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Palaeoscars and landslide prediction using 2D ERI techniques in Ooty area, Nilgiri district, Tamilnadu

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ABSTRACT

The landslide is one of the major disaster problems in Nilgiri Plataue in the part of Ooty region Kakachi, Billimalai, Padukadu and Karadicut. The soil flow, mudflow and rock fall is common sliding fromed by heavy rainfall and easily weathered rock of Archaen gneiss. The groundwater is taken as the major role for the sliding. 2D Electrical Resistivity Imaging (ERI) investigation is suitable method to identify the landslide prone zone and palaeosliding in the study area. 2D ERI with Wenner array was conducted for landslide prediction. The use of 2D ERI technique to distinguish the water bearing weathered zone, lithomorgic clay, weathered gneissic rock. The elevation n survey conducted using total station. The study area soil and rock mass sliding, toe slides,rock mass sliding in the studyarea due to high rainfall and seismic activity . The case study focuses in the palaeoslides and with the related upcoming landslides in the study area. The resistivity image obtained from the Res2DINV software is used for the prediction of landslide in Ooty, Nilgiris area.

Key Words: Landslide prediction, Palaeo landslide, 2d ERI, Resistiviy, Nilgiri Platue, Ooty, Pseudosection.

INTRODUCTION

The Ooty is formed in the high range of Western Ghats are known to be susceptible to landslides. This disaster cause was affected in damage to life and properties of Ooty living people. The Nilgiri Plateau is falling down stream such as bhavani, Moyar, Katteri, Connor, Kundah and Billithada halla. The major landslide are happened in the stream path. The geologically formation of study area consist of Archean metamorphic rocks which include charnockite, biotite gneiss, laterite and lithomorgic clay. The tectonic activity was occurred in the Precambrian

period. The Predominent lineaments identified are east-noth-east parallel to the river. The study area is Kakachi, Bhrathinagar N 11º19’24.0”-E 76º44’26.3”), Billimalai estate (N11º19’43.8”-E76º45’18.5”), (N11º19’43.5”-E76º45’19.8”) Padukadu estate (N11º19’46.6”-E76º44’49.9”) Padukadu estitate -Near sivankovil N11º19’54.2” - E76º44’56.0”, Barar Kardicut N11º29’18.3” - E76º45’35.9”). The area is mainly composed bands of charnockites, garnetifereous biotite gneiss with enclaves of basic granulites and calc-granulites of Proterozoic age [6].

DATA acquisition

The data collection in paleoscar and landslide prone area by using topographic survey is carried out in the selected four landslide zones. The 2D Electrical Resistivity Imaging date were collected from the field using CRM -500 resistivity meter, Multicore cable, electrodes, switch panel and Res2DINV software [1]. 2D Geoelectrical Resistivity Imaging (Tomographics) study has been conducted in selected landslide zones. They are Kakachi, Billimalai estate, Padukadu estate, Kardicut, area covered to findout some upcoming landslide prone zone (Fig.1).

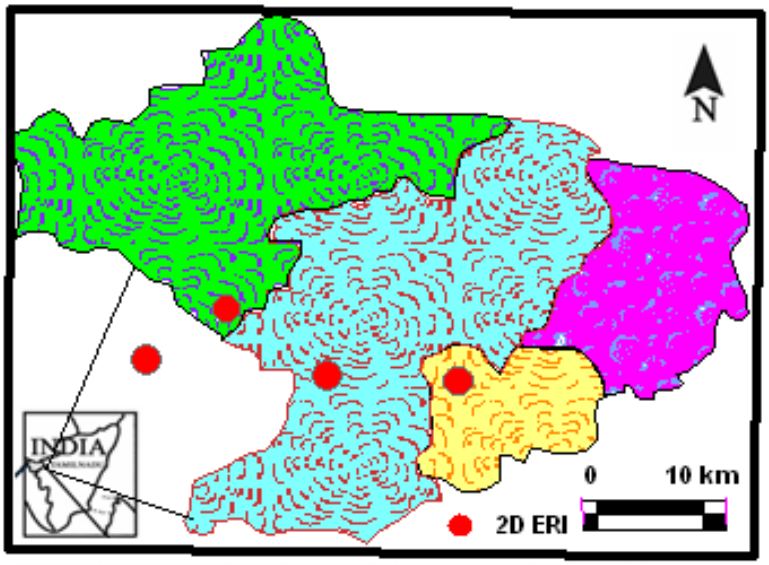

Fig. 1. Location map of the study area.

The main objective of the study is based on the lateral and depthwise extension of the landslide palaeoscar places studied area by using a tool of 2D electrical resistivity imaging method. Among the four 2D electrical resistivity imaging profiles to a lengths of 90m,75m,50,70m,65m,70m and 100mm with different orientations were carried out across the palaeoscar places in Nilgiris.

Data Processing

The imaging pseudo section is constructed on the basis of the apparent resistivity data and provides a simple image. It is not representing the true distribution of intrinsic resistivity and gives a very approximate picture of the true subsurface resistivity [4],. The Gauss-Newton is the popular general geophysical inversion technique [3]. This technique has developed a fast and versatile implementation of the smoothness - constrained least squares inversion water bearing

slope stability [5],[7] and [2]. This inversion technique is a powerful and effective means of processing pseudosection by using RES2DINV Ver.3.56 Software, by which the contoured image of true depth and formation resistivities are prepared.

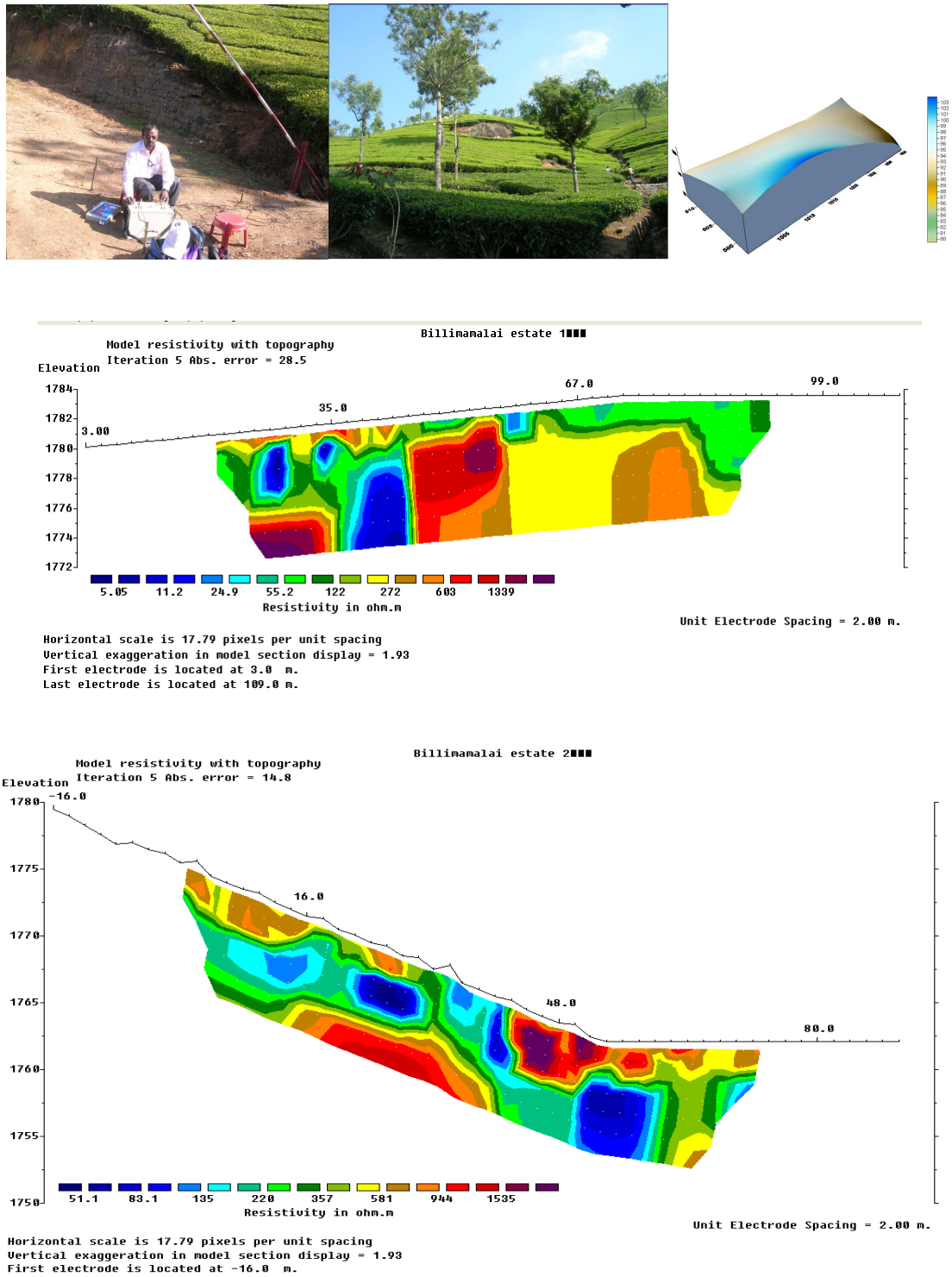

Fig.2. show the field data collection photos, elevation map and 2D profile 1&2 in Billimalai estate, Nilgiri District

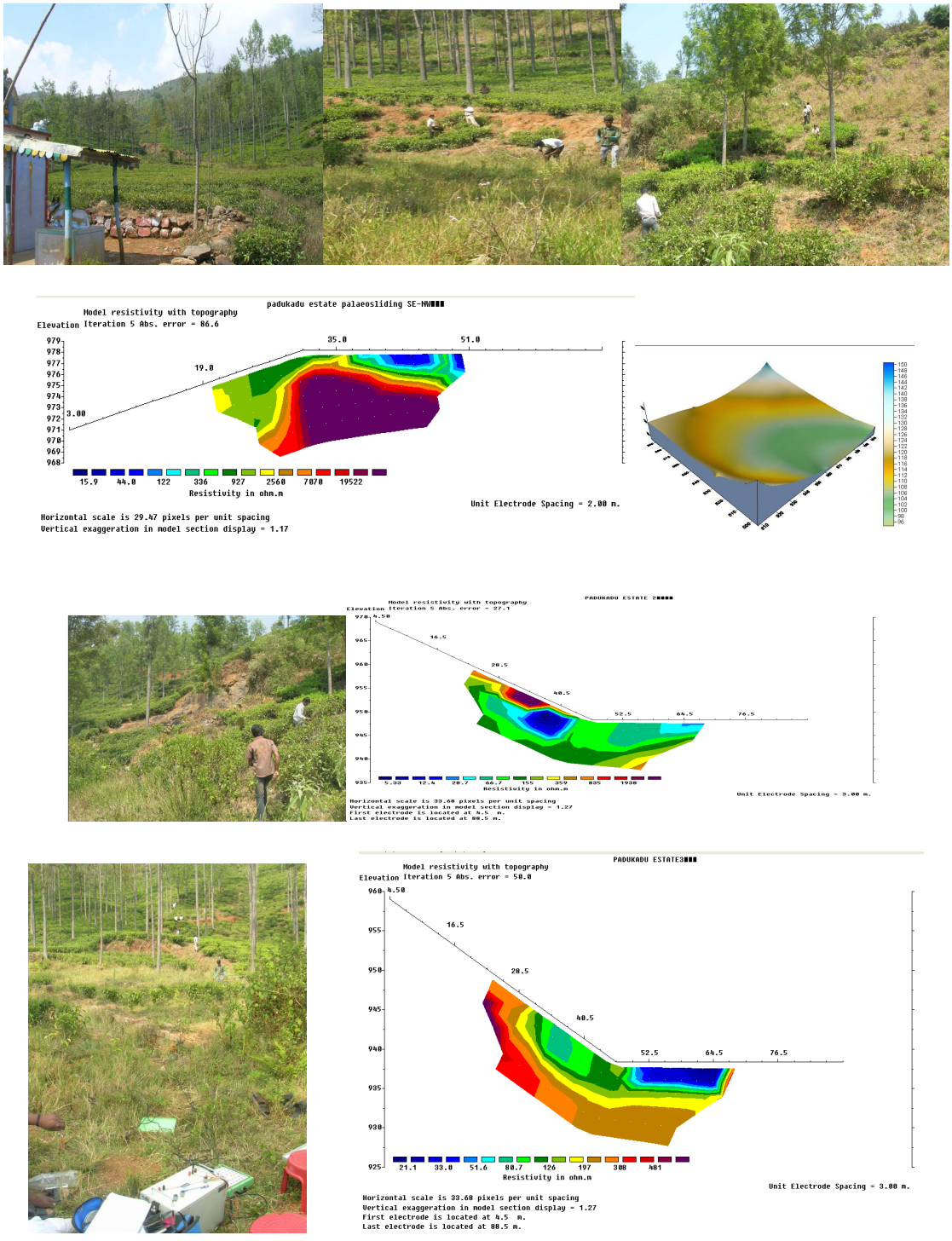

Fig.3. show the field data collection photos, elevation map and 2D profile 1,2 & 3 in Padukadu estate, Nilgiri District

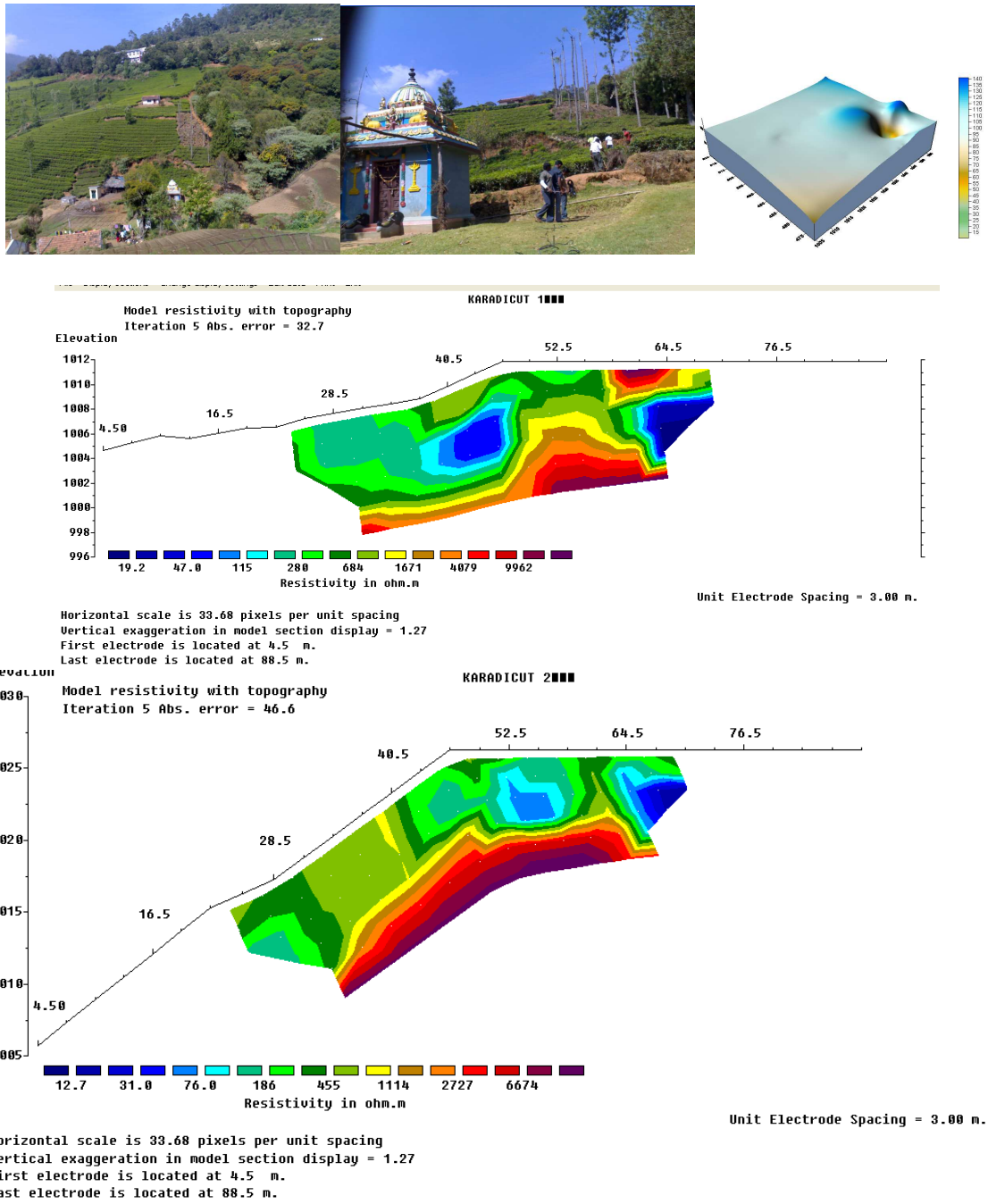

Fig.4. show the field data collection photos, elevation map and 2D profile 1&2 in Karadicut area, Nilgiri District

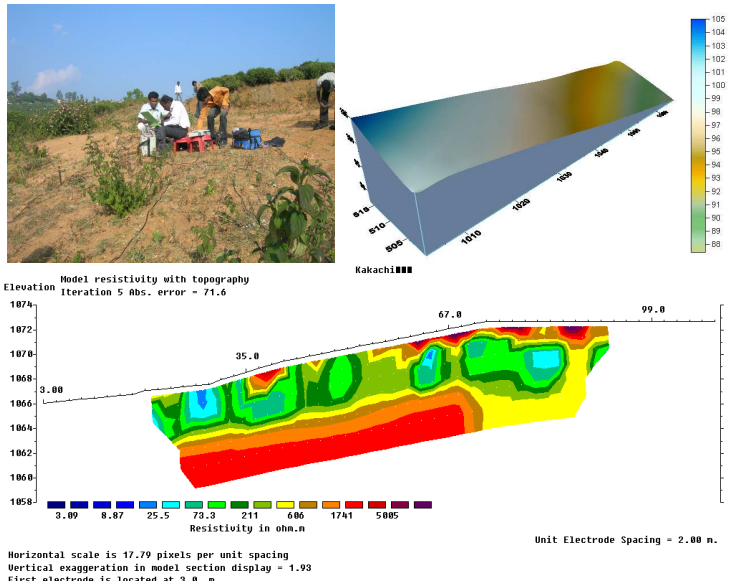

Fig.4. show the field data collection photos, elevation map and 2D profile 1 at Kakachi, Nilgiri District

2D electrical resistivity imaging pseudosection

Billimalai Estate:

The inversion resistivity section in billimalai estate along length is 75m and elevation of 1755-1780m in Fig.2 (profile 1&2). The high resistivity zone indicates the presence of charnockite beds (1538 ohm.m) and the low resistivity zone (5-51 ohm.) indicates the presence of the weathered gneiss with lithomorgic clay. The profile2 is covered a length of 90m, depth of 1772-1789m. The high resisivity zone is (272-13379 ohm.m) indicate charnockite gneiss and low resistivity zone (1-51 ohm.m) lithomorgic clay.

Padukadu Palaeoslides:

The profile Padukadu estate (Fig.3) length of 50m,65m and 70m and depth of 968-979m,935-978 and 925-960m (Fig.3) embody the lithomorgic clay with low resistivity that ranging from 5-50 Ohm.m. The basin like weathered gneiss rock formation ranges of resistivity from 283 to 50-100 Ohm.m.

Karadicut:

The Karadicut (Fig.4) clearly shows the occurrence of these palaeoscar and landslide prone zone as revealed by the pseudosections. The coverage of profiles length of 70m, and elevation is 996m-1012, 1005-1030m in the study area. The paleoscar is idenfied in the zone were identified low resistivity from 1-50 Ohm.m. The high resistivity zone indicates (200-6674 ohm.m) are indicate charnockite.

Kakachi:

The Kakachi (Fig.4) transeverse section of length is 100m. The elevation is range 1058-1074m. The low resistivity the soil coverage of 3-25ohm.m and 25-100 ohm.m indicate weathered zone, and upper layer of ohm.m indiacate the charnockite rock.The Kakachi (Fig.4) the low resistivities are indicated as water bearing zone. The Chanokite rocks are identified with high resistivity from1200-5005Ohm.m.

CONCLUSION

The 2D Electrical Resistivity Imaging technique is used to demarcate palaeoscar and prediction of landslides in the study area. The lithomargic clay and weathered zone was clearly delineated for their lateral and depth wise extension by the resistivity contrast technique from the pseudosections. The fulfilled details of landslide pronezone are explored from the resistivity image pesudosection contrast. The Karadicut and Padukadu estate is identified a critical landslide zone. The 2D ERI (Electrical Resistivity Imaging) study is used for the landslide prone zone in the Nilgiri Distict, Tamilnadu.

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