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伽师强震群区上地壳三维速度层析成像——人工爆破和天然地震的联合反演

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摘要 伽师震区位于天山褶皱、帕米尔构造弧与塔里木块体三个构造单元的交接地带，近年来该区发生了一系列的强震活动.为进一步获得该震区详细的地壳速度结构，本文利用人工爆破和天然地震资料联合反演的方法，对1997年新疆伽师震区布设的三维人工地震透射台阵和流动地震台网的资料进行处理，重建了台阵下方上地壳三维速度扰动图像，并结合地震活动分布，对伽师强震群的地震成因作出进一步分析.结果表明研究区上地壳速度结构在纵向和横向上具有明显的非均匀性，随着深度的逐渐加深，震区下方以萨如锡为中心的低速异常体逐步被高速异常体所替代.自12 km深度开始，在与强震群震中相应的位置上，明显出现沿北北西向的高P波速度异常体，在其周围为相对低速分布，呈现出低速条带环绕高速条带的分布格局，V_P/V_S在相同的位置上也表现为高值分布.这种结构上的差异可能与伽师强震群发生有密切关系.16 km深度的P波速度层析图表明，伽师强震群发生在地壳相对高速扰动区内或是高速扰动向低速扰动过渡的边缘，壳内高速体的存在为强震的孕育和发生提供了重要基础.

关键词 伽师强震群 联合反演 速度异常体 速度扰动

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Abstract Jiashi strong earthquake swarm region is located at the juncture area of three t ectonic units，i.e. Tianshan fold zone，Pamir tectonic arc and Tarim block. Many strong earthquakes occurred recently in this area. In order to obtain the fine crustal velocity structures of this area，the data from a 3-D seismic transmiss ion experiment and a portable seismograph network acquired in Jiashi strong earthquake swarm region in 1997 are processed. Joint inversion of explosion and earthquake data is carried out to reconstruct the 3-D images of velocity perturbation of the upper crust under the seismic arrary. The temporaty seismic array wasused to record the seismic waves generated by 8 shots fired at different azimaths，and the additional 20 seismic stations were deployed in this area to record local earthquakes. The results show that the structures of the upper crust in the study area is characterized by obvious inhomogeneouities both laterally and vertically.The low P wave velocity zone centered at Saruxi beneath the Jiashi earthquake swarm area is gradually replaced by high P wave velocities with the increase of depth. There is a high P wave velocity anomaly striking NNW at the depth of 12 km under the earthquake swarm area. It extends downwards to the depth of 16 km at least，and is surrounded by relatively low velocities. V_P/V_S ratios are also characterized by high values in this region. This kind of structural differences may be related to the occurrences of Jiashi strong earthquake swarm. It can be found from the P wave velocity images at the depth of 16 km that Jiashi strong earthquake swarm generally occurred in the regions with comparatively high P wave velocity perturbations or in the transition zones between high and low velocity perturbations.The existence of high P wave velocity anomaly in the crust may play an important role in the seismogenic process.

Key words Jiashi strong earthquake swarm;Joint inversion;Velocity anomalies;Velocity perturbation

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