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Deep earth exploration by Magnetotelluric (MT) survey

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In order to study the electrical imaging of shallow and deep crustal structure and to prepare a meaningful conceptual crustal model using magnetotelluric method and the results of following investigated area are presented.

MT survey bounded by latitudes $26^{\circ}40'00''$ - $27^{\circ}35'00''$ and longitudes $88^{\circ}10'00''$ - $88^{\circ}45'00''$ was conducted over a 120 km long N-S transect in Sikkim-Darjeeling Himalaya. 1D model of MT data has indicated the thickness of surface layer vary in between 6 to 352 m, which is followed by crystalline rock of varying thickness 487 m to 6400 m is observed. This is followed by very low resistive layer (Siwalik sediments?) of thickness varying from 261-4732 m and resistivity varying from 1-16 Ohm-m, which is underlain, by a layer (Gondwana sediments??) of thickness varying from 2458-6898 m and resistivity varying from 23-279 Ohm-m. Beyond a depth level varying from 1851-13444 m high resistivity basement is encountered.

MT survey was carried out along Islampur-Karandighi transect of 100 km bounded by latitudes $25^{\circ}45'00''$ - $26^{\circ}15'00''$ and longitudes $87^{\circ}35'00''$ - $88^{\circ}20'00''$, Uttar Dinajpur district, West Bengal. Highly conductive zone is characterized by resistivity ranging from 1-17 Ohm-m and thickness varying from 165-3164 m. This layer is underlain by a layer of resistivity varying from 46-281 Ohm-m and thickness varying from 280-3210 m. The high resistivity basement is interpreted at a depth of 698-6379 m. The basement comes up to a shallow depth (698 m) whereas the same occurs at a greater depth (4801 m). The steep gradient of basement could possibly be attributed to a fault.

MT survey bounded by latitudes $24^{\circ}00'$ - $24^{\circ}15'$ and longitudes $87^{\circ}40'$ - $88^{\circ}00'$, was conducted in Rampurhat area, in the eastern part of Birbhum coalfield, West Bengal. The results of MT studies reveal that the Rajmahal trap and intertrappean bed occupy a large thickness of the subsurface sequence with

thickness varying from 265-748 m and resistivity in the range of 126-175 Ohm-m. The Gondwana sediments below the Rajmahal trap show resistivity in the range of 1-10 Ohm-m and thickness varying from 444-900 m. The Rajmahal trap and the Gondwana sediments overlie a resistive Archaean basement that lies at a depth of 1030-1670 m below ground level. These observations suggest an undulating basement below the sedimentary column in the northern boundary of Bengal basin.

MT survey bounded by latitudes $21^{\circ}30'00''$ - $22^{\circ}15'00''$ and longitudes $88^{\circ}00'00''$ - $88^{\circ}30'00''$ was conducted along Diamond Harbour-Bakkhali transect for delineation of depth extension of fresh water zone. MT survey in the area is enabled to delineate depth extension of fresh water zone and depth to the bedrock of the area. The fresh water zone exhibits resistivity of the order of 23-69.5 Ohm-m and its thickness varies from 455-885 m followed by a high resistive formation at depth ranging from 700-900 m in the area. On the basis of 1D inversion of MT data the boundary of fresh water and saline water separated by a fault has been identified.

