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Characterization of the geology and subsurface crystalline limestone mining using 2D ERI at Puthur Mines, Tirunelveli, Tamilnadu

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ABSTRACT

The 2D Electrical Resistviity Imaging (ERI) method was carried out in crystalline limestone in Puthur Mines, Tirunelveli, Tamilnadu, India. The objectives of the study were to investigate the crystalline limestone characteristics and calcic granulite of the subsurface formations. Three profiles were carried out using Wenner conFigureuration. The 2D ERI study has been carried out using the equipment resistivity meter, Multicore cable, rods and Res2DINV software. The collected resistivity data were calculated using Res2DINV software to develop the apparent resistivity pseudosectioon. The Picture display were, the range of resistivity in the three profiles obtained average apparent resistivity (1-50 Ohm weather soil, 100-600 weathered limestone, 1400-14000 Ohm.m-Calcic Granulite rock) indicate the subsurface geological condition of the Puthur open cast mine. The interpretation of resistivity pseudosection result is compared with the open cast mines borehole.

Key words: Crystalline Limestone, Apparent Resistivity, 2D ERI, Pseudosection, Tamilnadu,

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INTRODUCTION

The purpose of the study is to delineate limestone intrusion in the country rock at Puthur Mines. Puthur is a major panchayat in Tirunelveli District of Tamil Nadu. The project area is comprised of toposheet of 1:50,000 scale published by Survey of India and the size of the area is approximately 640 sq km. The precise location of study area is between 9 10’ 50.6” and Longitude 78 09’ 11.8” (Fig.1). Puthur mines and the surrounding areas are well connected with roads. The study area The Southern Granulite Terrain (SGT) forms the southernmost tip of the Indian shield. It has traditionally been divided into crystal blocks separated by roughly E-W trending lineaments defined as shear zones.

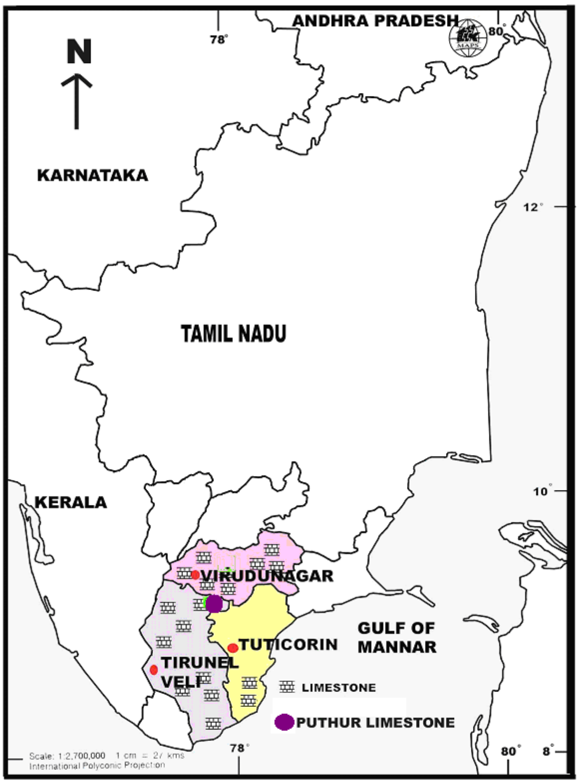

Fig.1 The Geological Map of the study area.

INSTRUMENTATION

To the study 2D ERI technique the fault zone, crystalline limestone and weathered soil were studied. The 2D ERI technique is a fast and cost effective technique, which covers both perpendicular and straight changes in the subsurface resistivity [8],[9]. This 2D technique is also applied for characterization of shallow subsurface studies by [5-13]. The limestone and karst topographys was studied by Olayinka [15],[14],[1],[16,17]. The following study of 2D Electrical Resistivity Imaging survey system were including CRM - 500 resistivity meter, multicore cables,steel electrodes and Res2DINV Software (Fig.2)

2D ERI DATA INTERPRETATION

The very high resistivity values and low resistivity in ohm meters were mapped in the Puthur mines. However, a similar anomaly associated with high resistivity values can be observed with the limestone mines and to detect fracture zones and folded.

LIMESTONE DEPOSITS AT PUTHUR MINES PROFILE -1.

The profile 1 trends NW-SE direction to a length of 140m. The upper part of the layer reveal as weathered soil. The inversion resistivity values are obtained from 1 to100 ohm.m. While the moderate limestone resistivity vaule is find out in 100-650 ohm.m. The lower part of the layer represents granite is indicates from range of high resistivity 1418 to 14672 ohm.m (Fig.3.1).

Fig.2 shows the 2D ERI field survey were carried in the Puthur open cast mine.

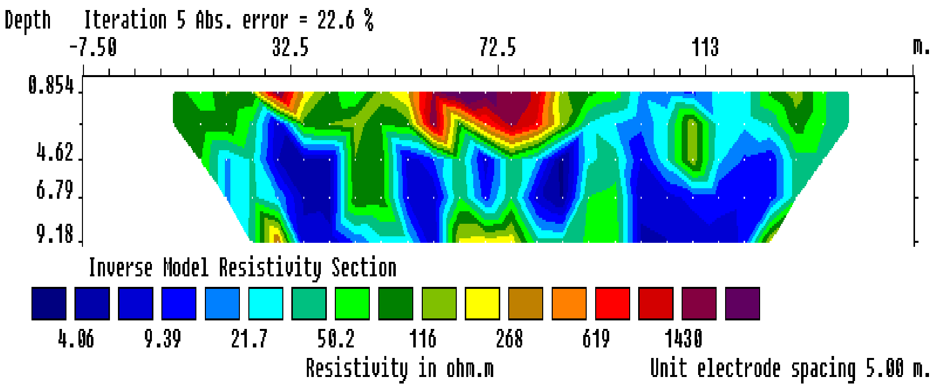

Fig.3.1 2D Electrical Resistivity Imaging Pseudosection survey carried for the exploration of crystalline limestone deposits at Puthur profile 1.

LIMESTONE DEPOSITS AT PUTHUR MINES PROFILE -2.

Second profile maximum length of 150 m and imaging depths of 18.4m were carried out in the limestone mines. While the range of resistivity is find out from 383-595 ohm.m indicates the pure limestone. The lowest resistivity values of 42 – 230 ohm.m designate the clay layer (Fig.3.2).

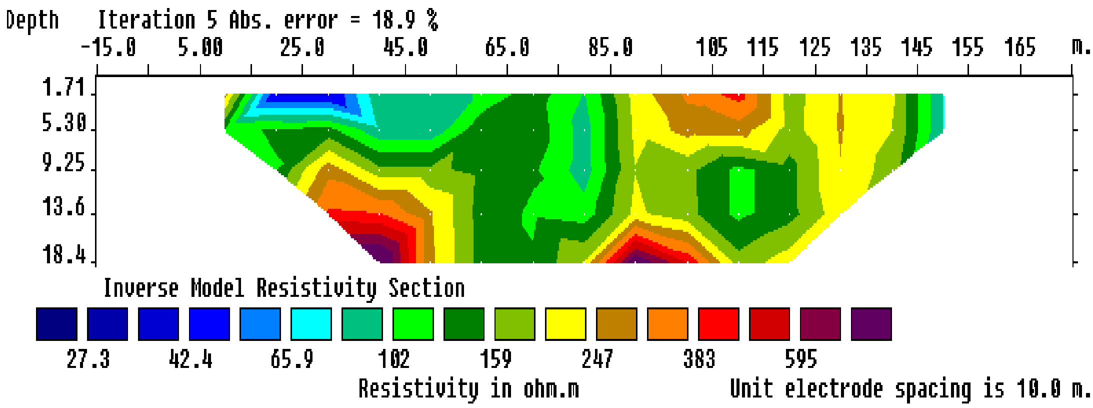

Fig. 3.2 2D Electrical Resistivity imaging study for folded and faulted area at Puthur Mines area.

LIMESTONE DEPOSITS AT PUTHUR MINES PROFILE -3.
Third profile maximum length of 105m and to imaging depths of 9.18m were carried out in the limestone mines. The low resistivity zone of circled image indicates the path of the vein deposits are clearly depicts the resistivity that ranges from 1 to 55 Ohm.m. The moderate resistivity between 143-254 ohm.m is indicate the crystalline limestone (Figure3.3).

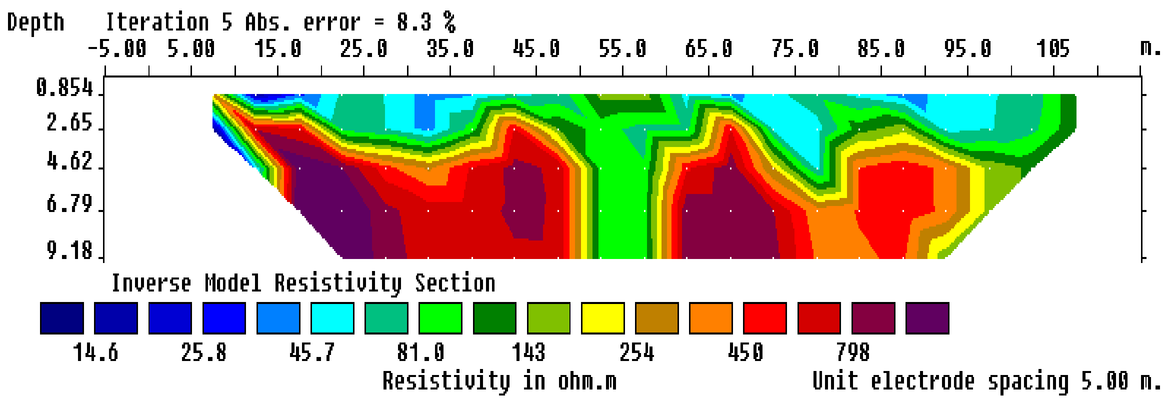

Fig.3.3 2D Electrical Resistivity imaging Pseudosection survey carried for the exploration of crystalline limestone deposits at Puthur Mines.

CONCLUSION

The 2D Electrical Resistivity Imaging technique gives the pseudosection subsurface resistivity changes in crystalline limestone area. The investigation of the three 2D ERI of crystalline limestone guided with the available borehole information in the mines area. The 2ERI study is used to estimate the structural feature and crystalline limestone intrusions are studied in the top to bottom of the mines area. The collected 2D Electrical Resistivity Imaging data is compared with open cast mine data (Borehole data). The lowest layer of clay range of resistivity is indicated from 10-50- Ohm. The moderate resistivities in crystalline limestone were obtained from 150-650 ohm.m. The higher resistivity zone of calgic granulate are determined in the range of 150-1000 ohm.m in the study area. The use of 2D ERI study is to find out the horizontal and vertical change of the limestone and faulted zone in the Puthur mines.

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