frontiers | Frontiers in Earth Science

TYPE Editorial
PUBLISHED 06 January 2023
DOI 10.3389/feart.2022.1049535

OPEN ACCESS

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SPECIALTY SECTION
This article was submitted to Structural Geology and Tectonics, a section of the journal Frontiers in Earth Science

RECEIVED 20 September 2022
ACCEPTED 23 September 2022
PUBLISHED 06 January 2023

CITATION
Hou M, Xiong F, Ma C, Foulger GR and Yu S (2023), Editorial: Permian-Triassic Tethyan orogeny along the southern Eurasian margin.
Front. Earth Sci. 10:1049535.
doi: 10.3389/feart.2022.1049535

Editorial: Permian-Triassic Tethyan orogeny along the southern Eurasian margin

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KEYWORDS

Tethyan, magmatism, metamorphism, sediment provenance, tectonic, geodynamic

Editorial on the Research Topic
Permian-Triassic Tethyan orogeny along the southern Eurasian margin

As one of the major Phanerozoic orogenic belts on Earth, the Palaeo–Tethyan orogenic system along the southern Eurasian margin is characterized by multiple magmatic, sedimentary, metamorphic and mineralization events, recording the oceanic basin closure and terrane accretion during the convergence of Cimmerian microplates. A systematic study of these petrological and metallogenic records is beneficial to understand the assembling processes of the Cimmerian terranes, and thus helps to reconstruct the pre–Cenozoic evolution history of the Tethyan orogenic system. Although important advances have been made over the last decades, many parts of this orogenic system are poorly studied, and some key scientific problems need to be further studied by multidisciplinary integrated approaches. Therefore, we launched a Research Topic in Frontiers in Earth Science to discuss 1) Tethyan tectonic evolution and dynamic processes; 2) sediment provenance and paleogeographic reconstructions within the Tethyan realm; 3) geodynamic similarities and differences in other tectonic realms.

This Research Topic collects 10 papers from different disciplines, which helps to understand the tectonic evolution and geodynamic processes in the Tethyan realm. Among them, three articles focus on sedimentary provenance, sedimentary structure and tectonic implications. For example, Han et al. studied the provenance of the Lower Triassic Qingtianbao Formation in the southwestern margin of the South China Craton. Their results suggest that the Palaeo–Tethyan Ocean may undergo unidirectional subduction westward beneath the Indochina Block during the Late Permian–Early Triassic, providing an important constraint to the subduction polarity of the Eastern Tethyan ocean. Lv et al. studied the sandstone petrography and detrital U-Pb age of the Lower Jurassic Baitianba Formation from the Sichuan Basin, which helps to understand the pre-collisional tectonic evolution of the basin–mountain system at the margin of the

Tibetan plateau in the Cenozoic. Liang et al. focused on the age and tectonic nature of the late Paleozoic to early Mesozoic sedimentary succession in the Sanjiang Tethyan orogenic belt, SE Tibetan Plateau, and revealed that the studied succession deposited within a retro-foreland basin along the rear part of the Permian-Triassic magmatic arc in response to flat subduction of the Palaeo–Tethyan Ocean.

Three papers within this Research Topic provide insights into tectono-magmatism and mineralization. Gan et al. studied one Triassic adakitic pluton in East Kunlun orogen, Northern Tibetan Plateau, to constrain its petrogenesis and tectonic setting. Their study results suggest that the Late Triassic adakitic magmatism in East Kunlun orogen may be the response to the tectonic transition from oceanic subduction to post–subduction extension, and the reworking of ancient continental crust is the major mechanism of continental crust evolution in the Palaeo–Tethyan orogenic belt. Li et al. studied the Peridotite xenoliths to constrain the nature and evolution of the mantle beneath SE China. Their study reveals the precise timing of the mantle evolution from enriched to depleted, providing ideas and references for exploring the evolution process of the Tethyan mantle. Liu et al. studied the geochronology and geochemistry of high-Mg monzodiorite in the Lhasa terrane, Southern Tibetan Plateau. Their study results suggest that the delamination of the thickened crust may have occurred after the collision between the Lhasa block and the Qiangtang block.

Two articles published on this Research Topic focus on metamorphism and Tethyan tectonic evolution. Lu et al. presented EPMA major and LA-ICP-MS trace element studies on the garnets in the ultrahigh-pressure eclogites from the Changning-Menglian Tethyan suture. Their results reveal the rapid exhumation, cooling and decompression processes after short-term peak metamorphism during the closure of the Palaeo-Tethyan ocean. Fu et al. studied petrology, geochemistry, geochronology and Sr-Nd-Hf isotopes of the Bangbing eclogites in the SE Tibetan Plateau. Their study suggests that the Changning-Menglian Tethyan suture zone is a typical oceanic subduction-accretionary belt, and the Palaeo-Tethyan oceanic subduction lasted during the Early-Middle Triassic followed by the rapid exhumation in the Late Triassic.

Big Data and Machine Learning are becoming more and more important tools for geoscience research, and their combination may create unexpected solutions to conventional geoscience problems. This Research Topic collects two representative studies to show the powerful role of this new research tool. Li et al. used big data and geostatistical models of geochemical elements to study the viscosity variation of basalts, aiming to discover more potential new hydrothermal or massive sulfide fields. Their studies provide a possible rule for the hydrothermal vents' exploration. Hu et al. used computer image recognition technology to calculate fault multifractality and applied this method to fault study of the Permian Maokou Formation in Sichuan Basin, western Yangtze Block. Their study results suggest that the Sichuan basin was affected by Tethyan collisional orogeny in Triassic, which controlled the NW–SE compressional environment and the NE-trending faults.

In conclusion, the articles collected in this topic are the results of multidisciplinary research including petrology, sedimentary geology, structural geology, marine geology and geochemistry. We hope that the articles within this Research Topic would provide further insights into the tectonic evolution and geodynamics of the Tethyan orogenic system.

Author contributions

MH and FX wrote the original text. CM, GF, and SY conducted the revisions. All authors reviewed the final manuscript and approved it for publication.

Funding

The work was supported by NSFC Program (No. 41602049) and the Research Project of Chengdu University of Technology (No. 2021ZF11412).

Acknowledgments

We gratefully acknowledge the efforts of the reviewers for their helpful comments. We would like to thank the authors for their valuable contributions to this Research Topic.

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.

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