United States Department of the Interior

Geological Survey

Airborne gamma-ray spectrometry and aeromagnetic survey of part of the Southern Powder River Basin in Converse County, Wyoming

Open-File Report

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by

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This report is preliminary and has not been edited or reviewed for conformity with U.S. Geological Survey standards and nomenclature.

Contents

List of Illustrations

Introduction

The base map (Plate 1), Bismuth^{214} contour map (Plate 2), ratio Bismuth^{214} to Thallium^{208} contour map (Plate 3), and the profiles for map line 1 (Plate 4) described in this report were obtained from an airborne gamma-ray spectrometry and aeromagnetic survey conducted by Geodata International, Inc. on June 21 and July 31, 1975. The project area covered a portion of the southern Powder River Basin from T.34N. to T.39N. and from R.71W. to R.74W. in Converse County, Wyoming. The profiles for map line 1 (plate 4) are included in this report to demonstrate the type of data offered for every flight line.

Survey

A total of 29 flight lines covering 1,015 square miles (2,639 km^2) were flown at 3/4-mile spacing north of Douglas, Wyoming shown in Figure 1. Each flight line is approximately 35 miles (56 km) long and was flown in a north-south direction. Two tie lines approximately 22 miles (35.2 km) long were flown perpendicular to the survey lines. During the survey the aircraft maintained a nominal altitude of 400 feet above ground level.

Purpose

The survey is part of a U.S. Geological Survey program of geophysical investigations of the Powder River Uranium District in Wyoming. The gamma-ray spectrometry data were obtained to monitor the radioactive signatures of known, near-surface ore zones, and of the surrrounding geological units. The units range in age from Cretaceous Lance Formation to Oligocene White River Formation.

The geology used for the base map (Plate 1) was taken form Sharp, W.N., and Gibbons, A.B., 1964, Geology and uranium deposits of the southern part of the Powder River Basin, Wyoming: U.S. Geol. Survey Bull. 1147-D, 60 pages.

The aeromagnetic data were acquired in order to examine the spatial distribution of both shallow and deep contributions to the local magnetic field.

System

The spectrometric data were collected utilizing a high sensitivity gamma-ray spectrometer with nine 11 1/2 in.-diameter by 4 in.-thick NaI detectors, each having a volume of 415 cubic inches (6,800 cm^3). Corrections were made for altitude, airspeed, and cosmic radiation. A $\pm$0.5 gamma proton precision magnetometer was used to measure the earth's magnetic field once every second.

Preliminary Observations

Geodata International, Inc. produced the contour maps with a square grid system, at a 3/8-mile (0.6 km) interval which necessitated the use of an interpolated flight line between each of the actual flight lines. This procedure resulted in additional contour lines plotted between flight lines.

When overlaying Plate 2 or Plate 3 onto Plate 1, it can be noted that the dominant radioactive highs correspond to uranium mines and mine pits. Humble's mill is located in sec. 20, T.36N., R.72W. Kerr McGee's shaft is located in sec. 36, T.36N. R.74W. Both of these features are expressed as highs on the two contour maps.