The Lithospheric Mineralization Architecture of the Jiaodong Gold Province as Revealed by Magnetotelluric Array Data

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SUMMARY

The Jiaodong Peninsula is located in the eastern part of the North China Craton (NCC), with proven gold reserves exceeding 5000 tons, making it the largest gold mining area in China. Since the Mesozoic, the Jiaodong Peninsula has experienced collision and subduction between the North China plate and the Yangtze plate, as well as the subduction and retreat of the Paleo-Western Pacific Plate. The complex history of evolution has led to different views on the deep structure of the Jiaodong Peninsula and its relationship with gold mineralization. To better study the electrical characteristics of the Jiaodong lithosphere, we utilized 120 Magnetotelluric sites to develop a 3D electrical structure model of the study area. We integrated the conductivity model of global ocean and oceanic sediments to transform the conductance of seawater and oceanic sediment layer into equivalent resistivity, which was used as a prior constraint in the 3D inversion.

The research yielded the following principal scientific conclusions: (1) Due to the destruction of the North China Craton, the resistive basement in the Jiaodong area has significantly thinned to an approximate thickness of 60 km. (2) The widespread conductive layer in the upper mantle across the study area represents the metasomatized enriched mantle, indicating that the gold likely originates from a common source area. (3) The large-scale conductor between the Yangtze and North China basements can be interpreted as a conduit for the migration of gold-rich fluids from the upper mantle to the surface. (4) The overlying resistive Yangtze basement is thicker than North China, which contributes to the variations in the number and types of gold deposits formed within different tectonic units.

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Keywords: Magnetotellurics, Jiaodong Peninsula, the destruction of the North China Craton, gold mineralization, the lithospheric electrical structure

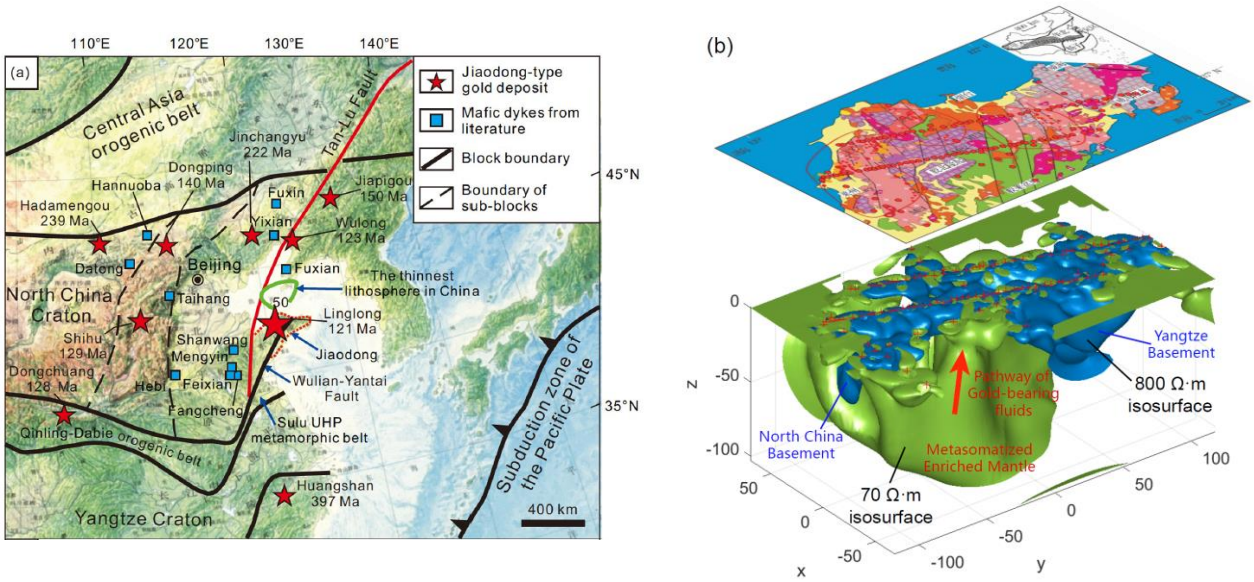

Figure 1. (a) Sketch map showing the regional structures and distribution of major gold concentration areas in the eastern NCC and adjacent areas. (b) Conceptual mineralization model of the Jiaodong gold province.