地球物理学报 2009 52 (2): 474～484 ISSN: 0001-5733 CN: 11-2074/P

地质构造★地球动力学

汶川地震区的流变结构与发震高角度逆断层滑动的力学条件

周永胜,何昌荣

中国地震局地质研究所地震动力学国家重点实验室，北京 100029

收稿日期 2009-1-15 修回日期 2009-1-23 网络版发布日期 2009-2-15 接受日期

摘要 本文利用龙门山地区的地质、地球物理剖面、弹性波速和流变实验数据等，建立了汶川地震相关构造单元的地壳流变结构.川西高原和龙门山构造带的地壳流变结构中存在多个塑性流变层，而四川盆地地壳基本没有出现塑性流变层，这种复杂的流变结构是汶川地震孕育和发生的基础.岩石破裂-黏滑-摩擦实验表明，以二长花岗岩为代表的震源区岩石具有很高的破裂强度和摩擦强度，能够承受极大的差应力和积累巨大的能量，这是高角度逆断层能够滑动和汶川地震强度大的原因之一.高流体压力是高角度逆断层滑动和触发汶川地震的另一个必要条件，而龙门山断层带内可能存在这种比较高的流体压力.

关键词 汶川地震 高角度逆断层 流变结构 大的差应力 高流体压力

分类号 P315

DOI:

The rheological structures of crust and mechanics of high-angle reverse fault slip for Wenchuan M_S8.0 earthquake

ZHOU Yong-Sheng, HE Chang-Rong

State Key Laboratory of Earthquake Dynamics, Institute of Geology, China Earthquake Administration, Beijing 100029, China

Received 2009-1-15 Revised 2009-1-23 Online 2009-2-15 Accepted

Abstract The rheological structures of tectonic units related to Wenchuan earthquake is estimated based on geological and geophysical field data, as well as experimental P-velocity and creep data. There are two to three plastic layers in western Sichuan plateau and Longmenshan tectonic zone, but it is almost no any plastic layer in Sichuan basin. It plays a significant role for the complicated rheological structures to accumulate the tectonic stress and forming Wenchuan earthquake. The high temperature and high pressure experiments show that the strength of rocks is very high in earthquake source (mainly granitic rocks, such as adamellite), which could sustain great different stress and accumulate huge energy. This is one of major causes for high-angle reverse fault slip and high intensity of Wenchuan earthquake. However, high fluid pressure is a necessary condition for sliding of high-angle reverse fault and triggering Wenchuan earthquake, and Longmenshan tectonic zone might have provided with the requirement.

Key words Wenchuan earthquake; High-angle reverse fault; Rheological structure; Great different stress; High fluid pressure

通讯作者:
周永胜 zhouysh@ies.ac.cn
作者个人主页: 周永胜;何昌荣