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1969年渤海M_S7.4地震发震断层的声学探测

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Acoustic detection of the causative fault of 1969 M_S7.4 earthquake in Bohai Sea

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摘要 发生于1969年的渤海M_S7.4地震是渤海海域惟一一个主震被现代仪器记录的大地震，对其发震断层的讨论争议颇多.2005~2008年，我们在主震震区进行了3个航次的高分辨率声学探测，获得了包括浅层单道地震、侧扫声纳以及CHIRP剖面等在内的数百公里综合地球物理观测资料.本文报道了对上述声学资料的研究结果.研究表明，在震区海底之下2~3 m发现了一条走向NE30°、长20 km、宽约3 km的微型凹陷带，地质时代为5000 a B.P.，沉积面的最大下凹幅度为1.5 m；在空间位置上微型凹陷带与BZ28断裂、余震活动分布基本一致，因此，微型凹陷带是BZ28断裂活动的结果，而A层底界的下凹变形则是1969年渤海7.4级地震活动的结果， BZ28断裂是该地震的发震断层.BZ28断裂呈NE30°走向，是郯庐断裂带的次级断裂，浅层地震剖面揭示其最新活动时间为全新世中晚期，根据地质时代以及断层的垂向位移量，计算得到BZ28断裂晚更新世以来的垂向活动速率约为0.05 mm/a，全新世为0.3 mm/a，具有活动强度增加的趋势.

关键词 1969渤海7.4级地震， 发震断层， 声学探测

Abstract: The M_S7.4 earthquake occurred on 18 July 1969 was the only strong earthquake that has been recorded by seismometers in Bohai Sea. Now arguments about this large earthquake are focused on its causative fault. In 2005~2008, we finished three cruises in the epicenter region and collected several hundreds high-resolution acoustic surveying data, including shallow penetrated single channel data, sidescan sonar data and CHIRP data. This paper reports study results of these new acoustic data. A micro depression belt is newly found in Holocene sediments 2~3 m beneath seabed in the epicenter region and it strikes NE30°, is 20 km long and 3 km wide. CHIRP data reveal that depositional interface formed at 5000 a B.P. has a 1.5 m vertical offset in the belt. The depression belt, BZ28 fault and aftershocks distribution of 1969 earthquake coincide in position, so it can be assumed that the depression belt is formed by BZ28 fault and the deformation of the bottom of seismic sequence A is caused by 1969 earthquake. BZ28 fault is the causative fault of this large earthquake and it is a sub-fault in the Tan-Lu Fault Zone and strikes NE30°. Shallow penetrated single channel seismic data show that it is active during the late Holocene. According to sediments age and vertical offset, we calculate the vertical slip rate of BZ28 fault since late Pleistocene. The result shows that activity intensity of BZ28 fault has the trend of increasing from 0.05 mm/a since the late Pleistocene to 0.3 mm/a during the Holocene.

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