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**摘要:** 笔者根据地震面波层析成像结果, 对欧亚大陆及西太平洋岩石圈和软流圈速度结构进行了研究, 发现东亚至西太平洋间存在一巨型低速异常带, 结合构造地质学、地幔岩石学、地球化学及其他地球物理特性的研究, 确认该区存在巨型裂谷体系。该巨型裂谷体系的岩石圈和软流圈三维  $V_s$  速度结构与太平洋洋中脊、大西洋洋中脊和印度洋洋中脊及其邻区的岩石圈和软流圈地震  $V_s$  速度结构十分相似, 而与东太平洋边缘现代板块俯冲带的岩石圈与软流圈  $V_s$  速度结构有显著差异。在进一步论述该区动力学特征后认为, 该巨型裂谷体系是中生代中晚期以来岩石圈整体主动伸展变形, 大型裂陷盆地形成, 岩石圈强烈拆沉减薄, 以及软流圈物质上涌加热引起的。边缘海是在大陆裂谷系形成基础上发展起来的, 主导扩张期为中渐新世至中中新世 (32~13Ma), 这些边缘海在17~15Ma后停止扩张, 因而未能将所有边缘海和洋中脊联通。据此划分出4期构造变形动力学演化阶段, 现今东亚至西太平洋间大陆裂谷、边缘海与沟弧体系是新生代中晚期以来, 邻区各板块构造相互作用叠加的结果。

**关键词:** 巨型裂谷体系; 巨型地震低速异常带; 地震层析成像; 岩石圈; 软流圈; 地幔岩; 东亚大陆; 西太平洋

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## Structure and dynamics of the lithosphere and asthenosphere in the East Asian-Western Pacific gigantic rift system

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**Abstract:** Based on the seismic S-wave tomography the authors carried out a systematic study of the speed structures of the lithosphere and asthenosphere of Eurasia and the west Pacific, and found a gigantic low-velocity anomaly zone between East Asia and the west Pacific. According to this discovery, combined with the tectonic, mantle petrological, and geochemical characteristics, as well as other geophysical features, a giant rift system is defined in the region. The 3D seismic  $V_s$  speed structures of the lithosphere and asthenosphere are very similar to those of the Mid-Pacific, Mid-Atlantic, and Mid-Indian ridges and their neighboring regions, but notably different from those of the present plate subduction zone on the eastern Pacific margin. On the basis of a further discussion on the dynamic characteristics of this region, it is concluded that the rift system resulted from the wholesale active extensional deformation and strong delamination and thinning of the lithosphere, formation of large rift basins, and upwelling and heating of a large amount of the asthenospheric substances since the Mid-Late Mesozoic. Marginal seas developed on the basis of the continental rift system, and the main extension stage is determined to be from the middle Oligocene to middle Miocene (32-13 Ma). The extensions of these marginal seas ended after the period from 17 to 15 Ma; as a result not all of the seas were connected with the mid-ocean ridges. Four stages of tectonic-deformational dynamics evolution may be distinguished, and it is considered that the tectonic superposition of interactions of various neighboring plates resulted in the formation of the continental rifts, marginal seas, and trench-arc-basin systems between present East Asia and the western Pacific since the Mid-Late Cenozoic.

**Key words:** gigantic longitudinal extensional rift system; giant longitudinal seismic low-velocity zone; seismic tomography; lithosphere; asthenosphere; pyrolite; eastern Asian continent; western Pacific