Tianci Zheng, PhD candidate

tczheng@pmo.ac.cn
https://tianci-zheng.github.io/
Purple Mountain Observatory, CAS, Nanjing 210023, China

Study

My research focuses on using gamma-ray bursts (GRBs) as probes to study the physics of compact objects, particularly the properties of newly formed magnetars and black holes. By combining the X-ray flare and the X-ray plateau in the afterglow phase, we have investigated the magnetosphere size of magnetars and potential re-magnetization process of magnetar (Zheng et al. 2021). Through the search for potential quasi-periodic oscillation (QPO) signatures in GRBs, we have examined the activities of the central engines. A possible asymmetrical induced magnetar precession was identified in the afterglow of GRB 101225A (Zou et al. 2021). The precession of the BH central engine is also suggested by GRB 050904. Its X-ray afterglow, consisting of nine flares, features a QPO-modulated plateau and sharp decay, which cannot be easily explained by the magnetar model but favors a scenario involving a precessing jet powered by a Kerr BH (Zheng et al. 2024). We have also investigated long GRBs originating from ultra-compact binaries, revealing that the companion's long-term tidal force may imprint a QPO pattern in the GRB afterglow, providing a method for studying the evolution of multiplicity (Zheng et al. 2025). My latest study (Zheng et al., submitted) reveals that the periodicity in GRB events may be characterized by a time-evolving period. We report the first case of GRB,131122B, highlighting that its relative period change is the fastest observed in the electromagnetic window. Our work opens a new window for studying GRB central engines and related phenomena.

Interest

GRBs	central engine activities; physical origin
TDEs	physical process
Phenomena	X-ray; gamma-ray; optical; Timing activities

Education

2022 – 2025 **Ph.D. in High Energy Astrophysics,** Purple Mountain Observatory, CAS (Degree-conferring institution: University of Science and Technology of China.
Thesis title: *Probing the Central Engine Properties via Long-Lasting Activity Signals in Gamma-Ray Bursts*
collaborator: Da-Ming Wei; Zhi-Ping Jin

2018 – 2021 **M.Sc., Master of Science in Physics,** Guangxi University.
Thesis title: *The Optical Observation of Gamma-ray Burst and Supernova –Case Study of GRB 160131A and SN 2019ehk*.
supervisor: Xiang-Gao Wang; En-Wei Liang

Education (continued)

2014 – 2018 **B.Sc. Bachelor of Science in Physics,** Guangxi University.

Visitor

2023.11.1 - 21 UMICH, NULV, AZ

Skills

Coding Python

Data analysis Optical: photometric, spectroscopic
X-ray: Swift/XRT, EP/WXT/FXT
Gamma-ray: Swift/BAT, Fermi/GBM

Periodicity test method: Discrete Fourier Transform, Lomb-Scargle Periodogram, Weighted Wavelet Z-transform, Gaussian Process
Significance estimation: Bayesian Inference, Simulation, direct analysis (white noise only)

Observation Experience

2018.10 - 2020.12 Duty of GWAC sky survey: GWAC, GWAC-30, GWAC-60
Duty of time domain observation: GWAC-30, GWAC-60, LCOGT (image/spectroscopy)

2023.11 Learning trip: Palomar P200, 2.4 m Hiltner telescope, 1.3 m McGraw–Hill telescope

Research Publications

Talks

2024.1 X-ray flare and plateau as a tool for probing the GRB central engine
The 1st Shen Kuo academic seminar, Wuhan, China

2024.5 X-ray flare and plateau as a tool for probing the GRB central engine
The 3rd Nanjing GRB Conference, Contributed talk, Suzhou, China

Sport & Travel

Tennis

- Tennis : 2014.9 –

Cycling

- Cycling to Tebit: 2018.7 - 2018.8
  Cycling around Hainan Island: 2021.11
  Cycling around Qinhai Lake: 2022.8