

MAGNETOTELLURICS - APPLICATION TO RESOURCE EXPLORATION, STUDIES OF CRUST/LITHOSPHERE, IMPROVEMENT OF TECHNIQUES OF DATA ACQUISITION AND INTERPRETATION



NATIONAL GEOPHYSICAL RESEARCH INSTITUTE
 (COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH)
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**MAGNETOTELLURICS – APPLICATION TO RESOURCE
EXPLORATION, STUDIES OF CRUST / LITHOSPHERE,
IMPROVEMENT OF TECHNIQUES OF DATA
ACQUISITION AND INTERPRETATION**

PROJECT COMPLETION REPORT

Project No.: MLP-4103-28(THN)

PI: Dr. T.Harinarayana

For the period 01-04-2003 – 31-03-2007

THIS REPORT IS DEDICATED

to

**SRI. G. VIRUPAKSHI,
Scientist – Director's Grade
Magnetotelluric Division, superannuating on 30th June, 2009**

**NATIONAL GEOPHYSICAL RESEARCH INSTITUTE
(Council of Scientific & Industrial Research)
HYDERABAD
INDIA**

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EXECUTIVE SUMMARY

As a part of the project related to application of magnetotellurics for resource exploration and studies of crust/lithosphere and improvement of techniques of data acquisition and interpretation, the research work and field studies carried out during the years 2003-2007 have been compiled and presented in this report. The results derived from eight major sub-projects undertaken have been summarized and presented.

One of the major area of research is related to geothermal exploration in one of the most difficult terrain of Himlayas, namely, the Puga region in Ladakh District, Jammu and Kasmir. The region is located about 4500 meters above mean sea level. A total of 35 stations have been occupied along 3 parallel profiles in EW direction using broad band digital magnetotelluric system. From 1D and 2D modeling of the data, a large deep anomalous conductivity anomaly from 2 km to 7 km has been delineated with estimated temperature of the order of 250-260° C.

As a part of OI DB integrated geophysical project, a complex area in central India, namely the Narmada-Cambay region has been investigated by magnetotellurics. The occupied area covers Cambay towards west and Narmada-Tapti towards east. A total of 511 broad band stations have been occupied in a near grid fashion. The subsurface sections derived from MT has also been integrated with other geophysical techniques. Based on the results derived, a large sub-trappean sedimentary basin feature is delineated towards NW, SE part of the study area. This region has been selected by DGH, New Delhi under NELP rounds for further exploration for hydrocarbons.

In order to solve the geoenvironmental problem in Himalayas for WAPCOS/NTPC, Lohari-Nag pala and Tapovan-Vishnugad region has been selected. The engineering problem is interference of the geothermal water and its possible interference during the tunneling for hydropower generation. A few selected traverses have been laid and MT stations have been occupied and the analysis of data has revealed high conductive, medium conductive and low conductive regions. Assuming that hard rocks are low conductive and fractured rocks or rocks filled with hot water are high conductive, different zones are demarcated and provided to the sponsoring agencies. This information is very much useful to them to take extra care during the tunnel excavation and construction.

Manabhum area in Arunachal Pradesh is one of the logically difficult terrain and also complex geological structure due to thrustal tectonic features. Presence of large boulders at subsurface depths poses many problems to seismic exploration. Magnetotelluric studies supported by Oil India Limited, three traverses have been occupied in the area using wide band MT data acquisition system. Geoelectric subsurface section along these profiles have provided marked boundaries between various sedimentary formations – Namsang, Tippam, Girijun etc., sedimentaries with basement depths extending to 6-7 km.

To understand the deep geoelectric structure in Sikkim Himalayas, 14 wide band MT soundings have been taken up from Siliguri-Gangtok in Higher Himalayan region. The traverse cutting across major tectonic features such as MCT, MBT etc. The upper crust below MCT has not shown anomalous features, but it is moderately conductive from a depth of 5 km. Higher Himalayan crystallines have exhibited high resistivity of the order of 1000 Ohm.m. The traverse overlaps with 100 line MT traverses of INDEPTH in Tibet and thus provided an opportunity to understand the regional tectonics in the area.

CONTENTS

- I. MAGNETOTELLURICS STUDIES IN PUGA GEOTHERMAL REGION, LADAKH DISTRICT , JAMMU AND KASHMIR , INDIA**
- II. EXPLORATION OF SUB-TRAPPEAN MESOZOIC BASINS IN THE WESTERN PART OF NARMADA-TAPTI REGION OF DECCAN SYNECLISE**
- III. MAGNETOTELLURIC AND GEOTHERMAL INVESTIGATIONS IN TAPOVAN- VISHNUGAD HYDROELECTRIC POWER PROJECT, UTTARANCHAL**
- IV. MT STUDIES IN BADRINATH- TAPOVAN GEOTHERMAL REGION, UTTARANCHAL**
- V. AGNETOTELLURIC SURVEY IN THE MANABHUM AREA, ARUNACHAL PRADESH, INDIA**
- VI. MAGNETOTELLURICS AND GEOTHERMAL INVESTIGATIONS IN LOHARINAG–PALA HYDRO POWER PROJECT, UTTARACHAL**
- VII. MAGNETOTELLURIC INVESTIGATIONS ALONG SILIGURI-GANGTOK-LACHUNG PROFILE IN SIKKIM-HIMALAYAS, INDIA.**
- VIII. MAGNETOTELLURIC INVESTIGATIONS IN ANTARCTICA FOR DEEP CRUSTAL STRUCTURE.**

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| PROJECT COMPLETION REPORT | | |
| <p><u>Project Title:</u></p> <p>MAGNETOTELLURICS – APPLICATION TO RESOURCE EXPLORATION AND STUDIES OF CRUST/LITHOSPHERE AND IMPROVEMENT OF TECHNIQUES OF DATA ACQUISITION AND INTERPRETATION</p> | Project No.: MLP-4103-28(THN) | |
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| <p><u>Project Team Members:</u></p> <p>T.Harinarayana, Project Leader G.Virupakshi R.S.Sastry D.N.Murthy M.Someswara Rao M.V.C.Sarma Madhusudhan Rao S.Prabhakar E.Rao K.Veerawamy B.P.K.Patro C.Manoj K.Naganjaneyulu K.K.Abdul Azeez Kareemunnisa Begum</p> | Date of Completion: 31-3-2007 | |
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| <p>Customer/Client's name and address for Externally funded projects /Name of Agency in case of GIA projects:</p> <p>I MT studies in Puga geothermal region Director, M.N.E.S., New Delhi – 110003</p> <p>VI MT studies in Narmada-Cambay region Director General, Directorate General Of Hydrocarbons, Hindustan Times Building, New Delhi – 110001.</p> <p>III. Magnetotelluric and geothermal investigations in Tapovan-Vishnugad hydroelectric power project, Uttaranchal WAPCOS (Water and Power Consultancy Services , India Ltd, New Delhi)</p> <p>IV. MT studies in Badrinath- Tapovan geothermal region, Uttaranchal Director, M.N.E.S., New Delhi – 110003</p> <p>V. Magnetotelluric survey in the Manabhum area, Arunachal Pradesh, India. Oil India Limited, Duliajan, Assam</p> <p>VI. Magnetotellurics and geothermal investigations in Loharinag –Pala hydro power project, Uttarachal WAPCOS (Water and Power Consultancy Services , India Ltd, New Delhi)</p> <p>VII. Magnetotelluric investigations along Siliguri- Gangtok-Lachung profile in Sikkim-Himalayas, India Director, Dept. of Science & Technology (DST), New Delhi</p> <p>VIII. Magnetotelluric investigation in Antarctica for deep crustal structure D.G, DOD, New Delhi Director, NCAOR, Goa</p> | <p>Classification:</p> <p>In-house Grant-in-Aid Sponsored Consultancy Collaborative</p> |
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