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北京南部地壳精细结构深地震反射探测研究

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Fine crustal structure in the south of Beijing revealed by deep seismic reflection profiling

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摘要

为了研究北京平原区的地壳结构特征、断裂的空间展布、断裂活动性以及深浅构造关系,在北京平原区的南部完成了1条长90 km的深地震反射剖面.探测结果表明,该区地壳以双程反射时间(TWT)6～7 s的强反射带Tc为界分为上地壳和下地壳,上地壳厚约18～19 km,下地壳厚约16～17 km,Moho界面深度约为34～35 km.该区结晶基底起伏变化较大,上、下地壳分界面和Moho界面都是一个具有一定厚度的过渡带.上地壳反射层位丰富,断裂构造发育,构造形态清晰.在夏垫断裂西北,剖面揭示了4～5组能量较强的反射震相,表现为典型的隆起区特征;在夏垫断裂东南,上部为一套向东南倾伏的密集强反射层,下部为一套形态各异、结构复杂的强反射层,这些反射具有典型的沉积盆地特征,盆地最深处约为11 km.剖面揭示的地壳深断裂倾角较陡,向上切穿了上、下地壳分界面,延伸到上地壳沉积盆地的底部,向下切穿了壳幔过渡带,与上部断裂和沉积盆地构成了独特的组合关系.

关键词 北京平原区, 隐伏活动断裂, 深地震反射剖面, 结晶基底, 速度剖面, 壳幔过渡带

Abstract:

In order to investigate the crustal structure features, the geometry of buried faults, the fault activities and the relationship of deep and shallow tectonics, a deep seismic reflection profile was completed in south region of Beijing plain. The results show that the crust beneath the survey area is divided into the upper and the lower crust by a strong reflection zone at about 6～7 s TWT.The thickness of the upper and the lower crust is about 18～19 km and 16～17 km, respectively.The depth of the Moho interface is about 34～35 km. There are considerable fluctuation and variation of crystalline basement in the study region. Both the discontinuity of the upper and the lower crust and the Moho discontinuity are transitional zones. There are rich reflection layers, many fault structures in the upper crust, and the structure patterns are clear. In the northwestern region of the Xiadian fault, the deep seismic reflection section shows 4～5 groups of strong reflection seismic phase, which exhibit the typical characteristics of a bulge. In the southeastern region of the Xiadian fault, there is a set of dense southeastward-dipping reflection strata with relatively strong energy in the upper portion of the section, and there is a set of strong reflection strata which exhibit apparent differences and complicated structures in the lower portion. These reflection strata have the typical characteristics of a sedimentary basin and the maximum depth of the basin is about 11 km.The crustal deep fault revealed by the deep seismic reflection profile has a steep angle. It penetrates upwards through the interface of the upper and the lower crust, and extends upwards into the bottom of sedimentary basin in the upper crust. It penetrates downwards through the crust-mantle transitional zone and constitutes a special combination relationship with the upper faults and the sedimentary basin.

Keywords Beijing plain, Buried active faults, Deep seismic reflection profile, Crystalline basement, Velocity profile, Crust-mantle transitional zone

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