A MAGNETIC SURVEY OF A PORTION OF THE AMERICAN BOTTOMS NEAR MITCHELL, ILLINOIS

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CHAPTER I

INTRODUCTION

Across the Mississippi River from Saint Louis, Missouri, is a wide expansion of the Mississippi flood-plain known as the American Bottoms. This almost flat area is underlain by approximately one hundred to one hundred and fifty feet of alluvium, sand, and glacial till. As a result little is known concerning the sub-surface geologic structure. Since this can not be determined by surface evidence, the author undertook the problem of finding the sub-surface structure, if possible, of a portion of the bottoms using the magnetic method of geophysical prospecting.

The fact that this method of prospecting can be used to determine the structure of magnetically disturbing horizons has been demonstrated in numerous cases throughout the literature on magnetics. Granite ridges, faults, igneous pipes, salt domes, etc., have been discovered using the magnetic method. The fundamental principle on which the method is based is that the inhomogeneities in the earth's crust cause

distortions in the normal earth's magnetic field. With the proper instruments we are able to measure the variation of the magnetic field from place to place on the surface of the earth. After deducting the diurnal and normal variations from our measured values we have the anomaly (if one is present) in the magnetic field that is caused by some magnetically disturbing body. To deduce the depth, size, and attitude of this anomalous body is the problem of magnetic interpretation.

There is a certain ambiguity in the interpretation of magnetic data. Therefore, the magnetic method is usually employed along with other geophysical methods of prospecting. In this case, a resistivity survey was made by Lt. Colonel George P. Jones, Jr. and a gravity survey by Captain Carroll E. Haines. When the other type of surveys are not made in conjunction with the magnetic survey, the interpreter makes use of a thorough knowledge of the local geology to reduce the ambiguities of his interpretation. Therefore, the knowledge of the local geology is very important.

The selection of an area to survey was rather difficult as the area has to be free of railroads, power lines, and other features which would create

undesirable distortions in the earth's magnetic field. In addition, it was preferable to have an area away from the bluffs so that the terrain corrections for the gravimeter would be nil. Another big factor in selecting the area was obtaining the permission of the land owners to work on their property. The area finally selected is located approximately one and one half miles east of Mitchell, Madison County, Illinois.

In the following chapters the author describes the main geological structures surrounding the area, and the recording of and corrections applied to the data, and gives a discussion on the background of magnetic interpretation. In the final chapter the interpretation and conclusions are made.

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