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中国东部海域岩石圈结构面波层析成像

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摘要 本文通过面波层析成像得到了中国东部海域及邻近地区的地壳上地幔S波速度图像, 给出了主要构造单元的区划及其结构特征, 并讨论了速度结构与现今构造活动及构造演化历史的关系. 研究区内中下地壳的平均速度与地震活动存在比较显著的关系, 强震基本都发生在低速区内或高低速过渡区. 太行山以东地壳内存在几条北西向低速带, 其中张家口—渤海地震带下方的低速带最为显著. 东部海域划分成北黄海、南黄海、东海、和冲绳海槽等4个构造块体. 北黄海具有较薄较高速的岩石圈, 与南华北盆地类似, 推测是中生代特提斯洋向北俯冲造成岩石圈减薄的遗迹. 北华北地区具有低速的地壳和较厚的岩石圈, 岩石圈地幔速度偏低且上下比较均匀, 可能反映中生代沿北方缝合带持续碰撞作用的特点. 南黄海具有相对较厚的岩石圈, 较多地保存了扬子克拉通的特征. 在扬子与华北地块的拼合过程中, 洋壳俯冲可能是北黄海和苏皖地区上地幔低速特征的成因. 在125° E以东的朝鲜半岛地区未发现这一拼合过程的遗迹. 有可能整个朝鲜半岛都是华北地块的一部分; 但也有可能是太平洋俯冲和日本海张开的作用完全改造了朝鲜半岛的岩石圈上地幔, 抹去了以往构造运动的痕迹. 东海地区的地壳厚度, 特别是岩石圈厚度向冲绳海槽方向减小, 反映出菲律宾海板块俯冲在弧后广大地区都有影响. 冲绳海槽地区可见俯冲的菲律宾海板块以及板片上方显著低速的地壳和上地幔, 为冲绳海槽的弧后扩张机制提供了证据.

关键词 [中国东部](#) [海域](#) [岩石圈](#) [面波](#) [层析成像](#)分类号 [P315](#)

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Surface wave tomography of lithospheric structure in the seas of east China

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Abstract This paper presents the S-wave velocity structure of crust and upper mantle in the marginal seas of east China resulted from surface wave tomography, describes the structural features of various tectonic units in the region, and discusses their relation with present tectonic activity and past evolution history. The average velocity of the middle and lower crust has a remarkable relation with strong earthquakes, which took place within the low velocity zones or along the boundaries between low and high velocity. There are several NW-trending low velocity zones in the crust east of the Taihang Mountains, among them the one beneath the Zhangjiakou-Bohai seismic belt is most conspicuous. The sea area can be divided into 4 tectonic units, i.e., the northern and southern Yellow Sea, the East China Sea, and the Okinawa Trough. The northern Yellow Sea has a thin and high velocity lithosphere similar to that of southern North China Basin, presumably resulted from Mesozoic lithosphere thinning caused by the northward subduction of Paleotethys. In contrast the northern North China has a low velocity crust and thicker lithosphere, the velocity of lithospheric mantle is rather low and homogeneous vertically, probably indicating the result of long-lasting Mesozoic collision along the northern suture zones. The southern Yellow Sea has a thicker lithosphere with the characteristics of lower Yangtze craton. In the suturing process of lower Yangtze and North China the subduction of oceanic lithosphere might have caused the low velocity features of the upper mantle in northern Yellow Sea and Su-Wan region. However, such suturing relics were not found in Korea Peninsula east of 125° E. It may imply that the whole Korea Peninsula is a part of North China Craton, or the effect of Pacific subduction and Japan Sea opening might have totally reformed the lithospheric mantle beneath the peninsula and erased the sign of past suturing. In the East China Sea the crust, especially the lithosphere thins towards the Okinawa Trough, indicating that the subduction of Philippine plate affects a vast back-arc area. In the Okinawa Trough the subducting Philippine slab and the conspicuously low velocities above the slab are clearly seen, providing evidence for the back-arc spreading mechanism of the Okinawa Trough formation.

Key words [East China](#); [Sea](#); [Lithosphere](#); [Surface wave](#); [Tomography](#)

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