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天山南北麓中-新生界碎屑锆石U-Pb年代学记录、物源体系分析与陆内盆山演化

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摘要:

大批量、原位高精度碎屑矿物同位素分析为盆地(盆山)动力学等前沿领域的研究注入了新的活力。针对天山北麓(准噶尔盆地南缘)、天山南麓(塔里木盆地北缘)中生界及新生界露头剖面,重点通过13个(新补充4个)砂岩样品的碎屑锆石U-Pb同位素的LA-ICP-MS分析,本文解析了其年代学、物源特征及其构造属性等高分辨率信息,并开展了沉积记录与物源体系对比,探索了天山及其邻近盆地的表壳演化过程与地球动力学机制。研究显示,上三叠统-中侏罗统天山南麓碎屑锆石U-Pb年龄构成相对单一,年龄偏老(峰值区间380~450Ma),而同层位天山北麓碎屑锆石物源年龄构成总体宽泛复杂(160~470Ma);上侏罗统-下白垩统天山南麓碎屑锆石年龄构成复杂化(150~470Ma),而天山北麓则趋于相对简单(但仍然保留250~430Ma较宽范围);新近统以上,天山南、北麓主物源碎屑锆石年龄构成均趋向单一,即南麓年龄偏老(峰值区间380~460Ma),而北麓偏新(峰值区间260~310Ma)。可能说明山盆构造分异活动可以分为四个阶段:中晚三叠世-中侏罗世平稳或渐弱,天山主分水岭位于南天山;晚侏罗世-早白垩世天山区域整体抬升剥露加剧,并伴随主分水岭相对北移;晚白垩世-古近纪相对较弱,而新近纪再度活跃并达到最强,南、北天山强烈隆升,分水岭各成系统。这也反映同期在欧亚板块南缘的一系列拼合-碰撞作用中,拉萨、印度板块对天山地区陆内构造变形和改造作用效果明显,而羌塘块体的影响较小;另一方面,与晚侏罗-早白垩世拉萨板块碰撞事件相关的天山隆升导致陆内区域气候-沉积演化的重要转折,但天山南北盆地局域气候-沉积记录的分异在新近纪印度板块碰撞以前是有限的。

英文摘要:

Larger numbers of in-situ and high-precision isotopic analyses on detrital minerals provide a new chance for the frontier research of basin (basin-range) geodynamics. For the Mesozoic and Cenozoic outcrop profiles in the northern and southern piedmonts of Tianshan (corresponding to southern Junggar and northern Tarim basins), Northwest China, thirteen sandstone samples (four new samples) were chosen, and their detrital zircon U-Pb isotopes were measured by LA-ICP-MS method. Based on contrast of geochronology, provenance system and tectonic attribute of the detrital zircons between the northern and southern piedmonts of Tianshan, this research further explores sedimentary crust evolution and its geodynamic mechanism of the Tianshan and adjacent basins. The paper shows that the Upper Triassic-Middle Jurassic detrital zircons in the southern piedmont of Tianshan (SPT) are characterized by relatively single and old U-Pb ages (peak range: 380~450Ma), while ones in the northern piedmont of Tianshan (NPT) by relatively wide and complex U-Pb ages (peak range: 160~470Ma). The Upper Jurassic-Lower Cretaceous detrital zircon U-Pb ages in SPT become wide and complex (150~470Ma), while ones in NPT become narrow (though relatively wide ages of 250~430Ma remained). For the Neogene strata, detrital zircon U-Pb ages in the both NPT and SPT tend to single, that is, relatively older (380~460Ma) and younger (260~310Ma) peak ages occurred in the two belts respectively. The above evidences indicate four phases to basin-range tectonic evolution in the study area. Stable and weak tectonic activity developed in the Middle-Late Triassic-Middle Jurassic Period, with main watershed occurred in the southern Tianshan. Regional and whole uplift became evident in the Late Jurassic-Early Cretaceous Period, with main watershed north migrating in the Tianshan. Following to weakening tectonic activity in the Late Cretaceous-Paleogene Period, the most intensive uplift of Tianshan area occurred in Neogene, with distinctive watershed systems in the North and South Tianshan. The research also shows that evidently intracontinental tectonic deformation and reconstruction in the Tianshan area resulted from Lhasa and India, rather than Qiangtang, collisions along the southern boundary of Eurasia. On the other hand, an important regional climatic-depositional transition in the study area was responsive to the Lhasa collision event in the Late Jurassic-Early Cretaceous Period, however, the above event had not resulted in evident differentiation of local climatic-depositional records between sedimentary basins respectively located in north and south to Tianshan until the India collision event happened in Neogene.

关键词: [碎屑锆石U-Pb年代学](#) [沉积物源体系](#) [盆山演化](#) [中-新生界](#) [天山](#) [准噶尔盆地](#) [塔里木盆地](#)

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