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青藏高原地壳高导层的成因及动力学意义探讨——大地电磁探测提供的证据

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Discussion of the formation and dynamic signification of the high conductive layer in Tibet

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摘要

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摘要 大地电磁探测结果显示,青藏高原的中下地壳普遍存在大规模的高导层,其电阻率低于 $10 \Omega\text{m}$,远低于稳定构造区地壳的电阻率值.通过对可能形成地壳内大规模低阻异常地质原因的分析认为,青藏高原地壳中的高导层不可能是由金属矿、石墨层或者盐水流体引起的,而很可能是由于地壳岩石的部分熔融或者是部分熔融与含盐水流体共同导致的.这些高导层的形成是与板块力学过程密切相关的.地壳内的高导层可能是印度板块和亚洲板块俯冲的电性痕迹,其成因与板块俯冲过程中由于摩擦生热部分熔融和脱水作用有关,也可能与岩石圈拆沉造成幔源物质上涌有关.沿高原内主要缝合带均存在东西向连续分布的大规模可能是青藏高原下地壳物质向东“逃逸”的证据;其中班公—怒江缝合带可能是最重要的物质运移“通道”.

关键词: 青藏高原 地壳高导层 部分熔融与水流体 动力学意义

Abstract: It is shown by magnetotelluric detections that the layers with low electrical resistivity less than $10 \Omega\text{m}$ are distributed in the mid-lower crust of Tibetan Plateau on a large scale. This magnitude of electrical resistivity is far less than the average value in the crust of regions with stable geological structures. According to our analysis, it is proposed that the formation of these low resistivity structures is not caused by metallic minerals, graphite, or salt aqueous fluid, but it is very possible that these highly conductive layers are formed by partial melting of rocks or a combination of partial melting and salt aqueous fluid. The formation of these highly conductive layers has a strong connection with the dynamic process of plate movement. The high conductive layers in the crust of Tibetan Plateau might be the electrical signature of the subduction of the Indian Plate. The feature of low resistivity can be ascribed to partial melting and dehydration caused by high pressure and high temperature, or to the uplift of mantle source matter caused by lithosphere delamination. The vertically trending high conductivity structures continuously extend along the main suture zones within the plateau. The feature of these high conductivity structures might be the evidence of eastward channel flowing of lower crust matter beneath the Tibetan Plateau. At these suture zones, the Bangong-Nujiang Suture Zone is the most important channel for the transportation of lower crust matter.

Keywords: Tibetan Plateau Crust high conductivity layers Partial melt Aqueous fluid Dynamic signification

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