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晚新生代以来天山南、北麓冲断作用的定量分析 点此下载全文

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摘要：

利用地表地质、二维地震和钻、测井资料建立了两条横穿天山南、北麓库车河地区和金钩河—安集海河地区的构造剖面,从几何学和运动学的角度探讨新生代以来不同序次台阶状逆断层及其相关褶皱的叠加过程、以及叠加过程中断层形态、褶皱形态与位移量之间的定量关系。生长地层和生长不整合分析表明,上新世早期(4.2～5Ma)可能是天山南、北麓新生代冲断褶皱的主要形成期,发育自天山内部的台阶状逆断层在向两侧沉积盆地扩展过程中形成多个滑脱面和断坡,断层位移在断坡位置引发褶皱变形,从而形成南北方向背斜带成排分布的构造格局。在天山南麓库车河剖面中,控制库车地区构造变形的三条台阶状逆断层位移量分别为5.7km、6.3km和18km,它们的活动时代由老到新,而位移量却逐渐增大,反映新生代以来天山南麓的冲断作用可能存在一个加速的过程。按上述数值计算,渐新世(23Ma)以来的缩短速率为1.3mm/a,上新世(5.2±0.2Ma)以来的缩短速率为3.6mm/a。在天山北麓金钩河—安集海河剖面中,山前深部楔形体内的断层位移量为16.9km,但只有6km的位移量沿中上侏罗统西山窑组煤层内的滑脱面向北传递至第二排背斜带,而至第三排背斜带,位移量已递减为0.22～0.29km。以上新世早期(4.2～5Ma)作为构造活动时间,计算出该剖面上、下构造层上新世以来的缩短速率为2.6～3.1mm/a和3.8～4.5mm/a,其中下构造层内的山前深部楔形体、霍尔果斯深层背斜和安集海背斜的缩短速率分别为3.9～4.6mm/a、1.2～1.4mm/a和0.04～0.38mm/a,这说明由于断层位移量在向北传递过程中不断被褶皱作用吸收或沿反冲断层向南消减,各排背斜带的变形强度由南向北依次减弱。

关键词：库车河剖面 金钩河—安集海河剖面 位移量 构造变形 缩短速率 上新世 天山

Late Cenozoic Active Fold-and-Thrust Belts in the Southern and Northern Flanks of Tianshan Download Fulltext

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Abstract:

The Tianshan Mountain range related to the India-Eurasia collision has been considered as an ideal laboratory to understand the dynamic processes responsible for intracontinental mountain building. The active fold-and-thrust beltsin its both flanks offer an exceptional opportunity to study the processes of growth folding above imbricate thrust systems and their interaction with sedimentation and displacement, which are emphasized more and more by the worldwide neotectonic community. In order to present a detailed and quantitative analysis of the timing, rates and process of deformationon these active fold-and-thrust belts, depth-converted seismic reflection profiles, wells, together with detailed surface structural measurements, have been usedto construct balanced cross-sections in the Kuqa river and Jingou-Anjihai river areas, located in the southern and northern piedmonts of Tianshan respectively. Growth strata and growth unconformitiesanalysis correlated to the available magnetostratigraphyindicates actively deforming structuresin both areasmay have mainly developedsince the early Pliocene (4.2~5 Ma). In Kuqa river cross-section, the displacements on three thrust faults, estimatedby geometric analysis,vary from 5.7 km to 6.3 km, and to 18 km, which reveals an acceleration of deformation since the Oligocene.Based on these measurements, we infer a long-term (23Ma) shortening rate of the Kuqa thrust-and-fold belt of about 1.3 mm/a, and the short-term (4.2~5 Ma) shortening rate of about 3.6 mm/a.In the Jingou-Anjihai river cross-section, the total displacementon thrust faults in deep wedges near the mountain front is estimated to be about 16.9 km, in which only 6 km is transferredto the Huo'erguoshi anticline, and has decreased to 0.22~0.28 km near the Anjihai anticline. Based on these measurements, we infer the shortening rate of the upper and lower structural layers of about 2.6~3.1 mm/aand 3.8~4.5 mm/a, respectively, and the deep structural wedges near the mountain front, Huo'erguoshi deep anticline and Anjihai anticline in the lower structural layer of about 3.9~4.6 mm/a, 1.2~1.4 mm/aand 0.04~0.38 mm/a, respectively.

Keywords:Kuqa cross-section Jingouhe-Anjihaihe cross-section displacement structural deformation shortening rate Pliocene Tianshan