THE ACRAMAN IMPACT STRUCTURE: ESTIMATION OF THE DIAMETER BY THE EJECTA LAYER THICKNESS

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The big role of gigantic craters formation in geological history of the Earth was established by the example of the K/T boundary event. The discovery of the iridium anomaly in the sedimentary rocks of Vendian in the western part of Ukrainian shield (1) allows to suppose its origin in connection with the great impact of that time. The only one big impact structure of that age is the Acraman Crater in south-eastern part of Australia (2).

The Acraman Crater is presented by deeply eroded structure, original diameter of which it is difficult to determine. By geological and morphological data the Acraman Crater is presented by an inner ring 30 km in diameter, an intermediate ring 90 km in diameter and an outer ring about 150-160 km in diameter (2). In (3), the diameter of the collapse crater was determined as 85 km. If the original diameter of the crater was equal to the diameter of outer ring, it may be estimated as 160 km. The formation of such impact structure was accompanied with not only regional consequences, but with global fenomenon such as deposition of the material of the fireball on the considerable part of the Earth surface.

The ejecta layer of the Acraman Crater is exposed in the Adelaide Geosyncline at the distance about 300 km from its center. At the same time the situation of the ejecta in the folded structure of Adelaide Geosyncline may reduce the original distence of their exposures from the center of the crater by some tens of kilometers (3,4). The thickness of the ejecta ranges from 0 to 40 cm, mainly less than 10 cm. The sequence of the sediments including ejecta layer detects its good preservation. As the thickness of the ejecta of the Acraman Crater is known, it is possible to estimate its original diameter with the formulae in (5,6) for determination of the thickness of the ejecta by the data of the crater diameter and the distance from its center.

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In the table 1 the thickness of the ejecta was determined for several possible radii of the Acramen Crater. If the radius of the crater was about 80 km, the thickness of the ejecta was about some tens meters at the distance of 300-350 m. If the radius was about 42.5-45 km, the thickness of ejecta layer was about some meters, that was 10 times greater, that was observed. The data of the table 1 allows to estimate the radius of the crater as about 15-20 km, but less than 42.5 km. The reduction of the distance of the ejecta by 50 km insignificantly changed its thickness.

Table 1. The ejecta thickness t (m) as a function of the crater radius R (km)and the distance from its center, r_1=300 km, r_2= 350 km.

R	$t=0.04R(\frac{r}{R})^{-3.0}$ (5)		$t=0.06R(\frac{r}{R})^{-3.26}$ (6)	
	r_1	r_2	r_1	r_2
15	0.07	0.05	0.05	0.03
20	0.24	0.15	0.18	0.10
30	1.20	0.74	1.00	0.58
42.5	4.9	3.0	4.4	2.6
45	6.1	3.7	5.6	3.4
80	60.1	38.1	64.8	39.3

As the original diameter of the Acraman Crater was less than 85-90 km, its formation caused only regional, but no global consequences. So the iridium anomaly in the sediments of Vendian in the Ukrainian shield cannot be connected with the Acraman crater.

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