

Magnetic Map of South Dakota Based on Data Taken by the  
United States Coast and Geodetic Survey

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It has long been known that anomalies in the earth's magnetic field are associated with geologic structure. This relationship is, in fact, the basis of much of the geophysical prospecting for oil that is being carried on today. One would predict from the laws of magnetism that if rocks containing iron were pushed up nearer the surface in any region, then the magnetic field in that region would be increased. Thus an anticline would be associated with a region of strong magnetic field.

No detailed survey of the earth's magnetic field has been made over the entire state of South Dakota. The South Dakota State Geological Survey has surveyed a portion and plan to continue this work.<sup>1</sup> The United States Coast and Geodetic Survey has measured the magnetic field at 80 stations,<sup>2</sup> and although these are spaced so far apart that interpolation is very uncertain, it was thought that some very large regional features might show up on a map made from these data.

The magnetic elements measured by the United States Coast and Geodetic Survey were declination, dip and horizontal intensity. In as much as vertical intensity has been shown to be more easily correlated with geologic structure than any of the other magnetic elements, the vertical intensity at each station was calculated from the relation

$$V = H \tan I,$$

where V is the vertical intensity, H is the horizontal intensity and I is the dip, or inclination. The values of vertical intensity thus obtained were corrected for the normal variation of intensity with latitude and longitude. In South Dakota

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this amounts to about 10 oersteds for each degree of

<sup>1</sup>South Dakota State Geological Survey Reports of Investigations, No. 33.

<sup>2</sup>United States Magnetic Tablets and Magnetic Charts for 1935.

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latitude and  $0.32 \times 10^4$  oersteds for each degree of longitude. The corrected values of vertical intensity were then plotted on a map (at end of paper) and contours drawn through the points of equal vertical intensity. The numbers shown on each contour are the vertical intensities in oersteds  $\times 10^4$  -5,000.

The large magnetic high in the northwestern part of the state may well be correlated with the granite outcrop known to occur in this region. The magnetic high in the northeastern section occurs at about the same place as the Lemmon syncline.

It must be concluded that it is very difficult to see much correlation between the magnetic map and the known geology of the region. This may be due to the sparsity of magnetic stations and to the fact that the measurements have been made over a period of 40 years. The work now being carried on by the State Geological Survey should indicate whether this is the case.

