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青藏高原东北缘岩石圈变形及其机理

崔笃信;王庆良;胡亚轩;王文萍;梁伟锋*

中国地震局第二监测中心, 西安 710054

Lithosphere deformation and deformation mechanism in northeastern margin of Qinghai-Tibet platea

CUI Du-Xin;WANG Qing-Liang;HU Ya-Xuan;WANG Wen-Ping;LIANG Wei-Feng*

Second Monitoring Center of China Earthquake Administration, Xi'an 710054, China

摘要

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摘要 为了解青藏高原东北缘岩石圈变形特征,进一步研究该地区地壳运动的壳-幔耦合机理,本文通过处理分析该地区1999~2007年多期GPS观测数据、1972~2000年水准测量数据和1992年及2007年相对重力测量资料,获得了该区域地壳水平运动速度场、较长时间段的垂直形变场和相对重力变化场.分析发现青藏高原东北缘东西部的变化特征存在明显差异:西部以北东向地壳缩短运动为主,而东部以顺时针旋转为主;东部以地壳隆升为主,速率在2.1 mm/a左右,而西部隆升的速率小于1 mm/a;相对重力变化则表现为在整体增大的背景下东部升高速率较大,平均为 $9.0 \times 10^{-8} \text{ m} \cdot \text{s}^{-2} \cdot \text{a}^{-1}$,而西部较小,平均值为 $3.1 \times 10^{-8} \text{ m} \cdot \text{s}^{-2} \cdot \text{a}^{-1}$.我们还发现,地壳不同变形形式的转换不是渐变的,而是发生在较窄的一个转换带内.这个转换带的整体走向为NEE,北部位于金昌与武威之间,中部在祁连山东部、门源以西,南部位于德令哈以东青海湖以西.最后结合前寒武纪构造格架、重力均衡异常资料和地震SKS分裂结果对形成这种运动态势的机理进行了探讨,我们认为岩石圈物质侧向流动、岩石圈结构及壳-幔耦合方式差异可能是导致东部与西部岩石圈变形差异主要动因.

关键词 青藏高原东北缘, 岩石圈变形, GPS速度场, 变形机制, 地震SKS分裂

Abstract: In order to investigate the features of lithosphere and study the deformation mechanism of crust-mantle coupling in northeastern margin of Tibet plateau, we have processed the GPS data observed from 1999 to 2007, leveling data observed in 1972~2000 and relative gravity data in 1992 and 2007, we have got the horizontal velocity field, long time crustal vertical rate field and gravity variation field in northeastern margin of Qinghai-Tibet plateau. We found that the deformation style in the east is different from that in the west. In the west the crust moves toward NE and shortens mainly, but in the east it rotates clockwise mainly. As for the vertical deformation the eastern part rises with an average rate of 2.1 mm/a, the western part rises slowly with a rate less than 1.0 mm/a. The gravity in the east increases greatly with a rate of $9.0 \times 10^{-8} \text{ m} \cdot \text{s}^{-2} \cdot \text{a}^{-1}$, more than that in the west with a rate of $3.1 \times 10^{-8} \text{ m} \cdot \text{s}^{-2} \cdot \text{a}^{-1}$. The style of deformation variation is not gradual but occurs in a transition belt. This belt is orientated in NEE. Its north section is between Jinchan and Wuwei in Gansu province, the middle is in the east of eastern Qilian mountain and the west of Menyuan in Qinghai province, The south section is in the east of Delingha and the west of Qinghai Lake. Furthermore, by use of Precambrian tectonic framework, gravity anomaly data and seismic SKS splitting result, the lithosphere deformation mechanism is studied. We infer that the main reasons for the difference of lithosphere deformation are probably the lateral flow of lithosphere material and the differences in lithosphere structures and crust-mantle coupling.

Keywords [Northeastern margin of Qinghai-Tibet plateau](#), [Lithosphere deformation](#), [GPS velocity field](#), [Deformation mechanism](#), [Seismic SKS splitting](#)

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Corresponding Authors: 崔笃信

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