GLIKSON, A PROBABLE IMPACT STRUCTURE, WESTERN AUSTRALIA; E.M. Shoemaker and C.S. Shoemaker, U.S. Geological Survey and Lowell Observatory, Flagstaff, AZ 86001

The Glikson Structure is a structural anomaly with an associated magnetic anomaly located in the Little Sandy Desert of Western Australia. The center of the magnetic anomaly and apparent center of the structural deformation is at 23°59'S and 121°34'E, about 27 km south of Savory Creek and 60 km northwest of the nearest points on the Canning Stock Route. As there are no prominent landmarks or named geographic features in the immediate vicinity of the structure, we propose to name this feature in honor of Andrew Glikson, a leading investigator of Australian impact structures, on the occasion of his retirement from the Australian Geological Survey Organization. Glikson brought the magnetic anomaly, pointed out by his AGSO colleague Alan Whittaker, to our attention. This led, in turn, to our field investigation and the discovery of the structural anomaly.

A reconnaissance geological examination of the Glikson Structure was carried out August 28 to 31, 1996. We reached the structure from the Canning Stock Route, following a west northwest course and then westerly course on a laterite plain lightly veneered with sand and marked with occasional linear dunes. Dune crossings were required in the last 20 km of travel, primarily within the structure itself. Bedrock is concealed beneath eolian sand over about 50% of the structure (Fig. 1a).

The structure is located within the broad Bangemall sedimentary basin of Mesoproterozoic age (1). Exposed rocks include sandstone and, locally, conglomeratic sandstone. Dolerite intrusions crop out within about ten km to the east and southeast (2, 3). The regional structure is gently undulating. As mapped on the reconnaissance 1:250,000 scale geologic sheets, dips in the Bangemall Group generally are less than 20° in the surrounding region (2, 3, 4, 5). Beds with dips up to 22° and 23° have been reported in the Ward Hills, about 75 km to the southeast (3). The local deformation in the Glikson Structure was completely overlooked in the prior reconnaissance geologic mapping.

Within five km of the center of the structure, dips that we observed east and south of the center generally range between 30° and vertical (Fig.1a). East of the center, the dips generally are steep to the east, although there is considerable variation in strike. Three km due south of the center of the structure the dips are to the south and southwest. Thus the structure we observed is consistent with that expected for the central uplift of a complex impact crater. However, two km farther south beds dip generally to the northwest. Possibly, these northwest dipping beds lie outside the axis of a ring syncline; more likely, complex folding is present on the flank of the central uplift. Confirmation of the structural form of the central uplift will require examination of outcrops west, northwest, and north of the center.

Within the central part of the structure, the rocks are crumpled and puckered in steeply plunging folds with wave lengths ranging from a few m to a hundred m or more. This pattern of deformation is strongly suggestive of the circumferential shortening that is characteristic of impact central uplifts formed in stratified rocks. Abrupt changes of strike also seem to indicate the presence of faults, possibly the rising toes of listric faults. Also, within five km of the center, the rocks are cut by close-spaced silicified fractures. Locally they are also offset on numerous tiny step faults. A brief search for shatter cones in the center of the structure was unsuccessful, but we found grooved "shatter surfaces". The entire ensemble of structural features near the center is typical of impact central uplifts and unlikely to be of tectonic origin, especially in view of the rather gentle deformation found in the surrounding region.

Beds exposed on the south side of the structure at about seven km radius are somewhat crumpled but, on average, are nearly flat lying. These beds apparently are near the axis of a ring structural depression or a ring syncline. Two and a half km farther to the southeast, beds dip 15_ to 25_ to the north northwest and evidently are on the outer limb of the syncline (Fig.1a). About nine km south of the center of the structure, the dips appear to be gentle, although reliable attitudes were not obtained. About ten km southeast of the center, beds dip gently inward toward the center or, in some places, are nearly flat lying. The margin of the structure appears to be at about nine km radius.

The Glikson structural anomaly is associated with a complex ring magnetic anomaly about 16 km in diameter (Fig.1b). It is composed of many smaller anomalies arranged roughly like beads on a necklace. On the basis of our reconnaissance observations, the ring anomaly evidently is more or less coincident with the ring structural depression. As the exposed rocks in the Glikson Structure consist entirely of sandstone, the origin of the anomaly is not immediately evident. Very possibly, the magnetic anomaly is due to the presence of dolerite intruded along the axis of the ring structural depression. Known dolerite bodies in the neighborhood have little evident magnetic signature, consistent with their

intrusion as nearly flat-lying sheets. High spatial frequency details of the ring depression. Known dolerite bodies in the neighborhood have little evident magnetic signature, consistent with their intrusion as nearly flat-lying sheets. High spatial frequency details of the ring magnetic anomaly, on the other hand, in particular the occurrence of discrete magnetic highs located north of individual magnetic lows, suggest that the anomaly is due to a chain of shallow discrete magnetized plugs or irregular intrusive bodies. If the magnetic anomaly is due to a chain of dolerite plugs, the Glikson Structure probably predates the intruded dolerite, which likely is Proterozoic in age (1).

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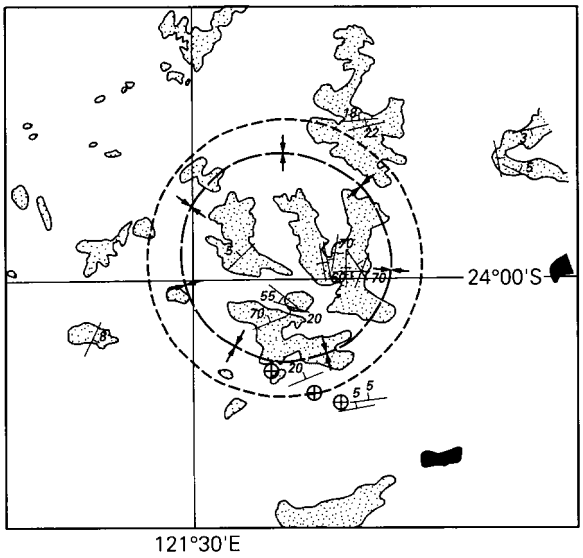

Figure 1a. Sketch geologic map of the Glikson Structure. Stipple pattern indicates principle areas of bedrock outcrop as shown on the Robertson, Gunanya, Trainor, and Buller sheets, based chiefly on photo interpretation. Blank areas are mostly sand covered. Exposures of dolerite are shown in solid black. Short dashed line indicates inferred outer margin of the Glikson structure. Interpretation of the structure is based chiefly on our observations in the center and in the southeast quadrant.

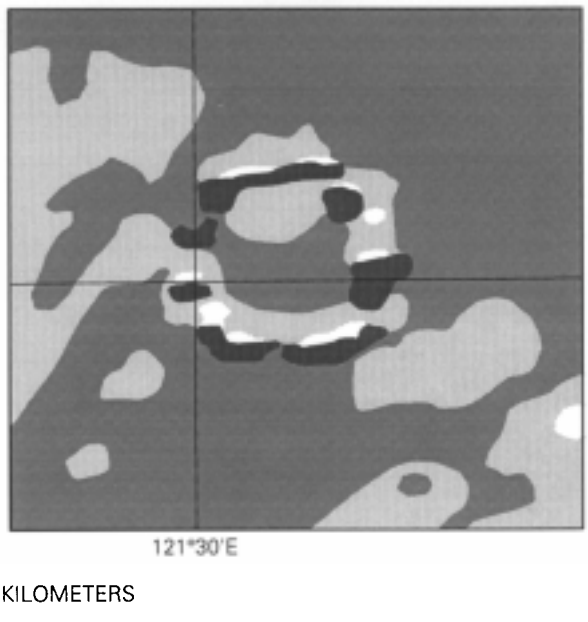

Figure 1b. Residual aeromagnetic anomaly associated with the Glikson Structure (from data provided by the Australian Geological Survey Organization). Dark tones show residual magnetic lows; light tone and blank areas show residual magnetic highs.