frontiers | Frontiers in Earth Science

TYPE Editorial
PUBLISHED 14 November 2023
DOI 10.3389/feart.2023.1331948



OPEN ACCESS

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RECEIVED 02 November 2023
ACCEPTED 08 November 2023
PUBLISHED 14 November 2023

CITATION
Yu H, Zhuang J and Chen C-H (2023), Editorial: Pre-, co-, and post-seismic processes of recent earthquakes in mainland China.
*Front. Earth Sci.* 11:1331948.
doi: 10.3389/feart.2023.1331948



# Editorial: Pre-, co-, and post-seismic processes of recent earthquakes in mainland China

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KEYWORDS

**dynamic processes of earthquakes, co-seismic, crustal deformation, precursors, foreshocks**

Editorial on the Research Topic
Pre-, co-, and post-seismic processes of recent earthquakes in mainland China

The aim of the Research Topic is to present the latest original research articles on the dynamic processes associated with the earthquakes in mainland China in recent years. The goal is to address several key questions, including: 1) what can we learn from these earthquake studies? 2) can earthquakes be forecasted using empirical methods? 3) do existing geophysical observations record pre-, co-, and post-seismic processes? and 4) is there detectable coupling between the solid Earth and other spheres such as the atmosphere and ionosphere during the earthquake preparation period and fault rupture process?

With the efforts made by the editorial team and the careful reviews by the reviewers, we have published eight articles that have essentially achieved the objectives of the Research Topic. The research primarily focuses on strong earthquakes that occurred over the last 10 years on the western part of the Chinese mainland. Additionally, the latest observational data, such as crustal deformation, electromagnetic activity, seismic activity, thermal infrared, InSAR, and other sources, have been applied in these studies.

The Research Topic investigates various processes associated with the preparation and occurrence of earthquakes, including long-term risk assessment, short-term anomaly monitoring, co-seismic variations, and earthquake sequences. It has been found that precursors can be observed before large or strong earthquakes.

On a long-term scale, Zhao et al. studied the present-day kinematics and seismic potential of the Ganzi-Yushu fault in the eastern Tibetan plateau, constrained using InSAR. They pointed out the seismic hazard of the Dangjiang and Dengke segments. Li et al. explored the "*Crustal attenuation structure of the Tianshan tectonic belt and its spatiotemporal variations*." They demonstrated that the accumulation and release of stress influence the opening or closure of crustal fractures.

On short-term scales, Xie et al. summarized the changes and mechanisms of apparent resistivity before the large earthquakes in mainland China. They concluded that pre-seismic apparent resistivity anomalies are caused by seismogenic processes such as medium deformation. Zhang et al. conducted a statistical analysis of the characterization of thermal infrared medium-to-short-term anomalies from blocks to faults. They argued that the satellite thermal infrared technology can be apply to monitor fault activity. In addition, Zheng claimed that the evolution of seismicity clustering features can reflect

changes in stress in the crust and is closely connected to the seismogenic process of a strong earthquake. This was explored by investigating the clustering features and seismogenesis of the 2014 Ms6.6 Jinggu earthquake in Yunnan Province.

The Research Topic also provides novel insights into the mechanisms of earthquakes and their correlation with the Earth's crust structure. Yuan et al. found that the occurrence of the 2022 Ms6.8 Sichuan Luding earthquake, may be related to the 2021 Ms7.4 Qinghai Maduo earthquake, as well as the Sichuan Lushan Ms6.1 and Malkang Ms6.0 earthquakes in 2022, respectively, based on co-seismic crustal deformation observations.

Furthermore, in this Research Topic, Li et al. pointed out that before a large earthquake, there is stress accumulation in the source media, while there is a stress release process after the earthquake. This was analyzed by studying the upper crust anisotropy of the 2020 Jiashi Ms6.4 earthquake. Building upon this, Li et al. conducted a study on the foreshock sequence of the Ms6.4 Yangbi, Yunnan earthquake. It is known that before the Yangbi mainshock on 21 May 2021, four moderate earthquakes with a magnitude greater than 4.0 occurred successively in the epicentral area since 18 May. While China has carried out foreshock identification immediately after these earthquakes, the final rupture of Yangbi was not predicted via its foreshocks. On average, more than 100 earthquakes with a magnitude of 6.0 and above occur in the world annually, and about 15% of them have foreshocks. The existence of foreshocks may provide an opportunity for predicting upcoming larger mainshocks. Unfortunately, the method to identify foreshocks has not been found yet.

In summary, this Research Topic addresses important knowledge gained from recent earthquakes in China and demonstrates that earthquakes can be forecast using empirical methods. The results offer a different perspective for the study of geophysical methods, techniques, earthquake rupture mechanisms, disaster prevention, deep earth structure, dynamics, and more.

## Author contributions

HY: Writing–original draft. JZ: Writing–review and editing. C-HC: Writing–review and editing.

## Funding

The authors declare financial support was received for the research, authorship, and/or publication of this article. This work has been supported by the National Key Research and Development Project of China (Grant No. 2018YFE0109700) and the Earthquake Joint Funds of NSFC (Grant No. U2039205).

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note