MAGNETIC FIELDS ASSOCIATED WITH A PROBABLE LATE CRETACEOUS ASTROBLEME AT DUMAS, SASKATCHEWAN. A. Gubins and D.W. Strangway, Dept of Geology, Univ. of Toronto, Toronto, Ontario M5S 1A1.

Several circular seismic time anomalies in the Williston Basin have been tentatively identifed by Swatzky (1972,1975,1976) as probable astroblemes. These include the Hartney, Viewfield, Red Wing Creek, Eagle Butte and Dumas anomalies. Preliminary results from a total magnetic field survey over the Dumas site in southeastern Saskatchewan indicate a negative magnetic anomaly (Fig. 1). Removal of the regional magnetic anomaly enhances the magnetic anomaly and allows a preliminary estimate of the magnetization direction according to the methods of Books (1962). The line joining the maximum and minimum magnetic values is in a general northwesterly direction pointing roughly to the Cretaceous pole in the Bering Sea. The time of the Dumas event is known to be Cretaceous from stratigraphic correlation.

This is consistent with a model for the impact process in which a significant volume of rock was heated above the Curie point and then acquired a magnetization parallel to the ambient earth's field for that time. Geophysical investigations at Meteor Crater, Arizona (Regan & Hineze, 1975) and at the Ries crater (Dennis, 1971) and Gosses Bluff structure, Australia (Young 1972) have also shown anomalies associated with an astrobleme. In each case a remanent, rather than induced, magnetic anomaly was present. Young (1972) shows that the magnetization direction of the anomaly is the same as the paleomagnetic field corresponding to the inferred time for the impact. At the Ries structure, the magnetic anomaly is negative and corresponds well with a remanent magnetization acquired when the earth's field was reversed about 14-15 million years ago. A summary by Strangway et al (1974) on studies of remanent magnetization of the Rochechouart, Mistastin, Manicouagan and Charlevoix structure and the Meteor and Ries craters shows that in general these magnetized impact structures tend to have "unusually strong, unusually stable and unusually well-grouped paleomagnetic results." In effect, the samples studied showed a TRM acquired through heating above the Curie temperature and on cooling "locking in" the ambient earth's field. In some cases, the increased temperature is believed to have generated extra magnetite thus enhancing the TRM acquired on cooling. In addition, the softer components of a pre-existing remanence tend to be modified by the shock of an impact(Cisowski et al, 1977).

Consequently, it should be suspected that around impacts large enough so that heating above the Curie temperature takes place, remanent magnetic anomalies due to the cooling of material in the presence of a field are present. The anomaly may arise from the reheated material in the crater itself and/or from the ejecta blanket around the crater. The magnetization direction appears to be in the direction of the ambient earth's field at the time of impact.

In the lunar case, one would expect the large craters in which extensive shock melting took place to have magnetic anomalies associated with them provided a) that sufficient magnetic material was present and b) that an ambient field was present. The lunar breccias are in general enriched in fine-grained iron and are therefore magnetic enough to cause anomalies (Strangway et al, 1973,1975). Russell et al (1977) have recently shown that provided one

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considers both the crater and the ejecta blanket that there is a good correlation between lunar magnetic anomalies and the presence of large impact craters. As in the terrestrial case, these anomalies could in themselves reflect the presence of an ancient lunar magnetic field. There is still controversy over whether the field is of internal origin or whether it is associated with the impact itself.

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