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What determines the structure of short gamma-ray burst jets?

https://arxiv.org/abs/2011.06729

type:theory-GRB_jet
comment:给出了在不同初始结构、持续时间、亮度以及ejection time history下短暴的数值模拟结果。并计算经过周围物质相互作用后在10^{11} cm之外的喷流最终结构

▶ details

Authors: Gerardo Urrutia, Fabio De Colle, Ariadna Murguia-Berthier, Enrico Ramirez-Ruiz
Comments: 9 pages, 7 Figures, submitted to MNRAS

The discovery of GRB 170817A, the first unambiguous off-axis short gamma-ray burst arising from a neutron star merger, has challenged our understanding of the **angular structure of relativistic jets.** The late afterglow of GRB 170817A has been described by a structured jet seen slightly off-axis (at an observer angle of $\approx 20^\circ - 30^\circ$). Studies of the jet dynamics and propagation usually assume that the jet is ejected from the central engine with a top-hat structure and its final structure, which determines the observed light curve and spectra, is primarily regulated by the interaction with the nearby environment. **However, relativistic jets are expected to be produced with a structure that is more complex than a simple top-hat, as shown by global accretion simulations.** In this work, we present results of numerical simulations of short GRBs launched with a wide range of **initial structures, durations, luminosities, and ejection time histories**. We follow the interaction of the jet with the pre-collapse, merger remnant wind and compute its final structure at distances $\gtrsim 10^{11}$ cm from the central engine. We show that the final jet structure, as well as the resulting afterglow emission (at much larger distances), depend strongly on the initial structure of the jet, its luminosity and duration. We find that the initial structure at the jet is preserved for long-lasting SGRBs, while it is strongly modified for jets barely making their way through the wind. This illustrates the importance of combining the results of global simulations with propagation studies in order to better predict the expected afterglow signatures from neutron star mergers. Structured jets provide a reasonable description of the GRB 170817A afterglow emission with an off-axis angle $\theta_{obs} \approx 22.5^\circ$ while top-hat jets do not.

- GRB 170817A 这一偏轴短暴引起了对结构性喷流的讨论。相对论性喷流的结构应该要比简单的高帽结构复杂。
- 作者给出了在不同初始结构、持续时间、亮度以及ejection time history下短暴的数值模拟结果。并计算经过周围物质相互作用后在10^{11} cm之外的喷流最终结构。
    - ejection time history ???

- 发现喷流最终结构以及远距离处的余辉辐射较强地取决于喷流初始结构，亮度以及持续时间。
    - details ??? images ???
- 发现对于持续时间长的短暴，初始喷流结能够构保持下来；而对于几乎不能穿越星风的喷流来说，其结构最终会强烈改变。

The Search for Fast Transients with CZTI

https://arxiv.org/abs/2011.07067

type:observation-fast_transient
comment:介绍了用于在CZTI数据中搜寻暂现源以及计算上限的算法

▶ details

Authos: Y.Sharma, A.Marathe, V.Bhalerao et al.
Comments: Submitted to the "AstroSat - 5 years" special issue of the Journal of Astrophysics and Astronomy

The Cadmium Zinc Telluride Imager on AstroSat has proven to be a very effective all-sky monitor in the hard X-ray regime, detecting over three hundred GRBs and putting highly competitive upper limits on X-ray emissions from gravitational wave sources and fast radio bursts. We present the algorithms used for searching for such transient sources in CZTI data, and for calculating upper limits in case of non-detections. We introduce CIFT: the CZTI Interface for Fast Transients, a framework used to streamline these processes. We present details of 88 new GRBs detected by this framework that were previously not detected in CZTI.

- AstroSat 上的 Cadmium Zinc Telluride Imager(CZTI) 是一个高效的硬X射线全天监测设备，它探测到了超过300个GRB，对GW事件以及FRB事件给出了可靠的X射线上限。
- 本文介绍了用于在CZTI数据中搜寻这种暂现源以及计算上限的算法。
- 介绍了CIFT (CZTI interface for Fast Transients)，这是一个用于流水化这些程序的框架。
    - interfrace ???
    - 专门搜寻CZTI的数据吗 ???
- 介绍了用CIFT新发现的88个GRB，这些GRB在之前没有被CZTI探测到。
    - 如果之前没有被CZTI发现，那这88个是从哪里找出来的???

Core-Collapse Supernove Burst Neutrinos in DUNE

https://arxiv.org/abs/2011.06969

type:instrument-DUNE_SN
comment:DUNE将对以后的银河系内核塌缩型超新星产生的中微子爆发中的electron-neutrino-flavor component 敏感

▶ details

Author: C.Cuesta (on behalf of the DUNE collaboration)
Comments: 7 pages, 6 figures, ICHEP 2020 Conference Proceedings

The Deep Underground Neutrino Experiment (DUNE), a 4**0-kton fiducial mass underground liquid argon time projection chamber experiment**, will be sensitive to the electron-neutrino-flavor component of the burst of neutrinos expected from the next Galactic core-collapse supernova. Such an observation will bring unique insight into the astrophysics of core collapse as well as into the properties of neutrinos. The recent progress on detection and reconstruction of supernova burst neutrinos in DUNE, including the contribution of the light detection systems are presented.

- DUNE将对以后的银河系内核塌缩型超新星产生的中微子爆发中的electron-neutrino-flavor component 敏感，这有助于以独特的视角了解核塌缩的天体物理以及中微子的性质。
- 内容主要是DUNE近来的中微子探测以及超新星爆发中微子的重构，包括light detection systems的贡献。
    - light dectection systems, 光探测系统 ???

Can we constrain the extragalactic magnetic field from very high energy observations of GRB 190114C?

https://arxiv.org/abs/2002.06918

type:theory-GRB
comment:GRB的γ-ray信号能反映河外磁场的强度和结构的影响

▶ details

Authors: T.A. Dzhatdoev, E.I. Podlesnyi, I.A. Vaiman
Comments: 8 pages, 4 figures. Accepted for publication in Phys. Rev. D

Primary very high energy γ-rays from γ-ray bursts (GRBs) are partially absorbed on extragalactic background light (EBL) photons with subsequent formation of intergalactic electromagnetic **cascades**. **Characteristics of the observable cascade γ-ray signal are sensitive to the strength and structure of the extragalactic magnetic field (EGMF)**. GRB 190114C was recently detected with the MAGIC imaging atmospheric Cherenkov telescopes, for the first time allowing to estimate the observable cascade intensity. We inquire whether any constraints on the EGMF strength and structure could be obtained from **publicly-available γ-ray data** on GRB 190114C. We present detailed calculations of the observable cascade signal for various EGMF configurations. **We show that the sensitivity of the Fermi-LAT space γ-ray telescope is not sufficient to obtain such constraints on the EGMF parameters.** However, next-generation space γ-ray observatories such as MAST would be able to detect pair echoes from GRBs similar to GRB 190114C for the EGMF strength below $10^{-17} - 10^{-18}$ G.

- 来自GRB的非常高能的γ-rays会部分被河外背景光光子（extragalatic background light photons）吸收，随后形成星系间电磁cascades。
    - intergalactic electromagnetic cascades ？？？
- 可观测cascade的γ-ray信号能反映河外磁场（extragalactic magnetic field）的强度和结构的影响。
- GRB 190114C 是地一个可以用来估量可观测cascade 强度的GRB。作者探究了是否可以从GRB 190114C公开的 γ-ray数据 对河外磁场的强度和结构做出限制。

- 文章详细计算了不同河外磁场结构（configuration）下的可观测cascade 信号。
- 证明Fermi-LAT的灵敏度不足以观测到能对河外磁场模型作出限制的数据。而下一代空间γ-ray天文台比如MAST，将能够探测到低于$10^{-17} - 10^{-18}$ G的河外磁场下来自类似GRB的pair echoes。