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# 中国大陆及邻区岩石圈三维流变结构

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## 3D rheological structure of the continental lithosphere beneath China and adjacent regions

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摘要

依据地震波速得到的上地幔温度和气象台站记录的地表温度为约束,结合地表热流和热导率观测数据,利用有限元方法计算了中国大陆及邻区岩石圈三维热结构.基于此温度结果和GPS观测得到的应变率数据,以滑动摩擦、脆性破裂和蠕变三种强度机制为约束,计算得到了中国大陆及邻区岩石圈三维流变结构.结果显示:弱强度和低等效黏滞性系数的下地壳在中国大陆及邻区普遍存在,并且下地壳的流变强度和等效黏滞性系数比上地壳和岩石圈地幔一般要低1~2个数量级;中国大陆范围内青藏高原存在着厚度最大、强度最低的下地壳;青藏高原的岩石圈强度和等效黏滞性系数比华北、华南和印度板块的都要低;岩石圈流变结构的横向分布特征与重力梯度带和地形过渡带比较一致.

关键词 中国大陆及邻区, 岩石圈, 流变结构, 等效黏滞性系数

Abstract:

The rheological structure controls the intensity and styles of lithospheric deformation. With the constraint of the upper mantle temperature derived from seismic velocity and the surface temperature from the observation of meteorological stations, we have calculated the three-dimensional thermal structure of the continental lithosphere beneath China and adjacent regions according to the observed thermal parameters. Based on the 3D thermal structure and strain rates derived from GPS observation, we have calculated the rheological structure of the continental lithosphere with the constraint of the frictional slip, brittle fracture and creep. The results show that a weak ductile lower crust is widespread beneath China and adjacent regions. The weakest and thickest lower crust is found in the Tibetan plateau. The rheological strength and the effective viscosity of the lower crust are usually two orders of magnitude lower than that of the upper crust and the lithospheric mantle. The lithospheric strength and effective viscosity of the Tibetan plateau is lower than that of North China, South China and the Indian plate. In general, the lateral variations of the lithospheric rheology are consistent with the spatial patterns of late Cenozoic crustal deformation and gravity lineament.

Keywords Chinese continent and adjacent regions, Lithosphere, Rheological structure, Effective viscosity

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