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TERRESTRIAL HEAT FLOW STUDIES IN ARIZONA

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

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Abstract

During this quarterly reporting period, three temperature logs were obtained which are satisfactory for heat flow analysis. A temperature log in central Yuma county in southwestern Arizona has a temperature gradient of about $74^{\circ}\text{C}/\text{km}$. A temperature log measured to a depth greater than a kilometer in the Gila Mountains near Safford, Arizona, has a temperature gradient of about $35^{\circ}\text{C}/\text{km}$.

Introduction

This report presents the work performed under U. S. Department of Energy Contract ET-76-S-04-3721 from 1 May 1978 to 31 July 1978. A summary of the work is presented with a discussion of the data. Future work for the project is outlined.

Summary of Work

Two field trips were made during this reporting period. Twelve drill sites were visited and three temperature logs were successfully measured.

Thermal conductivity samples for a number of drill tests are under preparation. Several sets of thermal conductivity samples are ready for thermal conductivity measurements.

The initial recalibration of the gamma-ray spectrometer has been accomplished. A new crystal detector was purchased during the previous quarter period. Furthermore, the analyzer system had been completely rebuilt by the manufacturer in late 1977. Therefore a calibration of the entire gamma-ray spectrometry system was made necessary. The initial steps of this calibration were performed using standards acquired in the past. The sensitivity of the system to room temperature extremes prevented a complete calibration. A heat pump was purchased and installed in the spectrometry laboratory. In anticipation of the measurements to be made with the gamma-ray spectrometer, 25 new sample containers were constructed.

Discussion

A mineral test well in central Yavapai county, about 25 km southeast of Prescott, Arizona, was logged to a depth of 110

meters. The indicated temperature gradient is $20^{\circ}\text{C}/\text{km}$. The predominant rock type in the area is a schist. Thus, a tentative analysis of the data would indicate a heat flow below normal for the Basin and Range. Lithologic samples from the drill hole will be obtained for thermal conductivity measurements. This data site is about 20 km southeast of a geothermal profile across the Basin and Range-Colorado Plateau transition indicated by data obtained earlier in this study and so should help further define this geothermal transition.

A dry water well located about 85 km north of Yuma, Arizona, was logged to a depth of 310 m. The temperature gradient in the bottom part of the well is about $74^{\circ}\text{C}/\text{km}$. Because the temperature log was taken entirely in air and because the depth to water is not known in the area, it is difficult to speculate on the possibility of a hydrothermal system at some depth below 300 m.

A mineral test hole located in the Gila Mountains northeast of Safford, Arizona, was logged to a depth of 1100 m. The temperature gradient is about $35^{\circ}\text{C}/\text{km}$ in the lower 200 m of the well. This data would seem to agree with the interpretation of earlier data in the Gila Mountains as suggesting the absence of a shallow, thermal source beneath the Gila Mountains and that the hot springs and warm water wells in the adjacent Safford Valley are probably caused by hydrothermal ground-water circulation along faults.

Projected Work

The project effort will be concentrated toward making thermal conductivity and gamma-ray spectrometry measurements in the laboratories. The thermal conductivity samples presently ready for measurements should enable the determination of several heat flow values in the next eight weeks.

DOE Contract ET-76-S-04-3721

Project expenditures from 1 May 1978 to 31 July 1978

A. Personnel

Principal Investigator \$ 708.75

Graduate Student 2166.67

Student Assistant 320.00

B. Fringe Benefits 135.75

C. Supplies

Laboratory Supplies

Heat pump 569.25

Materials 27.86

Field Supplies 40.04

D. Field Expenses

Vehicle 798.25

Personnel Living Costs 726.00

E. Indirect Costs

Overhead 1322.50

Total Expenditures \$6815.07