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TERRESTRIAL HEAT FLOW STUDIES IN ARIZONA

QUARTERLY TECHNICAL PROGRESS REPORT
FOR PERIOD 31 JANUARY 1978 TO 1 MAY 1978

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Abstract

During this quarterly reporting period, ten temperature logs satisfactory for heat flow analysis were obtained. Two logs measured in northwest Arizona have temperature gradients of about $50^{\circ}/\text{km}$. A deep temperature log obtained in extreme southwest Arizona has a gradient of $38^{\circ}\text{C}/\text{km}$. Data in south-central Arizona suggest a region of heat flow slightly above normal for the Basin and Range.

Introduction

This report presents the work performed under U. S. Department of Energy Contract ET-76-S-04-3721 from receipt of the contract on 31 January 1978 to 1 May 1978. The receipt of this contract began Phase II of the project. Phase I had terminated 30 September 1977.

A summary of work for this quarterly reporting period is presented and a discussion of the data is given. Future work planned for the project is outlined.

Summary of Work

The project for this quarterly reporting period has been primarily field effort. Sufficient contact with industrial groups had been maintained since termination of Phase I to allow the field work to be restarted immediately upon receipt of the contract.

Five field trips, totaling 59 field days, were made during this quarter. Ten of twelve temperature logs obtained are satisfactory for heat flow analysis. These ten temperature logs represent nine new locations in northwest and southwest Arizona.

Geologic information and lithologic samples were obtained for 19 drill holes. The majority of these drill holes were logged during Phase I of the contract. Preparation of these samples for thermal conductivity measurements has begun.

After tests indicated a fracture in the crystal detector used in the gamma-ray spectrometry lab, a replacement NaI detector was purchased. Standards acquired in the past will provide for the recalibration required by installation of this new component.

Discussion

A drill hole northwest of Kingman, Arizona, was logged to a depth of 890 m and has an indicated temperature gradient of less than $30^{\circ}\text{C}/\text{km}$. This drill hole is about 1.3 km distance from a drill hole earlier logged to 290 m with a similar temperature gradient.

Temperature logs were measured in two drill holes about 10 km apart and less than 20 km from the Coffers Hot Springs near Wikieup, Arizona. The temperature gradients in both drill holes are about $50^{\circ}\text{C}/\text{km}$.

A drill hole in extreme southwest Arizona was logged to a depth of 830 m. The temperature gradient from 450 m to 830 m is $38^{\circ}\text{C}/\text{km}$. However, the indicated temperature gradient from 100 m to 250 m is $9^{\circ}\text{C}/\text{km}$. This temperature gradient is similar to gradients measured in shallow holes in the area by the Bureau of Reclamation office in Yuma, Arizona. The very low temperature gradients indicated at shallow depths are most likely due to ground-water movement.

Three drill holes south of Ajo, Arizona, were logged to depths of 440 m, 540 m, and 690 m. The temperature gradients are about $30^{\circ}\text{C}/\text{km}$. A fourth mineral test hole about 30 km southeast of Ajo has a temperature gradient of about $47^{\circ}\text{C}/\text{km}$. This drill hole was logged to a depth of 230 m. The lithologies penetrated by these drill tests would seem to indicate heat flow values slightly greater than 2.0 HFU. Temperature gradients measured in two water wells about 50 km north of Ajo are about $50^{\circ}\text{C}/\text{km}$ and $40^{\circ}\text{C}/\text{km}$. These logs were made to depths of 180 m and 120 m.

A heat flow value of 2.4 HFU for a location about 35 km southeast of Ajo has been published (Roy, R. F., Decker, E. R., Blackwell, D. D., and Birch, F., 1968, Heat flow in the United States, Journal Geop. Res., v. 73, pp. 5205-5221). Data available thus far would seem to indicate a region in south-central Arizona having a heat flow somewhat above normal for the Basin and Range.

Projected Work

Concentration on field work will continue for about the next eight weeks. After that time the main effort will be directed toward making thermal conductivity and gamma-ray spectrometry measurements in the laboratories.

Presently planned field work is in southwest Arizona and in the mountain region of east-central Arizona. Additionally, a set of drill holes in central Yavapai County is to be logged. Heat flow values for this location would provide more data for the geothermal profile across the Basin and Range-Colorado Plateau transition acquired during Phase I of this contract.

DOE Contract ET-76-S-04-3721

Project Expenditures From 31 January 1978 to 1 May 1978

A. Personnel

Principal Investigator \$ 945.00

Graduate Student 1733.33

B. Fringe Benefits 181.00

C. Expendable Supplies

Laboratory Supplies

Bicron Model 3M3/3P Scintillation
Detector Assy. 900.40

Materials 82.45

Field Supplies 45.26

D. Field Expenses

Vehicle 2697.25

Personnel Living Costs 2096.42

E. Indirect Costs

Overhead 1763.33

Total Expenditures \$10,444.44