

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Preliminary contour maps of gamma-ray
spectrometric and aeromagnetic survey of the
Freer area in Duval, Live Oak, McMullen,
and Webb Counties, Texas

By
Karen A. Schulz

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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.

Survey Description

Plates 1 through 8 presented in this report display contoured aeroradiometric and aeromagnetic data acquired for the U.S. Geological Survey by Geodata International, Inc. These data were partially presented in Open-File Report 75-294 in June 1975, entitled "Airborne gamma-ray spectrometry and aeromagnetic survey of the Freer area in Duval, Live Oak, McMullen, and Webb Counties, Texas." That report provided a base map with flightline paths, contour maps of bismuth²¹⁴ and of the ratio bismuth²¹⁴ to thallium²⁰⁸, and profiles for flightline 1 including bismuth²¹⁴, thallium²⁰⁸, potassium⁴⁰, total count, altitude, and magnetic data. Plate 9 of this report is a preliminary geologic map compiled from preliminary mapping by the Texas Bureau of Economic Geology, as presented in ERDA's report GJO-1632, from Open-File Reports 74-41, 74-42, 74-43, 74-44, and 74-45 by Eargle and Dickinson, from down-hole log information, and from unpublished work maps by D.Hoye Eargle.

The aeromagnetic and high sensitivity aeroradiometric data were obtained continuously along flightlines spaced at 1.6 kilometre intervals. The flightlines were oriented northwest-southeast at an angle of about 34 degrees west of north. Fifty-two lines 40 kilometres long were flown, resulting in 2080 kilometres of data. The nominal altitude of the aircraft during the survey was 120 metres above the ground surface.

The radiometric data were measured using eight NaI(Tl) detectors. The detectors were right cylinders 29.2 centimetres

in diameter and 10.2 centimetres thick, and the total detector volume was 54400 cubic centimetres. An additional NaI(Tl) detector with the same dimensions of the other eight detectors was shielded from the ground radiation by about 10 centimetres of lead. This detector was used to monitor bismuth²¹⁴ in the atmosphere.

The total magnetic field data were measured using a proton precession magnetometer towed 30 metres below the aircraft. The magnetometer had a ± 0.5 gamma precision. A radar altimeter was used to measure the altitude of the aircraft above the ground surface. The aircraft location was determined from the output of a doppler radar navigation system with a cross check provided by a 35 mm film with pictures of the ground below the aircraft. One picture was taken every three seconds, and at a nominal airspeed of 192 kilometres per hour, each picture had a 15 to 20% overlap with the previous and succeeding pictures.

Data Manipulation

Before contouring, various corrections were applied to the data. Background counts due to cosmic rays, aircraft contamination and airborne bismuth²¹⁴ were subtracted from the observed radiometric count rates. The counts due to cosmic rays were determined by monitoring the gamma-ray spectrum from 3.0 MeV to 6.0 MeV. The aircraft contamination was measured by flying at altitudes in excess of 1000 metres where ground radiation was negligible.

The regional magnetic field was calculated using the

spherical harmonic expansion given by Cain, et.al.(1968) and was removed from the magnetic data. Corrections for diurnal changes in the magnetic field were determined from the data of the magnetic observatory in the U.S. Geological Survey at Dallas, Texas.

In contouring the data a grid size of 400 metres was used. The radiometric data were smoothed with a nine point sliding average before contouring, and the magnetic data were smoothed with a thirty-one point sliding average.

Exact locations of any given point on the radiometric maps may be in error of as much as 0.4 metre. Error is a direct result of the gridding and contouring processes, and in general, all locations should be considered correct only to a tolerance of ± 0.4 metre.

References cited

- Cain, S.J., 1968, Computation of the main geomagnetic field from spherical harmonic expansions: U.S. National Aeronautics and Space Administration, Data Users' Note NSSDC 68-11.
- Eargle, D.H., and Dickinson, K.A., 1974, Preliminary geologic map of the Freer NW quadrangle, Duval County, Texas: U.S. Geol. Survey Open-File Rept. 74-41.
- _____ 1974, Preliminary geologic map of the Freer NE quadrangle, Duval County, Texas: U.S. Geol. Survey Open-File Rept. 74-42.
- _____ 1974, Preliminary geologic map of the Freer SW quadrangle, Duval County, Texas: U.S. Geol. Survey Open-File Rept. 74-43.
- _____ 1974, Preliminary geologic map of the Freer SE quadrangle, Duval County, Texas: U.S. Geol. Survey Open-File Rept. 74-44.
- _____ 1974, Preliminary geologic map of the Parrilla Creek NW quadrangle, Duval County, Texas: U.S. Geol. Survey Open-File Rept. 74-45.
- Schulz, Karen A., 1975, Airborne gamma-ray spectrometry and aeromagnetic survey of the Freer area in Duval, Live Oak, McMullen, and Webb Counties, Texas: U.S. Geol. Survey Open-File Rept. 75-294.
- U.S. Energy Research and Development Administration, 1975, Gamma radiation spectral survey of the Jackson/Goliad Formations in Texas: ERDA Open-File Rept. GJO-1632.

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