37. SITE 145

Arthur Raff, Scripps Institution of Oceanography, La Jolla, California

INTRODUCTION

One of the most obvious characteristics of the central Venezuelan Basin is the extremely smooth bottom topography, which is concordant with the smooth, featureless subbottom reflectors, Horizons A″ and B″ (Ewing, J. et al., 1965). A few isolated knolls or small seamounts have been discovered; one of these was crossed in the northern part of the basin by HMS *Vidal*, working in cooperation with the Lamont-Doherty Geological Observatory. This knoll was selected by the Atlantic Advisory Panel to be the first site drilled on Leg 15. The objective at this site was to determine the nature of the knoll with the hope of recovering cores characteristic of deeply buried rock.

The location of the knoll had been established by celestial fixes; consequently a survey (see Figure 1) was conducted by the *Glomar Challenger* using a 12 kHz sounder, magnetometer, and seismic reflection system in order to locate it. Unfortunately the ship's bow thrusters failed before the hole had been started and the vessel had to go to drydock in Curacao to make repairs. The site was never drilled, but the survey data, particularly the magnetics, are pertinent to major objectives of the cruise.

The drilling results from the other sites on Leg 15 show that the geologic section down to Horizon A″ (Early Eocene) is composed predominantly of soft pelagic ooze, and that from Horizon A″ and B″ it is generally a hard limestone. Horizon B″ itself is correlated with the first encounter with dolerite. Penetration into the dolerite never exceeded a few meters. Processed seismic reflection data indicate the presence of reflectors below Horizon B″ (Eaton and Driver, 1969).

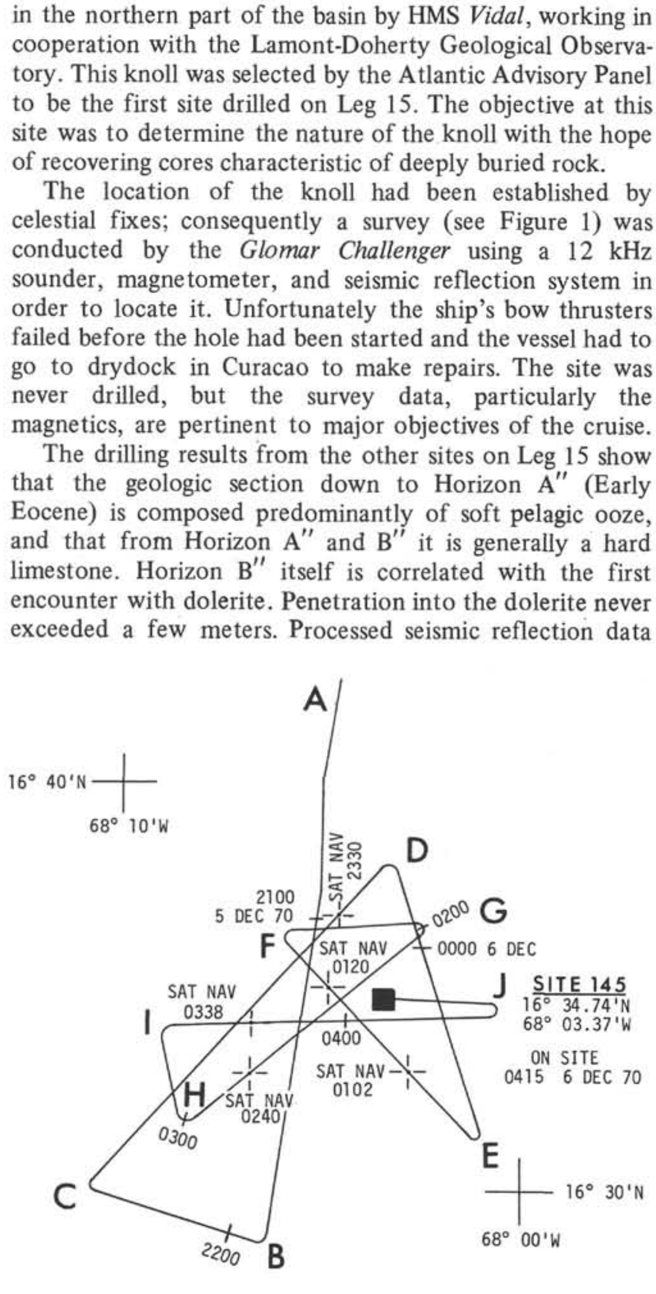

Figure 1. *Survey track chart of the knoll made by the* Glomar Challenger.

SURVEY DATA

The average water depth in the area of the knoll is about 4390 meters (uncorrected) and the knoll itself has a relief of about 238 meters. The seismic profile (Figure 2) indicates that the portion of the knoll above the surrounding topography consists entirely of ooze. The thickness of the sediment above the first subbottom reflector beneath the crest of the knoll is equivalent to the thickness of sediments overlying Horizon A″ in the surrounding area, and in some crossing it is the deepest reflector recorded. The crossing between points E and F on Figure 2 shows two reflectors separated by about 0.1 sec (reflection time) of acoustically transparent sediment; the deeper one appears to be flat. It is of particular interest to note that although the post-Horizon A″ sediments are present, none, or very little, of the A″ to B″ sediments are present.

The nature of the knoll below the deepest reflector is investigated in terms of the magnetic anomaly pattern, contoured with bathymetry in Figure 3. Richard Jarrard of Scripps Institution used an existing program to compute the magnetic anomaly for a number of realistic three-dimensional shapes based on seismic profiler data.

The shape giving the closest fit to the measured anomaly is the same as that shown as "good fit" in the profile of Figure 4 except that its base is 5800 meters, seemingly unrealistic. The lowest likely base level for Horizon B″, 5480 meters, gives an almost equally good fit.

This "good fit" body has a uniform magnetization of 0.022 cgs units (2200 gammas/cm^3) with a declination of 170° and with a magnetic dip of minus 6.7°. (This magnetic declination and dip are for a simple dipole field that is symmetrical about the earth's spin axis and equator.) The fit to the measured magnetic anomaly is excellent compared to that for most computed seamounts. The location of the virtual geomagnetic pole is at 149.3°E and 73.6°N, which is near the North American Cretaceous magnetic pole.

CONCLUSIONS

The limited geophysical data indicate that the knoll was formed during the Cretaceous, that it is reversely magnetized, and that it was formed at a latitude of about 3.3°N which would require 13° of northward migration for it to reach its present location.

REFERENCES

Eaton, J. and Driver, E., 1969. Geophysical investigation in the eastern Caribbean: Curacao Ridge to Barbados (abstract). Trans. Am. Geophys. Union. **30**, 208.

Ewing, J., Talwani, M. and Ewing, M., 1965. Sediment distribution in the Caribbean Sea. Fourth Caribbean Geol. Conf. Trinidad, 317.

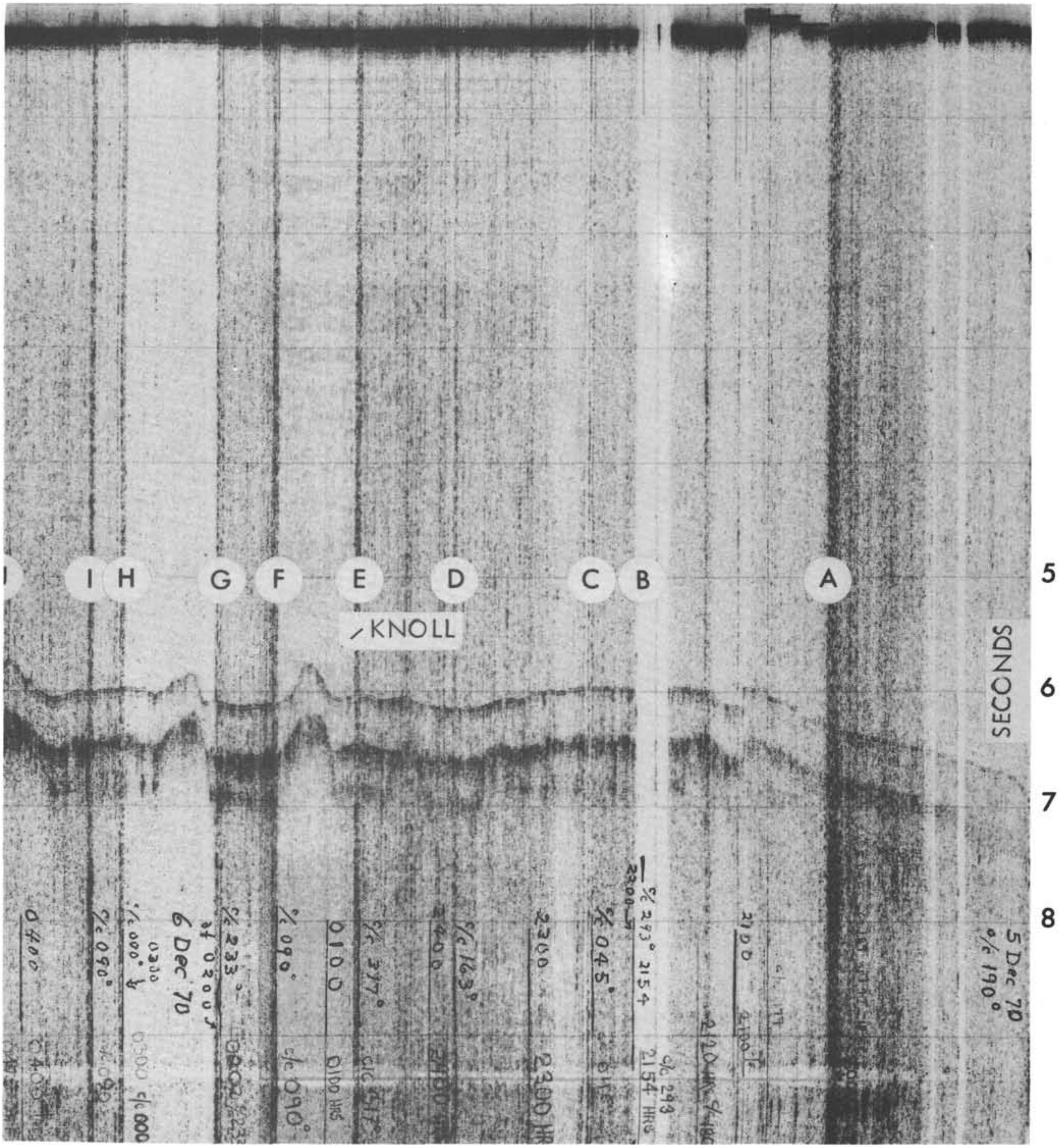

Figure 2. *Seismic profile made during the survey of the knoll by the* Glomar Challenger. *The letters indicate the turn points on the survey track shown in Figure 1.*

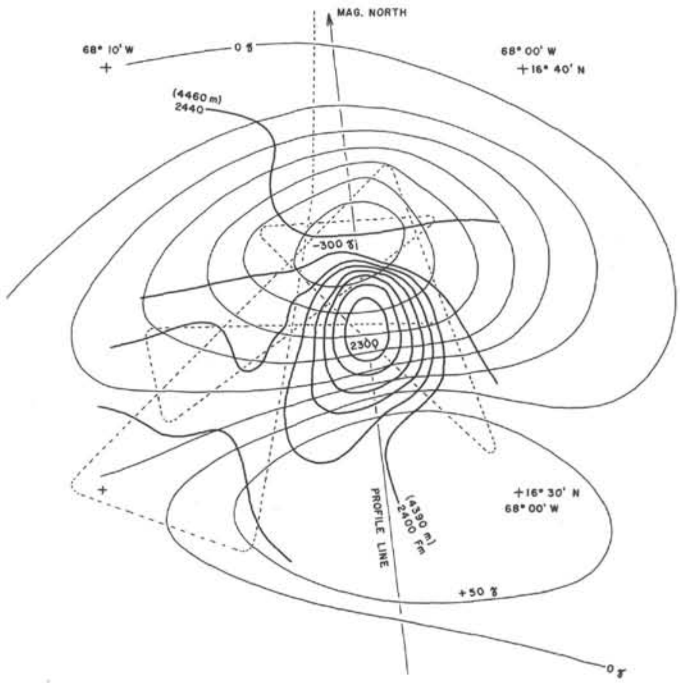

Figure 3. *Site 145 showing the ship's track, the bathymetric contours of the knoll at 20-fathom intervals, and the magnetic anomaly contours at 50-gamma intervals. The earth's smooth magnetic field is removed leaving only the anomaly.*

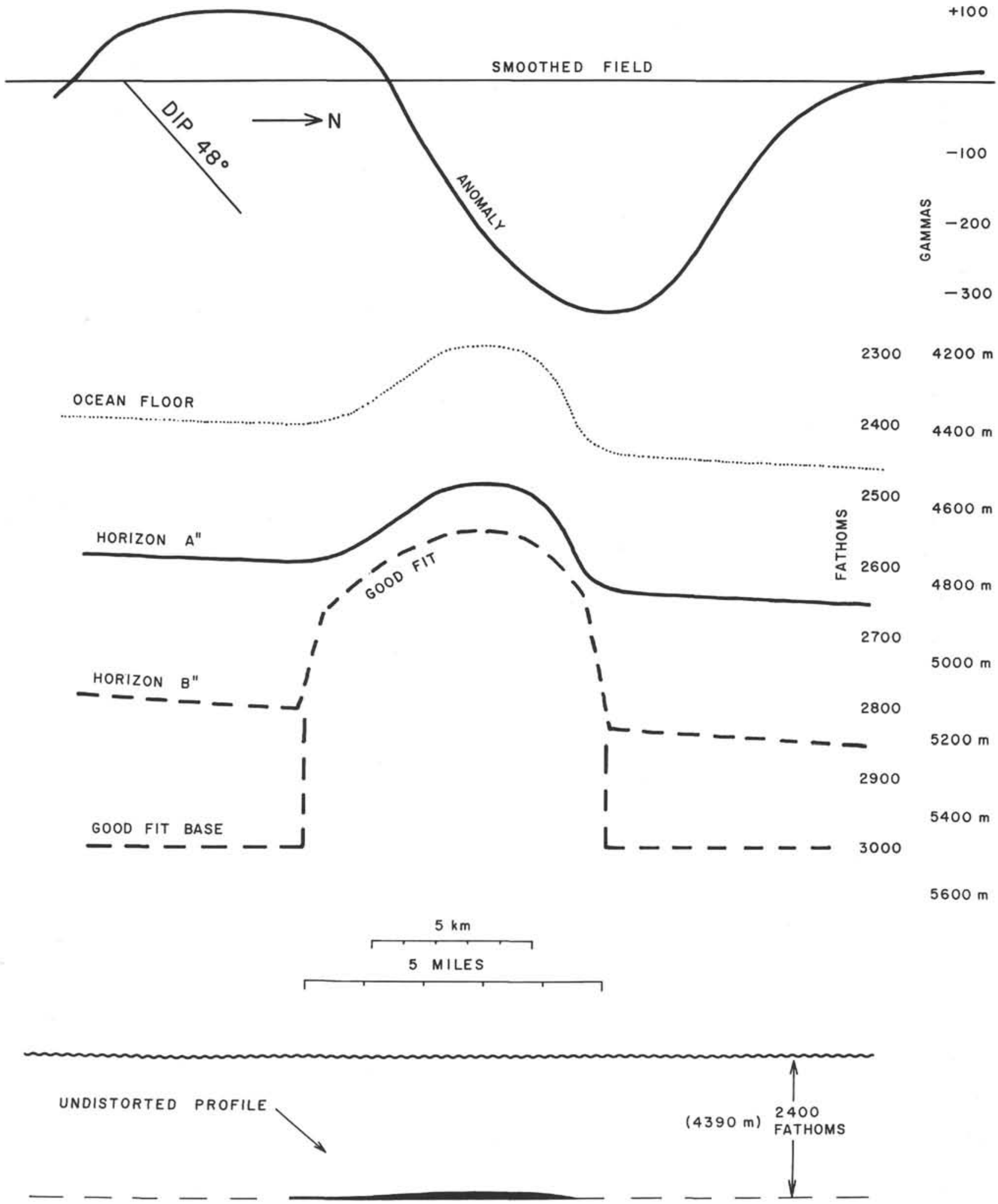

Figure 4. *Measured magnetic, topographic, seismic, and interpretive profiles of the knoll. The profile direction is magnetic north-south as indicated in Figure 3. Both of the dashed line shapes give a computed magnetic anomaly that would normally be considered a good fit to the measured anomaly.*