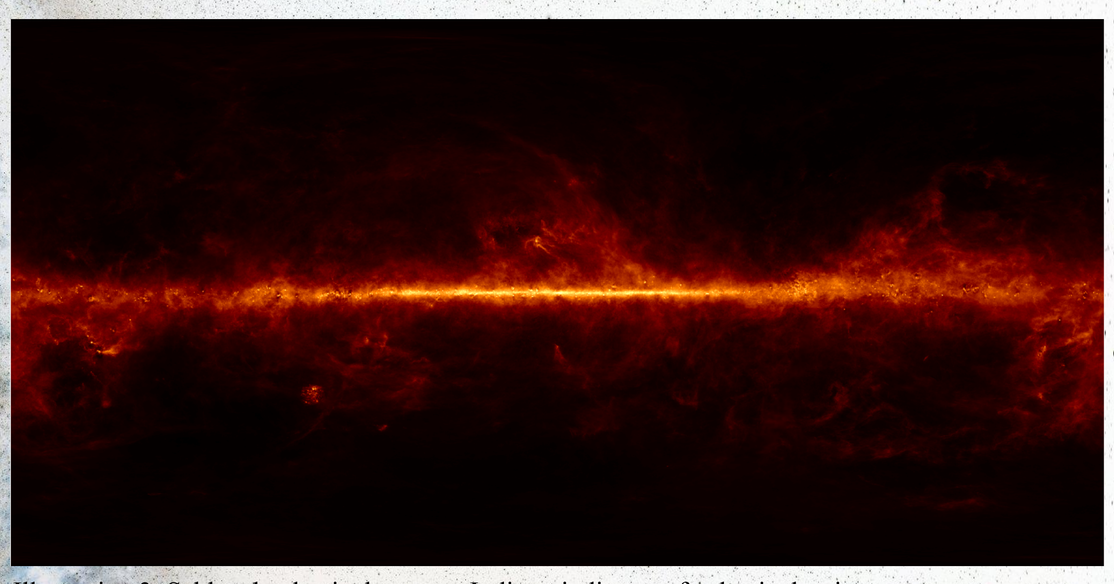

Illustration 3: Schlegel galactic dust map. Indirect indicator of galactic density.

Future work

We plan to publish an in-depth analysis regarding these analyses after having concluded thorough simulations that exclude possible statistical fluctuations.

We also plan to expand the study to other catalogs such as BATSE's which will provide richer statistical samples.

Acknowledgement

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Background image: “The Milky Way panorama” http://www.eso.org/public/images/eso0932a/ , ESO/S. Brunier

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