Geologic sections across the onshore Senegal–Mauritania basin derived from geoelectric studies

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On the basis of magnetotelluric two-dimensional models along three traverses, the regional electrical structure within the Senegal–Mauritania basin sediments has been studied. Correlation of the computed models with the wells drilled in the region shows that the main gross lithologic units were detected. The models can be generalized into three resistivity layers: (*i*) post-Turonian; (*ii*) pre-Senonian; and (*iii*) basement. In the southern part of the basin, there are relatively conductive formations below the Mesozoic that are interpreted as sediments of the Paleozoic Bove basin sequence. By combining the information that has been provided by the geoelectric cross sections and the lithologic and electric log data, a schematic model for the generalized sedimentary structure of Senegal has been generated. The interpretation that emerges shows that the basin is a westward-sloping, open homocline in which the structure is controlled by north–south-trending basement faulting that portrays a staircase structural style.

La structure géoélectrique régionale du bassin sédimentaire du Sénégal–Mauritanie a été déterminée au moyen de modèles magnétotelluriques à deux dimensions établis sur trois lignes transversales. Une corrélation entre les modèles calculés et les données des puits forés dans la région démontre que les principales unités lithogiques sont détectées. En général les modèles indiquent trois couches de résistivité : (*i*) post-turonienne; (*ii*) anté-sénonienne; et (*iii*) et le socle. Dans la partie sud du bassin, il existe des formations relativement conductrices sous-jacentes aux unités mésozoïques interprétées comme étant des sédiments appartenant à la séquence du bassin de Bove paléozoïque. Un modèle schématique de la structure sédimentaire générale du Sénégal a été élaboré à partir des enseignements fournis par les coupes géoélectriques couplés avec les données lithologiques et électriques des puits de forage. L'étude suggère que le bassin est formé d'un pli monoclinal ouvert, incliné vers l'ouest, dans lequel la structure est contrôlée par les failles du socle orientées nord–sud offrant un style structural en escalier.

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Introduction

During the period 1980–1984, a series of magnetotelluric (MT) soundings were performed over a large part of the Senegal–Mauritania (S–M) basin (Fig. 1). They were intended to contribute to the knowledge of the electrical characteristics of the sedimentary sequence and add information about the gross division of the subsurface in a region in which not much is known because of the scarcity of deep drill holes. Fieldwork was carried out at 36 sites along three profiles using a four-channel digital MT system (Ritz 1984; Ritz and Vassal 1986, 1987). The technique is based on surface measurements of electromagnetic fields from which an apparent resistivity–frequency relationship is obtained. This is interpreted to give resistivity structure (geoelectric cross section) by using a combination of one-dimensional inversions (Jupp and Vozoff 1975) and two-dimensional (2D) forward modeling (Wannamaker *et al.* 1985). The MT method has been used effectively as a deep sedimentary basin exploration tool in Senegal. The technique responds favourably to conductive sedimentary layers, and the main lithologic units can then be readily followed by using calculated resistivities derived from 2D resistivity models (Ritz and Flicoteaux 1985). The major structural elements associated with regional tectonism may be defined using their electrical response. However, the application of MT techniques in any location depends on the existence of sufficient contrast in the electrical resistivities of the different formations. Thus, resistive layers (Jurassic limestones for example) above a high-resistivity basement or intrusive bodies within the basement are more difficult to resolve across the S–M basin.

As a result of the spatial arrangement of MT sites along three approximately linear traverses oriented perpendicular to the structural trends of the basin (Fig. 1), it is possible for the first time to obtain a general view of the resistivity structure of the sedimentary sequence in Senegal. The aim of this paper is to present a simplified picture of the geologic–electric units of the S–M basin based on two-dimensional modeling, with constraints imposed by borehole information and surface geology (Bellion 1987).

Geologic and geophysical setting

The S–M basin is a passive margin basin lying between 10° and 21°N (Guinea Bissau to Mauritania). It is bordered on the east by the Pan-African Mauritanides orogenic belt, and its southern margin partially covers the Paleozoic Bove basin (Fig. 1), composed of Late Ordovician to Devonian rocks (Villeneuve 1984). The coastal basin developed in response to the opening of the central Atlantic Ocean in early Mesozoic, about 180 Ma ago (Dewey *et al.* 1973). Chanut (1984) suggested that the crustal stretching started around 243 Ma ago because of a thermic event, which was dated in the basement of Kolobane 1 well (Kb1; Fig. 1). The Permo-Triassic rifting and the post-Triassic subsidence of the west African margin, which were responsible for the formation of the basin, were probably accompanied by the intrusion of magmatic material into fissures and fractures, predominantly parallel to the coast

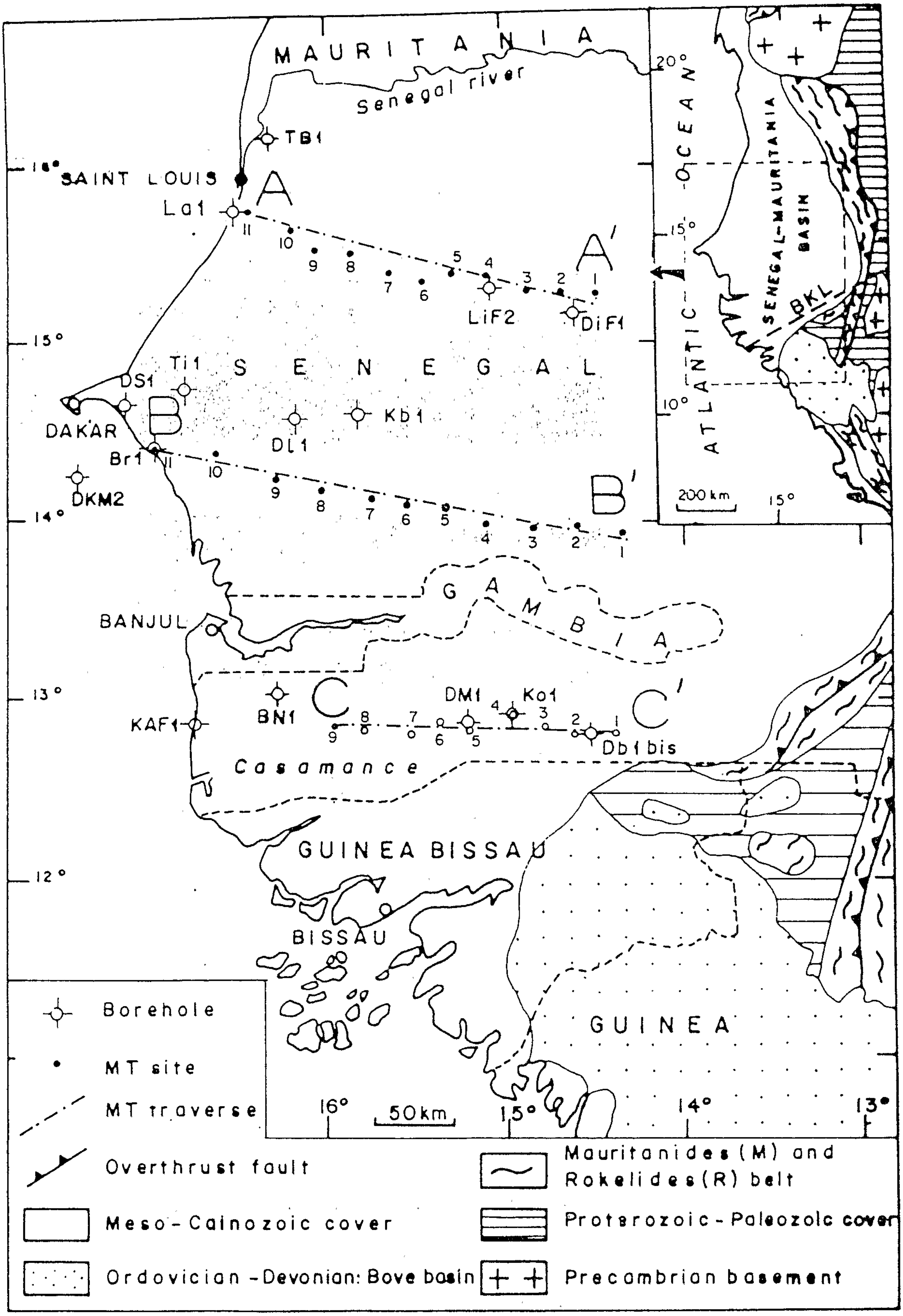

FIG. 1. Geologic setting of the Senegal–Mauritania sedimentary basin in west Africa with locations of magnetotelluric traverses. Also shown are the locations of all wells (boreholes) referred to in the text. BKL, Bissau–Kidira Lineament.

TABLE 1. Details of wells drilled in the Senegal–Mauritania basin and referred to in this paper

Well		Depth (m)	Bottomed in
Balandine 1	BN1	4106	Aptian
Dabo 1 bis	Db1bis	253	Metamorphic basement
Dakar Marine 2	DKM2	4252	Liassic(?)
Diana Malari 1	DM1	1412	Ordovician
Dioumanan F1	DiF1	624	Granitic basement
Diourbel 1	DL1	4153	Diorite (age?)
Leona 1	La1	708	Early Maastrichtian
Linguère F2	LiF2	945	Metamorphic basement
Kafountine 1	KAF1	5395	Early Cretaceous
Kolda 1	Ko1	615	Silurian
Kolobane 1	Kb1	2561	Metamorphic basement(?)
Mbour 1	Br1	4025	Aptian
Ndiass 1	DS1	4010	Late Jurassic
Tienaba 1	Ti1	3403	Albo-Cenomanian
Toundou Besset	TB1	4002	Aptian

TABLE 2. Generalized electric stratigraphy compiled from well data (see Fig. 1 for location of boreholes)

Stratigraphy		Lithology	Resistivity ($\Omega \cdot$m)
Cainozoic	Quaternary	Sands, clays	10–200
	Tertiary	Sands, clays, limestone	
Mesozoic	Maastrichtian	Sands	
	Cretaceous	Sands, clays, sandstones Limestones westward	0.2–3 4–50
	Jurassic	Sands, grits Limestones	> 10 > 1000
Paleozoic	Devonian	Clays, hard sandstones	5–50
	Silurian	Shaly clays	
	Ordovician	Fractured hard sandstones	

(Van der Linden 1981), and into east–west-trending faults (Reyre 1984). Nevertheless, the surface geology does not reveal the deep structure; only drilling (a few scattered wells; Fig. 1) and seismic refraction surveys have provided consistently reliable depth information. Table 1 lists the depth and the age of the rock at the bottom of wells in the survey area. Beneath the deep S–M basin, west of 15°30′W, the nature, age, and depth of the basement are generally unknown. A reconnaissance refraction survey (Société africaine des pétroles 1960) in the central part of the S–M basin along MT profile A–A′, between MT sites 4 and 10 (Fig. 1), indicates a clear high-velocity horizon (V = 5.8–6.3 km/s) dipping gently to the west from 1000 m down to 3000 m near MT site 8. This horizon has been assigned to the top of the basement, and because of the strong westward thickening of the sedimentary cover, it disappears west of 16°W.

Reconnaissance gravity and magnetic surveys have been conducted in Senegal and Mauritania (Crenn and Rechenmann 1965; Bureau de recherches pétrolières 1956). The area between 15°30′ and 16°W, north of MT profile B–B′, is characterized by a number of linear lows, separated by highs, striking generally north–south; this suggests the existence of structural troughs in part of the area (Guétat 1981). Magnetic and gravity interpretations (Liger 1980; Roussel and Liger 1983; Ponsard 1984) showed that the basement and occasionally the Meso-Cainozoic cover are contaminated by mafic intrusions. A coastal positive gravity gradient area, with a north–south trend, is interpreted in terms of a thinning of the continental crust, whereas oceanic crust is suggested in the Dakar area. An east–west-trending positive gravity anomaly centred over Gambia and Casamance is explained by extensive dense intrusives within a thinned crust and may be related to a rift associated with the initial rupture of the Atlantic (Burke 1976).

From drilling results (Castelain 1965; De Spengler *et al.* 1966; Templeton 1971; Bellion and Guiraud 1984; Bellion 1987), the stratigraphy and electrical resistivity of the S–M basin are summarized below (see Fig. 1; Tables 1, 2). Paleozoic sandstones, more or less fractured, with interbedded schists were recognized under the southern margin of the S–M basin (wells Ko1 and DM1; Fig. 1). In particular, well DM1 intersected approximately 700 m of salty sandstones and shales. Resistivities were confined to the range 5–50 $\Omega \cdot$m. Saliferous rocks of Triassic–Liassic age have only been found in salt domes off Casamance, beneath the continental shelf of southern Senegal. During the Jurassic, a carbonate platform was built along the continental margin of west Africa (Von Rad *et al.* 1982), but Jurassic limestones with high resistivities (> 1000 $\Omega \cdot$m) have only been drilled west of 16°30′W in the Dakar area. Sedimentation was very active in Cretaceous time and consisted of terrigenous deposits (clays, sands, sandstones, and carbonates). The log data (Table 2) show very low resistivities for the Cretaceous sediments, which can be explained by the high electrolyte content of the porewater; for example, the formation-water salinity from log analysis for the TB1 well (Fig. 1) would be more than 100g/L at a depth of about 1700 m. Lithology is dominantly coarse sandstones, but some clays and carbonates are also encountered westward. West of 16°W, drill holes reach Early Cretaceous beds at about 3000 m (wells TB1, Br1, and DS1; Fig. 1; Table 1). Tertiary sediments consist of Paleogene chemical or biochemical deposits (carbonates and phosphates) with a more sandy facies eastward and a more clayey facies westward. In general, this unit is overlain by a a 50–100 m thick Neogene layer of sand. From Late Cretaceous to Mio-Pliocene a major phase of vertical tectonics continued the disruption of basement rocks. Late Cretaceous volcanism is known in the Leona area, west of the A end of traverse A–A′; in particular, Leona 1 well (La1; Fig. 1) bottomed in early Maastrichtian igneous breccia at a depth of 708 m, and a total of more than 250 m of metamorphosed sandy limestone, with inclusions of microsyenite, was intersected. In the Dakar region, alkaline volcanism ranges in age from 1 to 35 Ma (Cantagrel *et al.* 1976; Crévola 1980), with active periods during the Miocene and the Quaternary.

The western part of the onshore basin is probably covered with more than 8000 – 10 000 m of Meso-Cainozoic sediments; these values agree with recent data from thermal subsidence curves (Latil-Brun and Flicoteaux 1986).

Magnetotelluric data acquisition and interpretation

All the MT data analysis and modeling have been described and published in earlier papers (Ritz 1984; Ritz and Vassal 1986, 1987), and only a brief outline is given here.

The measurements determined the variations in time of the electromagnetic horizontal components for periods of 10 to 10 000 s. The data were processed (Vozoff 1972; Thayer 1975) to yield, as a function of frequency, the MT impedance tensor parameters, such as electrical strike direction, rotated apparent resistivity amplitude and phase for the TE and TM directions, and skew, which was used as a dimensional factor (Swift 1967). TE and TM data were defined as the rotated MT data computed along and perpendicular to the electrical strike, respectively. Generally, two apparent resistivity−phase curves resulted for a particular site because of the polarization of the electric field caused by lateral nonuniform resistivity distribution and (or) lateral variation of the sedimentary thickness. In the case of 1D resistivity distribution, both TE and TM data give identical solutions. The electrical strike directions are approximately north−south in the study area and align with the dominant surface structures. For most of the soundings the skew factor is less than 0.15 at all periods, indicating that geologic structures beneath these sites can be described as 1D or 2D. As an example, Fig. 2 shows the MT apparent resistivity and phase sounding curves for the TE and TM directions, taken at station 8 on the western part of profile A−A′ (Fig. 1). TE and TM data for station 8 appear to converge at periods of more than 100 s, and it can be expected that the 2D resistivity distribution is restricted to the upper few kilometres of the crust, whereas the deep resistivity structure is dependent on depth only (1D case). This is virtually the same for sites within the deep basin. At each site, a first tentative transformation of the TE data into resistivity−depth functions has been accomplished by an inversion algorithm (Jupp and Vozoff 1975). The 1D models for each profile were patched together to construct a simplified 2D starting model, and 2D foward modeling (Wannamaker *et al.* 1985) was used to generate computed MT sounding curves along three traverses; results of the modelling are shown in Fig. 3. Figure 2 shows an example of the computed TE and TM curves corresponding to the 2D model on MT profile A−A′ (Fig. 3), which is found to be a good fit to the observed data at station 8. Thus, 2D models along three sounding profiles were obtained (Fig. 3) that present possible electrical structures of the basin.

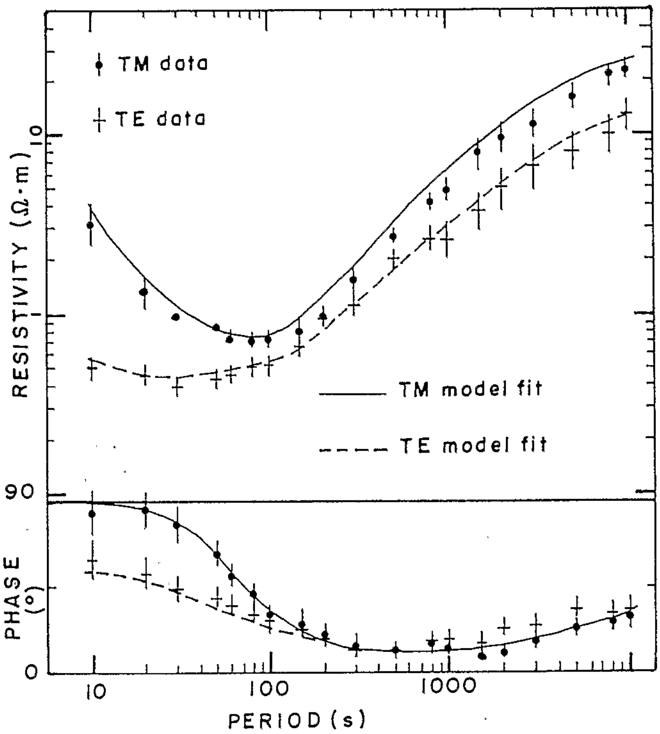

FIG. 2. MT sounding curves at site 8 on profile A−A′ and fit of the two-dimensional model shown in Fig. 3 to the data.

Electric−geologic models

Geoelectric cross sections along three traverses (Fig. 3) have revealed at least four outstanding features: (*i*) The post-Paleozoic sedimentary cover dips to the west, and the depth of the MT basement lies between 250 and 4000 m. (*ii*) The Meso-Cainozoic formations have extremely low resistivity values, typically 0.4−4 Ω·m; however, in some areas a near-surface layer of moderate resistivity overlies the better conducting sediments. (*iii*) On the southern margin of the basin (traverse C−C′) resistivity increases to between 10 and 30 Ω·m, suggesting the presence of Late Ordovician and Siluro-Devonian rocks of the Bove basin that are overlain by the S−M type sediments. (*iv*) The resistivity of the basement is 100−1000 times higher than that of the layer above.

In sedimentary basins the permeability and porosity of the units and the conductivity of the contained fluids largely determine the apparent resistivities measured by the MT method (Keller and Frischnecht 1966). However, if either permeability or porosity can be constrained by other information, then the remaining factors may be more accurately deduced. For example, for units saturated with salt water, fluid properties most strongly influence the MT response; for fresh porewater, the MT response is dominated by porosity. Salt-water interfaces can be detected by an abrupt decrease in resistivity between fresh- and salt-water-saturated units. Generally, in the study area, drill-hole data indicate that the zone of transition between the fresh and salt water occurs in the depth range of 300−1000 m, suggesting that at depths of less than 1000 m, porewater properties have little effect on bulk resistivities. Sedimentary rocks are distinctly more conductive than igneous rocks, and the resistivity of metamorphic rocks is variable because they have a wide range of porosities. Because of the interdependence of those factors that control the resistivity of the rocks, great care is required in translating the geoelectric units deduced from MT interpretations into lithostratigraphic units. Nevertheless, it seems clear from existing well logs that the low-resistivity units in the basin are related in some way to the presence of fluids.

The resultant interpretive cross sections in Fig. 3 indicate that the overall geoelectric sequence in the S−M basin can be represented as a four-layer sequence. The sequence from surface to bottom is as follows:

(1) Layer 1—Moderate resistive section (15−200 Ω·m) with a maximum thickness of about 800 m in the western part of the basin. Based on drill-hole data (Tables 1, 2), this layer is interpreted, at least in part, as being the fully fresh-water-saturated state of the sediments.

(2) Layer 2—A very highly conductive section (<1 Ω·m). This conductive section is interpreted as a saline aquifer under the freshwater aquifer, trending to the surface when approaching the coast and reaching a thickness of about 1800 m. The zone near the coast would be influenced by the presence of conductive ocean water, probably invading the underlying units.

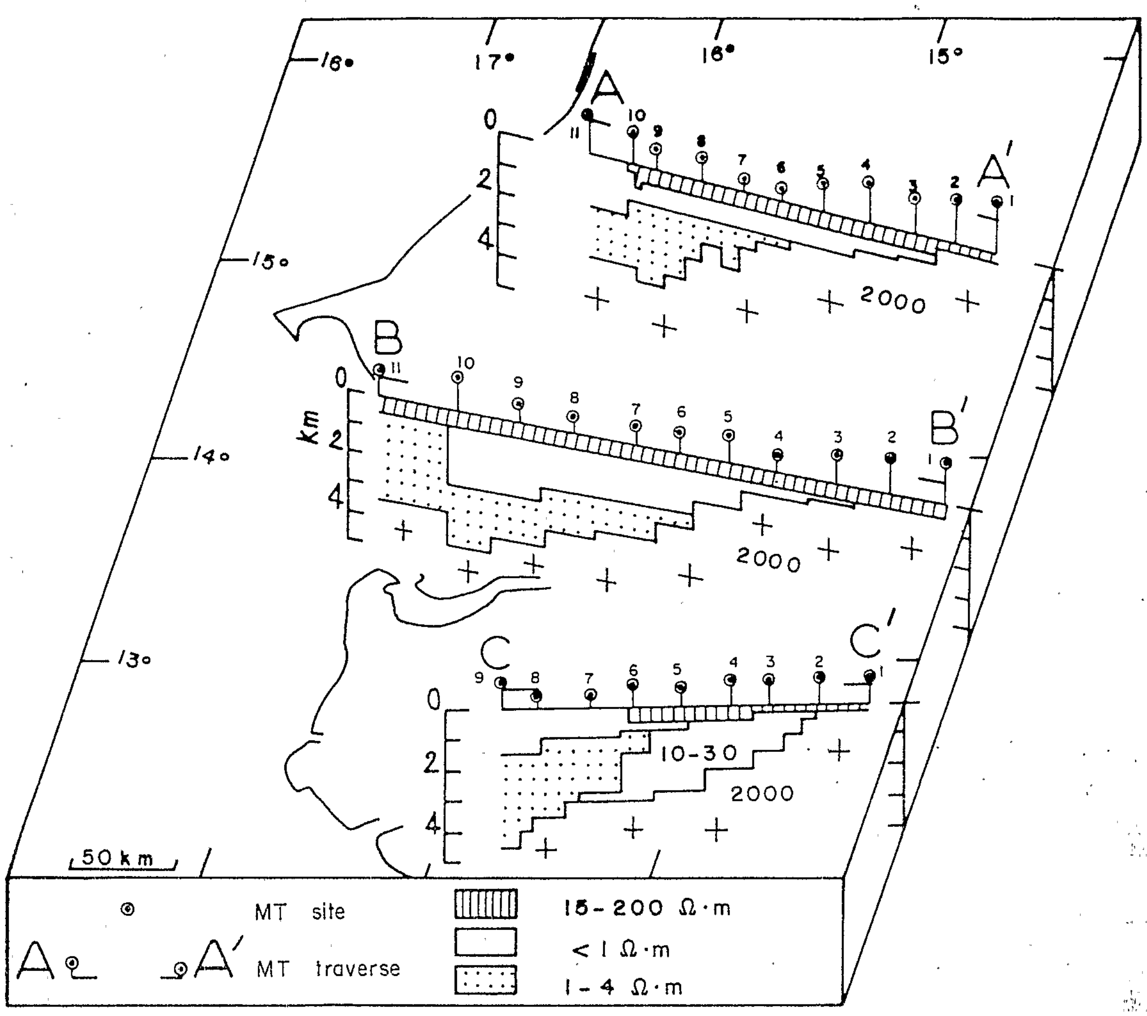

FIG. 3. Geoelectric cross sections across the Senegal—Mauritania basin compiled from the MT two-dimensional models. The numbers indicate the resistivities of the geoelectric units.

(3) Layer 3—Conductive section (1—4 Ω·m). These low resistivities might be caused by an increased fracturing at depth whereby the pores and fissures might be filled with highly conducting fluids.

(4) Layer 4—Resistive section (2000 Ω·m). Note that between MT sites 4 and 10 on profile A—A′, the resistive material seems to coincide with a seismic high-velocity layer of 5.8—6.3 km/s (Société africaine des pétroles 1960), which corresponds to the basement—an excellent agreement with MT results.

By combining the previous information, obtained by modeling the three MT profiles and the lithologic and electric log data (Tables 1, 2), we produced a block diagram for the generalized sedimentary structure of Senegal (Fig. 4).

The uppermost unit (layers 1 and 2) corresponds to the sediments of the Late Cretaceous — Cainozoic S—M basin sequence. Layer 1 is associated with Tertiary sediments, and layer 2 consists mainly of Senonian sandstones.

The second unit (layer 3) represents the sandstone and clay section of the Cretaceous and contains some carbonates in the western part of the section. The top of this unit, as depicted in Fig. 4, indicates the clayey horizon of the Turonian. Near the coast and at the western end of traverse B—B′, an abrupt change in the MT resistivity (Fig. 3) marks the facies change to a clayey unit. West of 15°30′W, the slope of west-dipping layer 3 increases and the deposits rapidly thicken seaward to reach a thickness of about 3500 m.

The third unit (layer 4) is a high-resistivity unit that can be followed across all three traverses. In general, the surface of layer 4 is characterized by progressively deeper burial to the west. A maximum value of 4000 m has been calculated for depth to resistive layer near the coast on traverse B—B′. The great depth to the high-resistivity rocks suggests that these are either basement or near-basement rocks. In the eastern part of the basin, the top of this layer is correlated with the depth of high-resistivity basement determined from drilling. West of 16°30′W, the Jurassic to Aptian limestones are known to extend into the region (wells Brl, DKM2, and DS1; Fig. 1; Table 1). These limestones are interpreted as having high resistivities (Table 2), and because they do not present a good contrast with resistive basement, the base of the limestone section could not be recognized. One finding from the MT modeling, which was suggested by the gravity data mentioned earlier (Guétat 1981), is the existence of a horst and graben system at the basement surface on the central part of traverse A—A′, between longitudes 15°30′W and 16°W.

The structure of the sedimentary sequence has a dominantly north—south trend. The interpretation that emerges shows that the basin is a westward-sloping, open homocline in which the structure is controlled by basement north—south faulting that

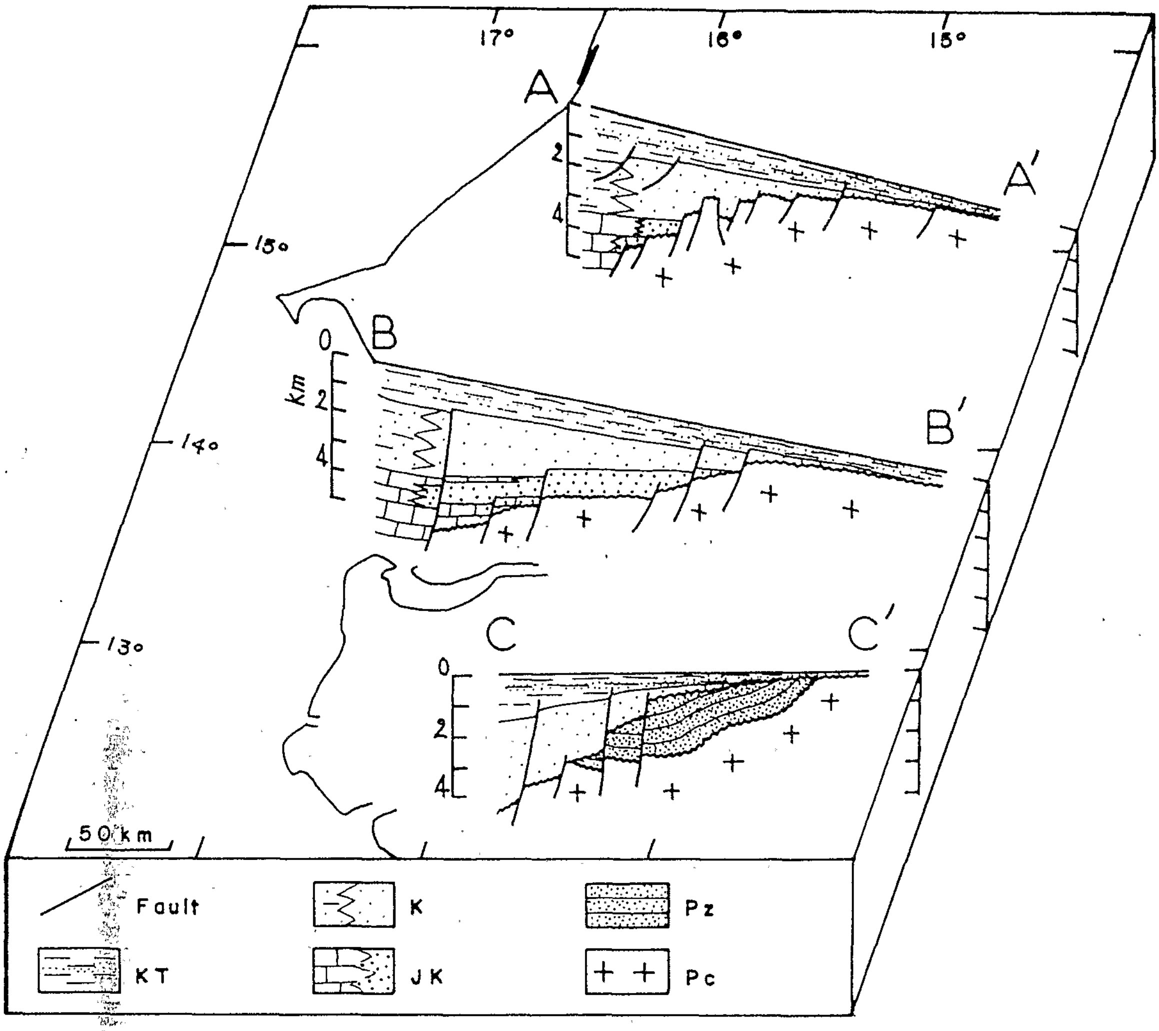

FIG. 4. Diagrammatic geologic interpretation of geoelectric models across the Senegal–Mauritania basin. Abbreviations: Pc, Precambrian basement; Pz, Paleozoic quartzite sandstones; JK, Jurassic to early Aptian limestones and sandstones; K, late Aptian to Turonian sandstones and sandy clays; KT, Senonian–Cainozoic shaly clays, sands, and carbonates.

portrays a more or less staircase structural style.

It is worthy to note, however, that the geoelectric section on the central part of traverse C–C′ becomes a five-layer section (Fig. 3). Between the Mesozoic cover and the basement surface, there are relatively conductive (10–30 Ω · m) formations that may be correlated with the Paleozoic sandstones of the Bove basin. The presence of such a layer was indicated in wells DM1 and Ko1 located near traverse C–C′ (Fig. 1), where the Paleozoic rocks are fractured and saturated with saline water. The resistivity of this unit decreases from 30 Ω · m in the east to about 10 Ω · m in the west; the change in character of the resistivity may be due to variations in water salinity or differences in the degree of fracturing, particularly as this is an area of known complex faulting (Villeneuve 1984). Along traverse C–C′, the Paleozoic sediments are localized, forming a syncline that is thought to be the collapsed prolongation of the Bove basin known in Guinea (Ponsard 1984). In the axial area (below MT site 5), the thickness of the Paleozoic sediments is about 1700 m.

Concluding remarks and discussion

The combined analysis of the magnetotelluric (MT) and limited deep-well data provided useful information on the exploration of the S–M basin subsurface, including (*i*) the electrical subdivision of the sedimentary sequence; (*ii*) the existence of thick conductive formations and their boundaries and dips; (*iii*) mapping of relief on the basement surface or some other high-resistivity formation; (*iv*) the identification of faults in the sedimentary section and basement; and (*v*) the delineation of structures of different types and origins. The MT method detects not only the resistivity discontinuities at lithologic boundaries but also resistivity discontinuities within lithologic units that may be due to the presence of saline water in fracture zones. It should be noted that the 2D models are not unique (Ritz and Vassal 1986). However, the main features of the regional geoelectric cross sections exist with a robustness that is in accord with seismic as well as gravity conceptions and electric log data; such features are the depth of the substratum, the presence of a graben-like structure along MT profiles A–A′, and the very low resistivities of the Cretaceous. In the western part of the basin, the presence of electrically resistive Jurassic limestones overlying the high-resistivity granitic–metamorphic substratum complicates calculations of depth to basement. Separation of these effects is a consideration in the application of the MT method. Magnetotelluric modelling appears to be a practical method for obtaining subsurface geologic information when there is sufficient contrast in the electrical resistivities of the different units.

The western North Atlantic counterparts of the S−M basin are the Carolina and Blake Plateau basins, which extend from Cape Hatteras to the Florida platform (Le Pichon *et al.* 1977; Schlee *et al.* 1979; Olivet *et al.* 1984). In comparison with these basins, the S−M basin has been less extensively investigated. However, very few onshore electromagnetic investigations (mainly geomagnetic induction studies) have been carried out on the North American side.

Remarkably low resistivities have been modeled in the S−M basin sediments, notably the sediments of the Cretaceous sequence (Fig. 3). In the Meso-Cainozoic Coastal Plain sediments of eastern North America (in Virginia), Greenhouse and Bailey (1981) obtained similar resistivities. Within the same units but farther south in Georgia, Mareschal *et al.* (1983) obtained a resistivity of 100 Ω·m. Hyndman and Cochrane (1971) found sedimentary resistivities in Atlantic Canada of about 1 Ω·m. Although these studies were aimed more at crustal structures than at sedimentary basins, they indicate the possibility that low-resistivity sediments are widespread in the North American basins.

Because of the lack of geoelectric data in the Coastal Plain, it is difficult at this stage to present a model applicable to rifted-margin basins on both sides of the Atlantic.

The geology of African and American equivalent basins shows numerous similarities (De Spengler *et al.* 1966; Meagher *et al.* 1977; Dillon *et al.* 1979; Folger *et al.* 1979; Klitgord and Behrendt 1979; Jansa and Wiedmann 1982; Roussel and Liger 1983; Bellion and Guiraud 1984; Dumestre and Carvalho 1985; Bellion 1987). It should be emphasized that the geology of the S−M basin has been deduced from outcrops, of which none were older than Maastrichtian, and from borehole data; more than 120 wells were drilled onshore and offshore, some reaching the basement or Paleozoic rocks in the east of the basin and shallow-marine, partly oolitic, Jurassic limestones in the west. In contrast, most of the American counterpart basins have been inferred from the interpretation of multichannel seismic profiles. On the shelf of the Blake Plateau basin, a single well (Cost GE-1) bottomed in Devonian rocks overlain by Early Cretaceous to Recent deposits. No older Mesozoic sample was recorded.

There are lithologic similarities between the undeformed sandstone and shale of the Ordovician−Silurian Suwannee basin (Florida) sequence, lying at 0.9−1.9 km depth (Sheridan *et al.* 1969; Smith 1982), and equivalent aged strata from Casamance on MT profile C−C′ (Fig. 4), which lie in the depth range 0.5−3 km.

The Meso-Cainozoic sedimentary fill is more than 10 km thick (believed to be about 12−14 km) on both sides of the Atlantic, and the general lateral and vertical evolutions are comparable. Clastic sediments are found landward; clayey and calcareous deposits, seaward. During the Jurassic, a series of thick, shallow-water carbonate platforms were formed, and these continued to flourish through the Early Cretaceous in the Blake Plateau (Albian) and S−M (late Aptian) basins. Landward, Lower Cretaceous rocks, mainly clastics (silty clay and fine- to coarse-grained sandstone, coal, and some anhydrite), are overlain by Upper Cretaceous mudstones and clays, with some carbonates, fine-grained sands, and sandstones. The upper part of the sedimentary sequence is composed of Paleogene chemical and biochemical deposits (carbonates and clays) and Neogene clastic deposits.

From a structural viewpoint, all basins are monoclines and generally have very low seaward dips. Several hiatuses exist between the Maastrichtian and Paleocene, the Paleocene and Eocene, and the Eocene and Miocene (Schlee and Jansa 1981; Bellion and Guiraud 1984). On the African side, these gaps are partly due to tectonic events recorded in all west African basins (Bellion 1987).

Compared with the Blake Plateau basin, the S−M basin shows a number of differences. The oldest Mesozoic sediments in the S−M basin are Late Triassic to Liassic evaporites (Templeton 1971), probably overlain by anhydrite nodule-rich carbonates. Well DKM2 (Fig. 1) bottomed in these carbonates of presumed Liassic age. The Jurassic to Early Cretaceous thick (3−5 km) platform is only 100 km wide, compared with more than 300 km on the American side. If the post-Jurassic sedimentary columns on both sides are almost identical, the late Maastrichtian is sandy over most of the S−M basin. To the west of the onshore S−M basin, numerous prominent north−south-trending normal faults delimit horsts and grabens and seaward-collapsed tilted blocks. Off Guineau−Casamance and Mauritania, several diapirs cut through the Mesozoic cover along the shelf and the slope, respectively. Important igneous activity occurred during the Cainozoic Era (1−35 Ma) in the Dakar region, as evidenced by the presence of basaltic sills, dykes, and lava flows (Bellion and Crévola 1988). On the American margin, none of these structures has been deduced from multichannel seismic profiles across the Blake Plateau basin, but diapiric structures have been reported along the Carolina trough (Schlee and Jansa 1981).

Most of the S−M basin is exposed and thus accessible for detailed onshore studies. On the contrary, the conjugate eastern North America basins develop offshore. The abrupt thickness change of sediments occurs in the onshore basin on the African side.

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