

西南天山隆起时代的河床砂岩屑磷灰石裂变径迹证据

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The uplift history of south-western Tianshan—Implications from detrital apatite fission track dating of channel sand samples

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摘要

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摘要

现代的天山山脉是在古生代造山基础上, 于新生代强烈抬升而形成. 其新生代造山和隆升过程, 造就了现今的天山地貌格局. 西南天山作为研究区域, 采用河床砂岩屑磷灰石裂变径迹测年分析, 从统计角度限定西南天山的隆升-剥露过程. 样品采集于特克斯河、夏特河、木扎河以及特克斯河干流的沉积河床. 磷灰石裂变径迹测试和统计分析表明, 存在代表源区热史演化不同年龄峰值. 尽管不同样品的年龄众数分布有少许差别, 颗粒年龄众数的去褶积分析获得了西南天山山体新生代冷却的三个基本段: 6~8 Ma, 12~19 Ma以及32~40 Ma. 结合山脉隆起的地质地貌模型, 无论是整体抬升或掀斜抬升, 以及压扭性背景抬升, 根据磷灰石裂变径迹封闭温度推断的抬升量与现今天山高度基本相当的事实, 都可以确认西南天山山体是6~8 Ma以来快速抬升冷却事件与青藏高原及其周边的主要隆升时期有较好的对应, 证明了天山隆升和印度-欧亚板块碰撞远系. 另外, 6~8 Ma的冷却事件与沉积地层学研究揭示的6 Ma左右的气候显著变化相互印证, 显示了研究区域山脉隆升和间存在的密切关系.

关键词: 西南天山 河床砂岩屑 磷灰石裂变径迹 冷却事件 地貌形态

Abstract:

The present Tianshan mountain range and its landform pattern were believed to be shaped by intensive uplift basing on the Paleozoic crust. Employing Apatite Fission Track Dating as a primary method, this study attempts to reveal the uplift and denudation history of southwestern Tianshan. We collected channel-sand samples from Teks River and its tributaries Akyaz, Shate, and Muza, for Apatite-Fission-Track analysis. A population of ages can be deconvolved into a best-fit group of component distributions by a peak-fitting approach. Different age-peaks obtained from the analysis represent thermal history of source areas, which further reveal three main cooling periods of southwestern Tianshan since Cenozoic: 6~8 Ma, 12~19 Ma, and 32~40 Ma. Combined with geological model of mountain's uplift, as well as the uplift capacity is equal with height of present Tianshan mountain range, the analysis result mentioned testifies that the Tianshan mountain range was shaped since 6~8 Ma. These three rapid cooling correspond well with cooling phases of Qinghai-Tibet Plateau. It testifies the far-field effect on the Tianshan as a result of the collision of Indian and Eurasian Continents. Furthermore, the phase of 6~8 Ma is in accord with stratigraphic research of an acute climate change at around 6Ma in the research area. It is possible correlation that generally exists between mountain uplift and climate change.

Keywords: Southwestern-Tianshan Detrital sample Apatite Fission Track Cooling event, Landform

Received 2009-10-29;

Fund:

国家重点基础发展研究项目中亚造山带大陆动力学过程与成矿作用(2007CB411300)和国家自然科学基金委创新群体项目与造山演化项目(40821002)资助.

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