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深地震测深揭示的华南地区地壳结构及其动力学意义

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Crustal structure beneath South China revealed by deep seismic soundings and its dynamics implications

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摘要

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摘要 20世纪70年代以来,我国实施与华南地区有关的深地震测深剖面达57条.本文收集该区的深地震测深研究成果,利用保真能力强的三维克里金插值技术构建了100° E~125° E, 18° N~34° N区域内的三维地壳速度模型.基于三维地壳结构模型,分别探讨了华南地区不同构造单元地壳厚度空间变化特征、地壳属性、上地幔顶部地震波速变化以及太平洋向欧亚板块的俯冲方向等.研究结果表明:(1)扬子地块平均地壳厚度为40 km左右,地壳平均速度为6.30 km/s;华夏地块平均地壳厚度32 km左右,地壳平均速度6.24 km/s.(2)扬子地块的四川盆地与全球地台区具有相似的地壳速度-深度变化特征,华夏地块与全球伸展区结构相似,台湾造山带具有较典型全球大陆弧的特点.(3)华夏地块上地幔顶部Pn波平均速度为8.02 km/s;台湾造山带Pn波平均速度为7.98 km/s;扬子地块的Pn波速度为7.94 km/s,包含四川盆地(Pn速度达8.02 km/s)和川滇地区(Pn速度最低为7.75 km/s).川滇地区和松潘—甘孜褶皱带东部构造活动性较强,四川盆地和华夏地块相对稳定.(4)推测太平洋板块向欧亚板块俯冲的方向为NW-SE方向.

关键词: 华南地区 深地震测深 三维速度结构 莫霍面 Pn波速度

Abstract: Since the 1970s, 57 DSS profiles have been carried out in South China. In this paper we collect all DSS profiles in South China, construct the 3-D crust velocity model in the region (100° E~125° E and 18° N~34° N) using robust 3-D Kriging interpolation method. We discuss the spatial distribution of Moho depth and Pn velocity in detail; analyze the relationship between average velocity and thickness in tectonic units; investigate the crust character and the subduction direction of Pacific plate to Eurasian plate. The results show that: (1) the average Moho depth of Yangtze block is about 40 km, the average crust velocity is 6.30 km/s, while the Moho depth of Cathaysia block is about 32 km, the average velocity is 6.24 km/s; (2) Sichuan basin has the same character as continental platforms in the world, Cathaysia block has the character of extended continent, Taiwan has the character of continental arcs; (3) the average Pn velocity is 8.02 km/s in Cathaysia block 7.98 km/s in Taiwan orogen, and 7.94 km/s in Yangtze block, including the fastest 8.02 km/s in Sichuan basin and the slowest 7.75 km/s in east Songpan-Ganzi. Chuandian area and east Songpan-Ganzi is relatively active, while Sichuan basin and Cathaysia block are steady; (4) the subduction direction of Pacific plate to Eurasian plate should be NW-SE.

Keywords: South China Deep seismic sounding 3-D velocity structure Moho Pn velocity

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