

江国明,张贵宾,吕庆田,史大年,徐晓. 2014. 长江中下游地区成矿深部动力学机制: 远震层析成像证据. 岩石学报, 30(4): 907-917

长江中下游地区成矿深部动力学机制: 远震层析成像证据

作者 单位

[江国明](#) [中国地质大学地球物理与信息技术学院, 北京 100083](#)

[张贵宾](#) [中国地质大学地球物理与信息技术学院, 北京 100083](#)

[吕庆田](#) [中国地质科学院矿产资源研究所, 国土资源部成矿作用和资源评价重点实验室, 北京 100037](#)

[史大年](#) [中国地质科学院矿产资源研究所, 国土资源部成矿作用和资源评价重点实验室, 北京 100037](#)

[徐晓](#) [中国地质大学地球物理与信息技术学院, 北京 100083](#)

基金项目: 本文受国家“深部探测技术与实验研究”专项课题(SinoProbe-03-02)、国家自然科学基金项目(40904021、40874067、40930418)、中国地质调查项目([2012]01-044-002)和中央高校基本科研业务费联合资助。

摘要:

长江中下游成矿带是我国东部重要的矿产资源基地。前人研究认为该地区的成矿作用与中生代大规模岩浆活动密切相关,但关于成矿的深部动力学机制仍存在着分歧。本研究利用远震层析成像方法获得了研究区下方整个上地幔内的三维速度结构,采取以下措施:(1)46个固定台站和67个流动台站记录的678个远震事件的17000余条P波波形;(2)利用改进的多道互相关技术直接从波形数据中提取相对走时残差信息,提高了数据处理的精度和效率;(3)地壳校正消除地壳不均匀性的影响;(4)检测板测试最佳网格间隔,水平方向为 $0.5^{\circ} \times 0.5^{\circ}$ ,垂向为50~100km,从而可以保证结果的可靠性。最终的层析成像结果表明成矿带地区下方的上地幔内存在“两高一低”的速度异常体,浅部的高速体可解释为现存的岩石圈,深部的高速体则为拆沉的岩石圈,而夹在中间的低速体为上涌的软流圈热物质发源地。我们的成像结果为成矿的拆沉模式提供了有力支持。该模式认为岩石圈的拆沉导致软流圈物质减压熔融,底侵在壳幔边界,最终爆发大规模岩浆活动和成矿作用。结果清楚地显示出拆沉的岩石圈已经下沉至上地幔底部,而且在其上方存在着明显的软流圈热物质。此外,成像结果还显示出深部的高、低速体的走向与成矿带走向基本一致,并且由南至北逐渐变浅。这些特征与成矿带的成矿阶段密切相关。但遗憾的是,成像结果无法提供软流圈物质起源的信息,有待今后进一步研究。

英文摘要:

The metallogenic belt in the Middle-Lower Yangtze River is an important mine and resource region of eastern China. The previous results shown that the metallogenesis is closely related to the large-scale magma activities, however, argue about the deep geodynamics of mineralization. In this present study, we have used the teleseismic tomography to obtain the three dimensional velocity structure of the whole mantle under the study region. To ensure the reliability of the results, some steps were taken by (1) gathering more than 17000 P-wave data generated by 678 earthquakes observed at 46 stable and 67 portable stations; (2) adopting the improved multi-channel correlation method to extract the relative residuals directly from the waveform data, which largely increases the precision and the efficiency; (3) using crust-correction to remove the influence of the crust heterogeneity; and (4) setting the optimal grid-space according to the checkerboard tests,  $0.5^{\circ} \times 0.5^{\circ}$  in the horizontal and 50~100km in deep. The final tomography shows that there exists two high-velocity and one low-velocity anomalies in the upper mantle under the metallogenic belt. The shallower high-V anomaly is explained as the current lithosphere, the deeper high-V one as the delaminated lithosphere, and the sandwiched low-V anomaly as the upwelling asthenosphere. Our result provides very strong evidence to the delamination model for mineralization, in which the delaminated lithosphere caused the partial melting of asthenosphere that would underplate to the boundary of crust-upper mantle and resulted in the large-scale magma activity and the metallogenesis finally. Our result clearly shows that the delaminated lithosphere has sunk into the bottom of the upper mantle and the hot asthenosphere appears above it. In addition, the tomography also represents that the strike of high-V and low-V anomalies is consistent to that of the metallogenic belt and their depths are gradually shallower from the south to the north, which suggests that the delamination of lithosphere is closely related to the period of mineralization. However, unfortunately, our tomography could not provide any information for the origin of upwelling asthenosphere, which is our future object.

关键词: [长江中下游成矿带](#) [远震层析成像](#) [岩石圈拆沉](#) [软流圈上涌](#) [拆沉模式](#)

投稿时间: 2013-10-10 最后修改时间: 2014-01-13

[HTML](#) [查看全文](#) [查看/发表评论](#) [下载PDF阅读器](#)

黔ICP备07002071号-2

主办单位: 中国矿物岩石地球化学学会

单位地址: 北京9825信箱/北京朝阳区北土城西路19号

本系统由北京勤云科技发展有限公司设计

[linezing.com](#)