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青藏高原东南缘构造旋转的古地磁学证据

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Paleomagnetic constraints on the tectonic rotation of the southeastern margin of the Tibetan Plateau

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摘要

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摘要 本文在总结青藏高原东南缘近年来地质研究进展的基础上,从古地磁学的角度讨论其新生代以来的构造运动特征.结果表明:相对稳定的欧亚大陆,新生代以来山泰地块发生了约 20° ~ 80° 顺时针旋转,局部地区旋转量甚至高达 135° ,且中部地区的旋转量明显高于南北地区;印支地块经历了 $\sim 30^{\circ}$ 的顺时针旋转;川滇地块的顺时针旋转量沿 102° E经度线由南向北由 30° 逐渐减小;另一方面,古地磁数据还揭示出山泰地块新生代以来发生了 $\sim 8^{\circ}$ 的南向滑移运动.旋转量随时间的变化表明主要构造旋转发生在始新世与中中新世之间,与哀牢山—红河断裂的左行走滑时间相一致.这表明青藏高原东南缘的新生代构造运动具有差异性和复杂性,现今国际流行的挤出逃逸、地壳缩短增厚及下地壳流模式均有其局限性.值得注意的是,青藏高原东南缘可靠的新生代古地磁数据在时空分布上的严重不足,制约了我们对印度与欧亚大陆碰撞在青藏高原东南缘的运动学响应过程的深入探讨和正确理解.因此,进一步对该地区新生代地层开展深入细致的古地磁学等综合研究,无疑具有重要的科学意义.

关键词 青藏高原东南缘, 古地磁, 构造旋转, 走滑逃逸

Abstract: In this paper we present a comprehensive summary of the geological evolution of the southeastern margin of the Tibetan Plateau and a detailed reanalysis of previously published paleomagnetic data. We focus on the Cenozoic, which represents a period during which the southeastern margin of the Tibetan Plateau was one of the most active tectonic regions due to the India-Eurasia collision. Our analysis indicates that, since the Cenozoic, with respect to the stable Eurasian block, the Shantai terrane experienced a clockwise rotation of $\sim 20^{\circ}$ — 80° , with some areas experiencing clockwise rotation by as much as 135° , and the rotation of the central part of the terrane is higher than that in the north and south of the terrane; the IndoChina terrane rotated $\sim 30^{\circ}$ clockwise and the rotation of the Chuandian terrane decreased from 30° along the longitude 102° E from south to north. Of the three terranes only the Shantai terrane recorded a $\sim 8^{\circ}$ southward translation. The variation of rotation versus time indicates that the main rotation of the southeastern margin of the Tibetan Plateau occurred between Eocene and mid-Miocene, which is in accordance with the sinisterly slip of the Ailao Shan-Red River fault zone. This complex tectonic history, revealed by paleomagnetism, cannot be fully explained by the commonly accepted models for the formation of the Tibetan Plateau, such as crustal thickening, lateral extrusion or lower crustal flow. Reliable Cenozoic paleomagnetic data in the southeast margin of Tibetan Plateau are scarce. Therefore, to better evaluate the effects of the India-Eurasian collision on the southeastern margin of the Tibetan Plateau, additional and more detailed paleomagnetic studies of Cenozoic rocks from this region are essential.

Keywords Southeastern margin of the Tibetan Plateau, Paleomagnetism, Tectonic rotation, Extrusion

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