International Research Journal of Geology and Mining (IRJGM) (2276-6618) Vol. 2 (1) pp. 011-015, January 2012
Available online http://www.interesjournals.org/IRJGM

Review

A case study of crystalline limestone intrusion and fault zone identication using 2d eri technique in Ramco cements, pandalgudi mines, Tamilnadu

A. Antony Ravindran and N. Ramanujam

Manonmaniam Sundaranar University, Department of Geology, Geophysics Wing, V.O.Chidambaram College, Thoothukudi.

Accepted 09 January, 2012

The aim of the study is find out the intrusion of crystalline limestone and faultzone indentification in Pandalgudi mines, Ramco Cement Pvt Ltd, Tamilnadu. The Crystalline limestone formed in this region due to the geotectonic intrusion of Calgic Granite in the Southern Granite Terrian (SGT) of Madurai Block. The high quality crystalline limestones were mined in this Pandalgudi region. The tectonically formed faulted zone and open cast mine were mapped through the 2D Electrical Resistivity Imaging (ERI) technique. 2D ERI technique were covered both vertical and horizontal pseudosection to display the subsurface intrusive, weathered soil and Crystalline limestone in the study area. The 2D ERI study has been carried out using the equipment resistivity meter, Multicore cable, rods and Res2DINV software. These apparent resistivity pseudosectioon were display the range of resistivity in the three profiles obtained average apparent resistivity (1-100 Ohm weather soil, 100-600 weathered limestone, 1400-14000 Ohm.m- Calcic Granulite rock) indicate the subsurface geological condition of the pandalgudi open cast mine.

Keywords: Crystalline limestone, Ramco cements, pandalgudi mines and tamilnadu

INTRODUCTION

The purpose of the study is to delineate limestone intrusion in the country rock at Pandalgudi mines in Virudhunagar. Pandalgudi is a major panchayat in Virudhunagar District of Tamil Nadu. The project area is comprised of toposheet of 1:50,000 scales published by Survey of India. Size of the area is approximately 640 sq km. The precise locatin of study area is between Latitude 9°15' - 9°25' and Longitude 78° 0' - 78°15' (Figure 1). Pandalgudi mines and the surrounding areas are well connected with roads. The nearest railway station is Aruppukkottai. Major of the roads are metalled and few are unmetalled. 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. The lithological and structural boundaries between Achankovil shear zone and southern part of Madurai block (Pandalkudi area) do not overlap.

Instrumentation

To the study 2D ERI technique the fault zone, crystalline limestone and weathered soil were studied using Wenner configuration. The 2D ERI technique is a fast and cost effective technique, which covers both perpendicular and straight changes in the subsurface resistivity Barker R.D., '1989'. This 2D technique is also applied for characterization of shallow subsurface studies by Antony Ravindran, 2011, Barker, R.D., 1990. The following study of 2D Electrical Resistivity Imaging survey system were including CRM - 500 resistivity meter, multicore cables,steel electrodes and Res2DINV

*Corresponding author E-mail: antonicogeo@gmail.com

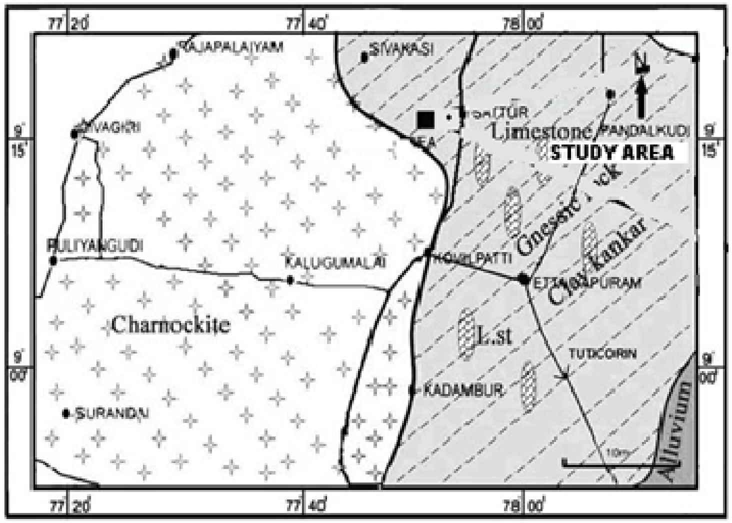

Figure 1. Geological Map of Pandalgudi

Figure 2. shows the 2D Field survey method and imaging at Pandalgudi Structures and geomorphological features are observed.

Geomorphology of limestone in the Pandalgudi Region

The limestone often contains variable amounts of silica in the form of chert or flint, as well as varying amounts of clay, silt and sand as disseminations, nodules, or layers within the rock. The primary source of the calcite in limestone is most commonly marine organisms. These organisms secrete shells that settle out of the water column and are deposited on ocean floors as pelagic ooze or alternatively are conglomerated in a coral reef. Secondary calcite may also be deposited by supersaturated meteoric waters (groundwater that precipitates the material in caves). The bed rock and karst topographys was studied by Zhou et al 2000 and 2002. This produces speleothems such as stalagmites and stalactites. Another form taken by calcite is that of oolites (oolitic limestone) which can be recognized by its granular appearance. Limestone makes up about 10% of the total volume of all sedimentary rocks. Calcite can be either dissolved by groundwater or precipitated by groundwater, depending on several factors including the water temperature, pH, and dissolved ion concentrations. Calcite exhibits an unusual characteristic called retrograde solubility in which it becomes less soluble in water as the temperature increases.

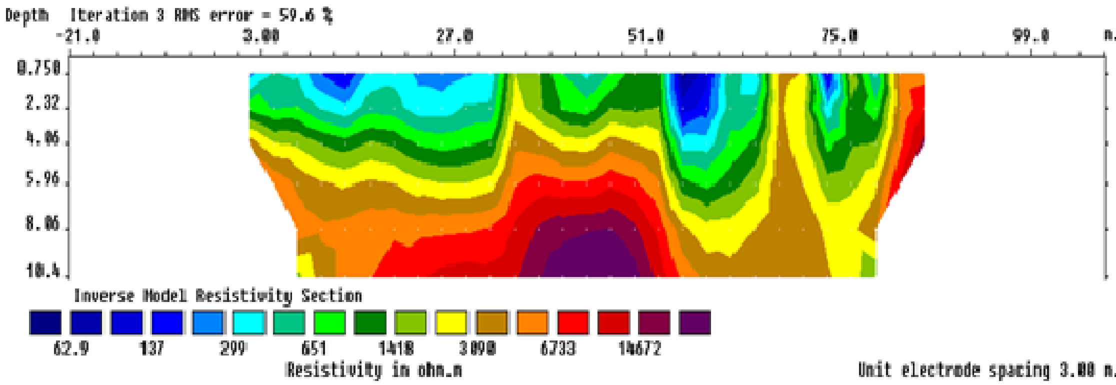

Figure 3.1 2D Electrical Resistivity imaging study for folded and faulted area at Pandalkudi Mines area.

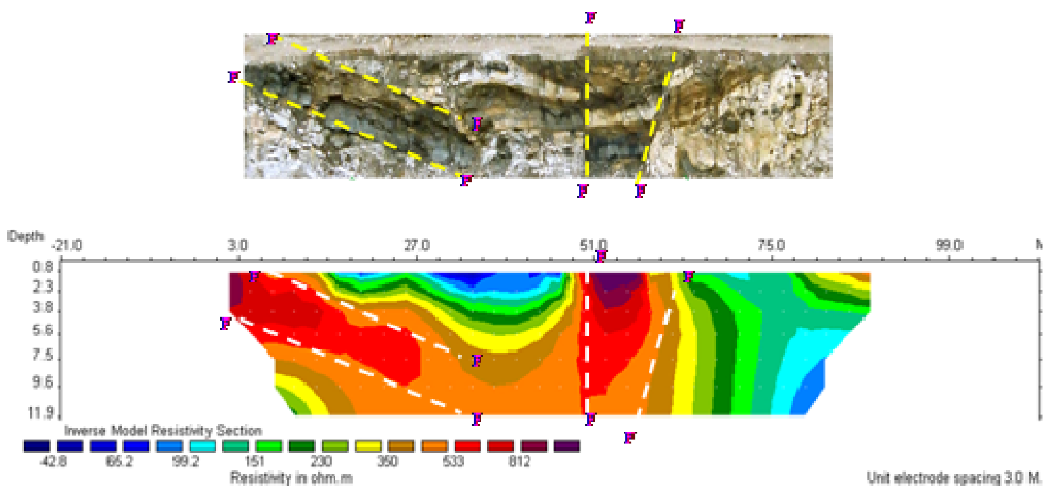

Figure 3.2 2D Electrical Resistivity imaging study for folded and faulted area at Pandalkudi Mines area.

2D Data Interpretation

.

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

2D Imaging Interpretation

Limestone deposits at Pandalgudi Mines profile -1.

The profile 1 trends NW-SE direction to a length of 80m. The upper part of the layer reveal as weathered soil. The inversion resistivity values for these bed that ranges from 1 to100 ohm.m. The resistivity values for intermediate layer of weathered Granite ranges from 100 to 650 ohm.m. The lower part of the layer represents limestone indicates high resistivity values that ranges from 1418 to 14672 ohm.m.

Limestone deposits at Pundalgudi Mines profile -2.

Second profile maximum length of 80 m and imaging depths of 11.9 m were carried out in the limestone mines. The range of resistivity 350-610 ohm.m indicates the pure limestone and lowest value of 42 – 230 ohm.m designate the clay layer.

Limestone deposits at Pundalgudi Mines profile -3.

Third profile maximum length of 80 m and imaging depths of 11.9 m were carried out in the limestone mines. The range of resistivity 1295- 4378 ohm.m indicates the pure limestone and lowest value of 59-377 ohm.m designate the clay layer.

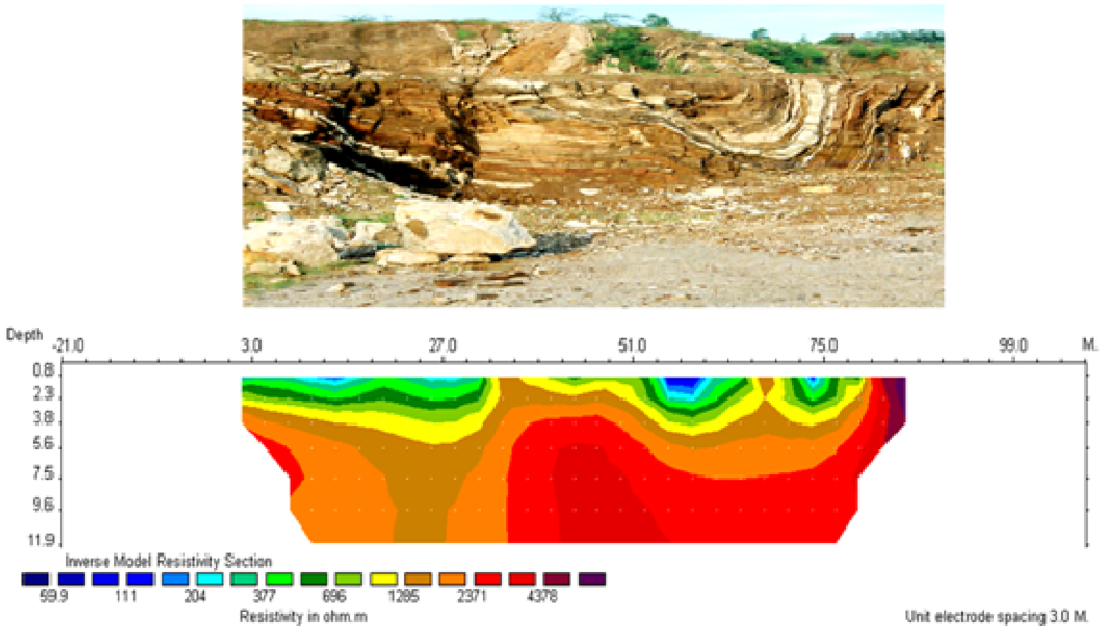

Figure 3.3 2D Electrical Resistivity imaging study for folded and faulted area at Pandalkudi Mines area.

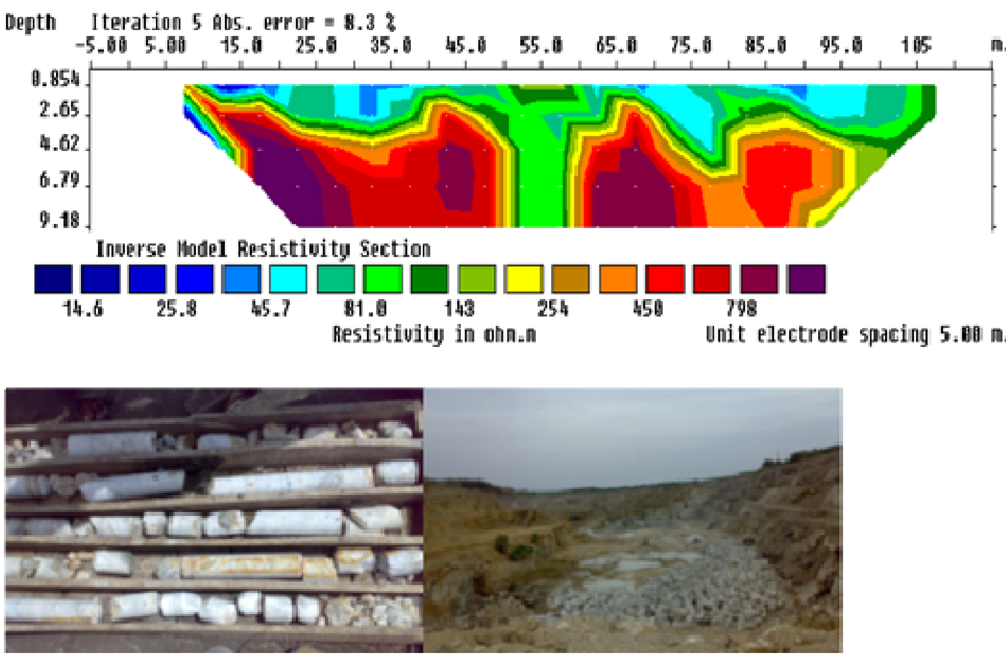

Figure 3.4 2D Electrical Resistivity imaging study for Pandulgudi limestone

DISCUSSION AND CONCLUSION

Based on regional characterization of the area limestone are mapped through 2D Electrical resistivity imaging technique. These features are formed when the relatively thin layer of Limestone often contains variable amounts of silica in the form of chert or flint, as well as varying amounts of clay, silt and sand as disseminations, nodules, or layers within the rock. The primary source of the calcite in limestone is most commonly marine organisms. Surface observations and photo observation is used to support the geophysical resistivity imagingtechnique interpretation.

2-D Electrical imaging Resistivity tomography traverses along with the use of Wenner array with a maximum length of 80 m and imaging depths of 10.4 m were carried out in the limestone mines. From the 2d resistivity imaging the high resistivity (3000 to 14000 Ohm.m); zone is a country rock. The resistivity ranging from 120 Ohm.m to 140 Ohm.m is a weather rock type and low resistivity zones with range of values 32 Ohm.m are identified in the first profile area. Second profile maximum length of 80 m and imaging depths of 11.9 m were carried out in the limestone mines. The range of resistivity 350-610 ohm.m indicates the pure limestone and lowest value of 42 – 230 ohm.m designate the clay layer. Third profile maximum length of 80 m and imaging depths of 11.9 m were carried out in the limestone mines. The range of resistivity 1295- 4378 ohm.m indicates the pure limestone and lowest value of 59-377 ohm.m designate the clay layer.

ACKNOWLEDGEMENT

The first authors express his sincere thanks to Mr. A.P.C.V. Chockalingam, Secretary and Prof.Maragathasundaram, Principal, V.O.C. College, Tuticorin, The heartful helps extended to Dr. N. Ramanujam, Professor and Head, Pondicherry University, Coastal Disaster Management, Andaman.

REFERENCES

Barker RD (1989). Depth of investigation of collinear symmetrical four electrode arrays, Geophysics, 54:1031-1037.

Barker RD (1990). Improving the quality of resistivity sounding data in landfill studies. In S.H.Ward (ed). “Geotechnical and environmental geophysics. V. 2. Environmental and groundwater applications” pp. 245-251.

Dahlin T, Loke MH (1998). Resolution of 2D Wenner resistivity imaging as assessed by numerical modelling, J. Appl. Geophysics, 38: 237-249.

Daniels F, Alberty RA (1966). Physical Chemistry. John Wiley and Sons, Inc.

Edwards LS (1978); A modified pseudosection for resistivity and IP. Geophysics, 32: 1020-1036.

Griffiths DH, Barker RD (1993). Two-dimensional resistivity imaging and modeling in areas of complex geology. J. Appl.Geophysics, 29: 211 – 226.

Kelly SF (1962). Geophysical exploration for water by electrical resistivity, J. New England water assn., 76: 118-189

Keller GV, Frischknecht FC, (1966). Electrical methods in geophysical prospecting. Pergamon Press Inc., Oxford.

Kilty KT (1984). on the origin and interpretation of Self Potential Anomalies, Geophysical Prospecting, vol. 32, pp 51-62.

Kunetz G (1966). Principles of Direct Current Resistivity Prospecting, Berlin, pp 103.

Loke MH, Barker RD (1996). Rapid least-squares inversion of apparent resistivity pseudosections using a quasi-Newton method. Geophysical Prospecting, 44. 131-152.

Telford WM, Geldart LP, Sheriff RE, Keys DA (1988). Applied Geophysics, Cambridge University Press, Cambridge, New York, pp 458-468.

Zhou W, Beck BF, Stephenson JB (2000). Reliability of dipole-dipole electrical resistivity tomography for defining depth to bedrock in covered karst terrains. Environ. Geol. 39: 760 – 766.

Zhou W, Beck BF, Adams AC (2002). Effective electrode array in mapping karst hazards in electrical resistivity tomography. Environ. Geol. 42: 922 – 928.