

地球动力学★地震学★地磁学

西太平洋板块向我国东北地区深部俯冲的数值模拟

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摘要 本文采用依赖温度的黏度结构以及考虑海洋板块和大陆板块厚度差异等特征, 以太平洋板块向欧亚板块会聚速率作为板块速度的主要约束, 通过变化海沟后撤速度模型, 数值模拟西太平洋板块向中国东北的俯冲过程. 结果表明, 要产生类似于中国东北之下低角度的板片俯冲, 海沟后撤是重要条件; 而上下地幔黏度的较大差异是决定俯冲板片不穿透660 km相变面的决定因素; 西太平洋板块向欧亚板块的俯冲应早于70 Ma B.P., 海沟后撤速度可能小于一些地质学家估计的45 mm/a, 而且可能是分阶段变化的; 速度场表明运动学模型的反过程: 大陆岩石圈之下物质的不断水平向东的流动和推挤可能成为海沟后撤的力源之一, 地幔物质的这种东向流动可能与印度板块挤压碰撞欧亚板块有关, 沿欧亚板块东缘的扩张构造可能是太平洋-欧亚板块运动和印度-欧亚板块运动的综合效应.

关键词 [依赖温度的黏度结构](#) [西太平洋板块](#) [中国东北地区](#) [深部俯冲](#) [海沟后撤](#)

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Numerical simulations on deep subduction of western Pacific plate to NE China

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Abstract Using temperature-dependent viscosity and considering depth difference between oceanic plate and continental plate, we discuss numerically the possible geodynamical process for tomography results in NE China with convergence velocity of Pacific plate and Eurasian plate and multiple trench retreating models. The results from our models show that trench retreat is necessary for reproducing the flat lying slab as observed by tomography under NE China. Occurrence of lying slab on 660 km phase change boundary is mainly due to the higher viscosity contrast between lower mantle and upper mantle. The subduction of the Pacific plate to Eurasian plate is most likely to have occurred before 70 Ma B.P., the trench retreating velocity is probably variable but must be less than 45mm/a, which is estimated by some geologists. As to the reason of trench retreat, our simulation results indicate that the possible force for trench retreat is the eastward asthenospheric flow and pushing effect under the continental lithosphere, which may be related to India-Eurasia collision, so the extensional tectonic features must be attributed to the total effects of India-Eurasia collision and Pacific-Eurasia convergence.

Key words [Temperature-dependent viscosity](#); [Western Pacific plate](#); [NE China](#); [Deep subduction](#); [Trench retreating](#)

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