LITHOSPHERIC STRUCTURES OF THE WEST AFRICAN CRATON EDGE IN EASTERN SENEGAL DERIVED FROM MAGNETOTELLURIC SOUNDINGS

RITZ, M., ORSTOM, BP 1386, Dakar, Senegal, and, ROBINEAU, B., Département de Géologie, Faculté des Sciences de Dakar, Senegal

Recent measurements of the electric and magnetic fields (magnetotelluric method) in two traverses across Eastern Senegal, from the Senegal coastal basin to the West African Craton across the Mauritanides orogenic belt, have led to two-dimensional geoelectric models in which lateral electrical conductivity inhomogeneities extend deep in the lithosphere (1). Geoelectric cross sections reflect the lateral resistivity changes associated with lithological and structural changes, and provide new information on the depth extent of the older sequences of the Mauritanides belt (2, 3). Lateral inhomogeneities are mainly represented by an elongate north-south striking change in crustal thickness west of the outcropping margin of the Craton, and variation of the lithosphere's thickness (Fig. 1).

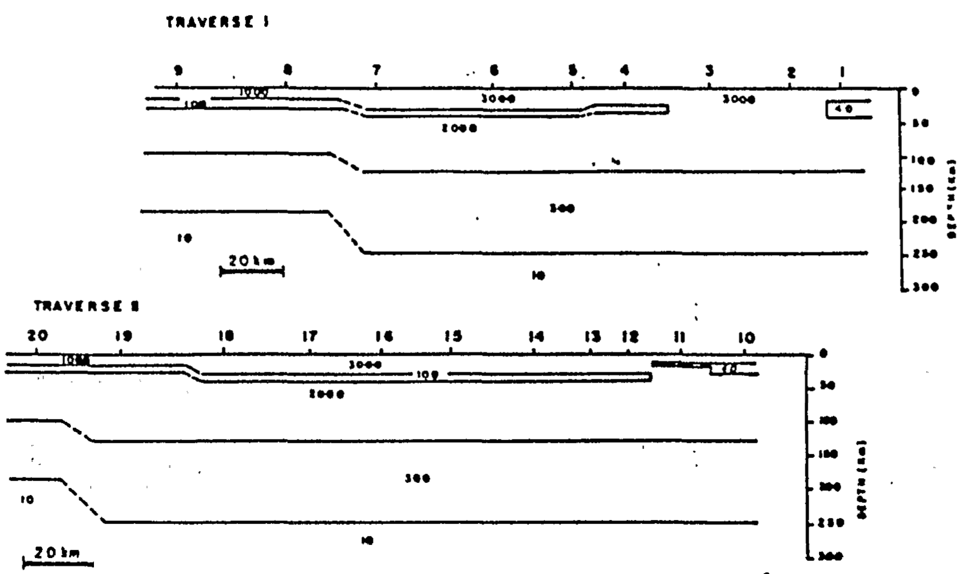

Figure 1. Crustal and upper mantle electrical resistivity structures.

The conducting zones at lower crustal depths beneath both the mobile belt and the Craton are believed to be the result of many effects: hydrated rocks and trapped pore water. The prominent north-south conducting layer in the interior of the Craton may be associated with hydrated minerals from the subducting Proterozoic lithosphere beneath the Craton, but the steps from the hydration water released by descending lithospheric slab approximately 2000 m.y. ago to the present-day conductor are enigmatic. A major electrical discontinuity extends from the surface to 175-250 km depth and separates two structural blocks (2, 3) (Fig. 2).

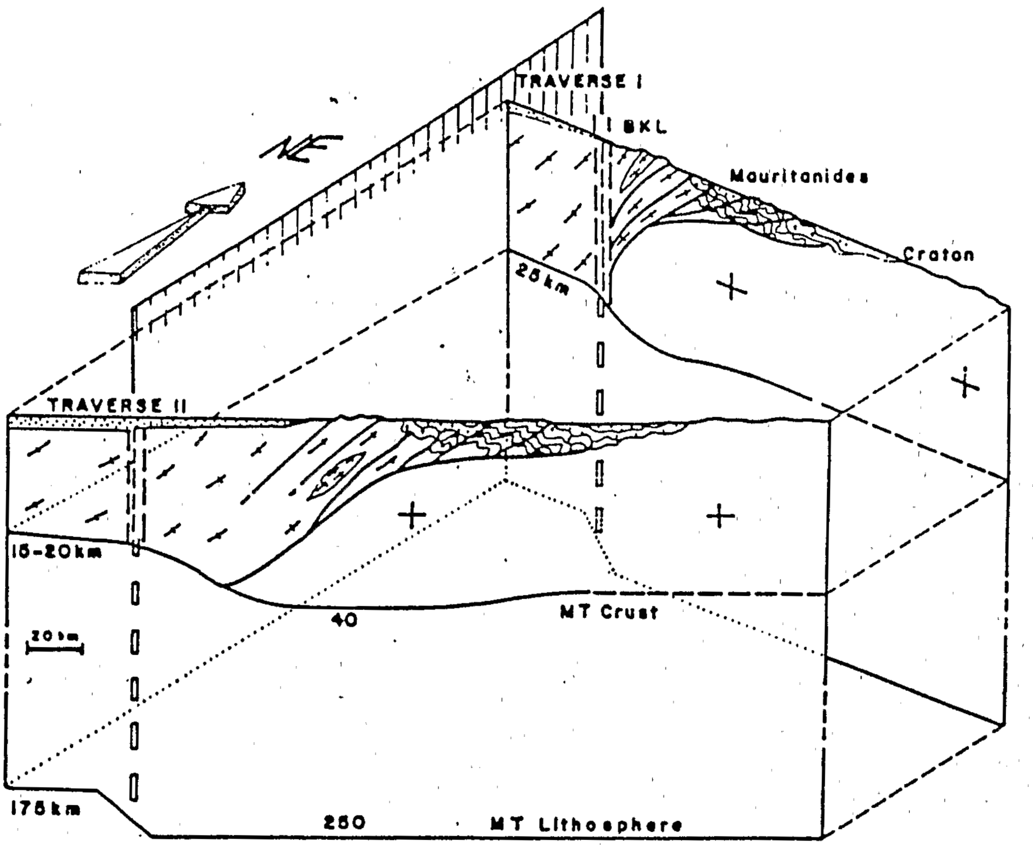

Figure 2. Synthetic block diagram for crustal and upper mantle structures of Eastern Senegal with geotectonic provinces derived from geoelectric models.

The eastern block, with higher resistivities and a larger thickness, is interpreted as being the West African Craton. At crustal depths this major electrical feature could be due to a major suture within the Craton between crusts of different ages. At greater depths the major discontinuity rotates and runs parallel to a regional lineament (Bissau-Kidira Lineament) suggesting that the discontinuity may be associated with an ancient zone of weakness in the lithosphere. With the details provided by the geoelectric sections, the tectonic setting of the study area can be more accurately outlined (3). The better knowledge of the deep structure of the southern segment of the Mauritanides orogenic belt confirms the geodynamical process already proposed (4), i.e. a west-dipping suture between the Craton and the Senegalese microplate, which collided during the Panafrican orogenesis.

(1) Ritz, M., and Vassal, J., 1987, Geophysical Journal of the Royal Astronomical Society, v. 90.

(2) Ritz, M., and Robineau, B., 1986, Tectonophysics, v. 124.

(3) Ritz, M., and Robineau, B., 1987, submitted to American Journal of Science.

(4) Villeneuve, M., 1984, D.Sc. thesis: Aix-Marseille III University, France.

TECTONOTHERMAL EVOLUTION OF THE WEST AFRICAN OROGENS AND CIRCUM-ATLANTIC TERRANE LINKAGES

ABSTRACTS AND PROGRAM

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