

地震学★地球动力学

深地震探测的分辨率分析——以南海北部OBS数据为例

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收稿日期 2009-1-19 修回日期 2009-9-1 网络版发布日期 2009-9-20 接受日期

摘要 多次深地震探测结果表明南海北部陆缘地壳结构在走向和倾向上都有明显的变化. 在一些相隔很近的测线上, 探测的深部地壳结构却相差较大, 为了分析这些探测结果中差异的原因和地壳结构变化的可靠性, 本文以东沙东侧海域测线和东沙西侧海域测线为例, 对采集的海底地震仪记录进行了时间、位置校正和初至波走时拾取, 利用有限差分地震走时层析成像进行了走时反演, 获得所在剖面的地壳速度结构, 并分析了模型的横向分辨率, 剔除模型中短波长的横向速度变化. 分辨率检测结果表明, 模型的横向分辨率随着深度快速下降, 0~8 km深度范围可以分辨10 km的横向变化, 8~17 km的范围能够分辨10~40 km, 而17~33 km的范围只能分辨40~80 km. 因此, 折射波的横向分辨能力不高, 在地壳深部难以分辨较小的横向速度变化, 前人探测的南海北部6 km宽、延伸至莫霍面的滨外断裂带并不能清晰的识别.

关键词 [南海北部](#) [深部地壳结构](#) [海底地震仪](#) [层析成像](#) [横向分辨率](#)

分类号 [P315](#)

DOI: [10.3969/j.issn.0001-5733.2009.09.012](#)

Lateral resolution analysis of deep crustal sounding: A case study on the data from ocean bottom seismometers in the northern South China Sea

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Received 2009-1-19 Revised 2009-9-1 Online 2009-9-20 Accepted

Abstract Deep seismic sounding surveys in the past two decades show obvious crustal structure changes both across and along the northern margin of the South China Sea. In the surveys, some very closely spaced survey lines displayed remarkable differences in crustal structure. To find the reasons for the differences and to analyze the reliability of crustal structure, ocean bottom seismometer (OBS) data from the west and east sides of the Dongsha Islands were reprocessed and inverted with tomography technique. The routine processing and inversion procedures include clock correction, position correction, finite-difference ray-tracing-based tomography, checkerboard test and comparison of the inverted crustal model with initial models. As a key step, we analyzed the lateral velocity resolution and smoothed out the short wavelength velocity variation which maybe most probably artifacts in the final velocity models. Resolution test results show that the lateral resolution declines rapidly with depth. Within the depth range 0~8 km, the lateral resolution is 10 km; as to the depth of 8~17 km, the lateral resolution is 10~40 km; for the lowest part, 17~33 km, the lateral resolution is 40~80 km. With such a resolution check to a previous experiment, a previously inferred 6 km-wide deep fault zone that extends downward to the Moho interface in the coastal South China area is proved to be impossible to be imaged clearly.

Key words [Northern South China Sea](#); [Deep crustal structure](#); [Ocean bottom seismometer](#); [Seismic tomography](#); [Lateral resolution](#)

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