地球物理学报 2009 52 (2): 444～454 ISSN: 0001-5733 CN: 11-2074/P

地质构造★地球动力学

2008年汶川8.0级地震发生的历史与现今地震活动背景

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收稿日期 2008-12-25 修回日期 2009-2-11 网络版发布日期 2009-2-15 接受日期

摘要 为了了解2008年5月12日四川汶川M_S8.0地震发生的地震活动背景，本文综合历史与现代地震资料，从南北地震带中段及其邻区的视野研究了汶川地震前1~2千年的强震活动性，以及震前20年的地震活动性背景.结果主要表明：（1）至少在2008年之前的1100~1700年中，龙门山断裂带未发生M≥7的地震，相对其南、北两侧的其他活动断裂带（或段）形成一个地震空区，2008年汶川M_S8.0地震发生在该空区中；（2）17世纪以来，在由龙门山断裂带大部分地区、川北岷江—虎牙断裂带以及甘南文县—武都断裂带组成的巴颜喀拉块体东边界上共发生了12次M=6.5~8.0地震，显示出一个已持续了近400年、逐渐加速的应变能释放过程，2008年汶川M_S8.0地震属于该过程中两次巨大地震之一；（3）汶川地震前20年，龙门山断裂带中、南段不存在背景地震活动的平静，反而显示出比曾经发生过1879年M_S8地震的甘南文县—武都断裂带还略高的地震活动背景水平；（4）2008年汶川地震的强度远远超出龙门山断裂带的历史最大地震，说明仅基于数百年至一、两千年的历史地震记载，远不足以正确评估较低滑动速率的、大型活动断裂带的潜在地震危险性.

关键词 汶川地震 历史与现今地震活动 地震空区 龙门山断裂带 巴颜喀拉块体东边界

分类号 P542

DOI:

The background of historical and modern seismic activities of the occurrence of the 2008 M_S8.0 Wenchuan, Sichuan, earthquake

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Received 2008-12-25 Revised 2009-2-11 Online 2009-2-15 Accepted

Abstract In order to know what is the seismicity background on which the M_S8.0 Wenchuan, Sichuan, earthquake of May 12, 2008, occurred, we investigate the activities of strong and large earthquakes in the last 1000 to 2000 years before the Wenchuan earthquake, and the background seismicity during the last 20 years before the earthquake, in the middle segment of the North-South Seismic Belt and its near surroundings, based on a systematic analysis of historical and modern seismic data. Our study shows that: (1) No any M≥7 event had occurred on the Longmenshan fault zone at least in the last 1100 to 1700 years before 2008, suggesting that relative to other active fault zones (or sections) on the north and south, a seismic gap had formed along the Longmenshan fault zone for a long time before 2008, in which the M_S8.0 Wenchuan earthquake occurred. (2) Since the 17th century, a sequence of 12 M_S6.5 to 8.0 earthquakes have occurred along the eastern Bayan Har Block boundary consisting of the larger part of Longmenshan fault zone, the Minjiang and Huya fault zones in northern Sichuan, as well as the Wenxian-Wudu fault zone in southern Gansu, which represents a near 400 years lasting process of seismic strain energy release with gradual accelerating. The 2008 M_S8.0 Wenchuan earthquake is one of two great earthquakes occurred already in this process. (3) During the last 20 years before the Wenchuan earthquake, no quiescence of background seismicity emerged along the middle and southern sections of the Longmenshan fault zone. Instead, the background seismicity there was somewhat higher than that on the Wenxian-Wudu fault zone of southern Gansu, where an M_S8.0 earthquake happened in 1879. (4) The size of the 2008 Wenchuan earthquake is much greater than that of the biggest historical event on the Longmenshan fault zone. This proves that potential seismic hazards along those large-scale active fault zones with relatively low slip-rates are not possible to be assessed correctly from the historical earthquake record that

is available only for the past several hundreds or 1 to 2 thousand years.

Key words Wenchuan earthquake; Historical and modern seismicity; Seismic gap; Longmenshan fault zone; Eastern Bayan Har Block boundary

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