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利用共转换点叠加方法研究华北地区地壳结构

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Crustal structure of the North China Craton from teleseismic receiver function by the Common Conversion Point stacking method

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摘要 利用华北地震台阵L测线的35个台站记录的895个远震数据进行了接收函数的计算,并利用*H-κ*叠加方法得到华北克拉通西部陆块东侧和中部陆块内基岩台站下方的地壳结构.利用得到的基岩台站下方的地壳结构和通过波形模拟方法得到的渤海湾盆地的沉积层结构作为背景模型对测线进行共转换点(CCP)叠加成像.在渤海湾盆地,通过增大CCP叠加方法中的共转换点单元,使得由于沉积层基底反射信号过强而难以识别的Ps转换波信号得以增强,获得渤海湾盆地下方的地壳结构.由CCP叠加的结果可以看出:华北克拉通地壳西厚东薄.西部陆块东侧的吕梁山下方地壳出现了地壳的突然减薄,减薄幅度约3 km.在减薄处的西侧,地壳逐渐加深,由44 km左右加深至46 km左右,之后在减薄处突然减薄至43 km左右,推测该减薄处可能是西部和中部陆块在深部的分界点;中部造山带地区的重力梯度带的西侧,地壳较为平缓,厚约42 km左右,山西断陷盆地下的地壳出现了略微的上升,幅度为2 km左右.大同盆地东侧下方的台站出现了Moho面的不连续,可能是地幔物质上涌的通道.在太行山前缘的重力梯度带内地壳迅速变浅至33 km左右,渤海湾盆地内地壳厚约32 km左右,冀中坳陷带下方地壳变浅,最浅可达29 km.沉积层基底的深度与地壳厚度呈负相关关系,可能与渤海湾盆地受到的拉张剪切作用力相关.

关键词: 接收函数 山西断陷带 渤海湾盆地 重力梯度带 莫霍面

Abstract: 895 teleseismic data recorded by the 35 stations located on North China Craton (NCC) as a line are used to calculate the receiver functions which are used to obtain the crustal structure under the stations installed on bedrock by *H-κ* stacking method. The image of the crust along the 550 km-long profile is obtained by the common conversion point (CCP) stacking method using the crustal model calculated from the *H-κ* stacking and the sedimentary structure calculated before. Because some stations are located on sediments, the size of the bin used in the CCP stacking is enlarged to strengthen the amplitude of the P to S conversion phases. Then the crustal structure of the Bohai Bay Basin (BBB) can be imaged by CCP stacking. The result shows that the crust thickness of the west NCC is much thicker than that of the east NCC. The thickness of the Western Block is about 45 km. The crustal thickness reduces to 43 km under the Lüliangshan which may be the boundary between the Western Block and the Trans-North China Orogen (TNCO) in the depth of Moho. In the west of the North-South Gravity Lineament, the average crustal thickness is about 42 km while the Moho rises slightly under the Shanxi fault depression zone. There is a discontinuity under east of Datong Basin, which may be the channel of the mantle-derived material. In the North-South Gravity Lineament belt, the crustal thickness reduced obviously to 33 km. The average crustal thickness of the Bohai Bay Basin (BBB) is about 32 km, which is much thinner than the one of the Central Block. The Moho depth under the Jizhong depression is the shallowest, which can reach to 29 km in the thinnest area along the profile. The thick sedimentary layer corresponds to the thin crust, which can be explained by the extension of the basin.

Keywords: Receiver functions Shanxi fault depression zone Bohai Bay Basin North-South Gravity Lineaments Moho discontinuity

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