ZHAMANSHIN ASTROBLEME: REVIEW AND FIRST RESULTS OF 1992 LANDSCAPE AND GEOMORPHIC SURVEY

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Zhamanshin impact crater located in Kazakhstan between the Aral Sea and Irghiz River was studied in June 1992 by geographic expedition. An attempt was undertaken to study the natural complexes of the impact structure with the landscape and geomorphic survey. Such approach could help to recognize unknown impact structures through their traces in landscape - the geographic complex which is the most sensitible to the changes of the environment.

High degree of knowledge and good expression in topography define Zhamanshin crater as suitable feature for the geographic investigations of the natural complexes of terrestrial impact crater. Zhamanshin is located in semidesert plain of the North Kazakhstan at 48°20′N and 60°58′E. The topographic levels of the area are within 150-300 m. The crater looks as isometric in plan depression of 100-150 m deep and have rim crest diameter 13 km. It is relict of impact crater aged around 0.75 m.y. [1].

The following tasks were taken in mind during the field trip.

(1) Definition of modern natural complexes of the area through the geologic/geomorphic and soil/vegetation differences.
(2) To study gravitational (slope), aeolian, and insolation conditions and hydrologic net patterns.
(3) Tracing the main directions of material movement with the exogenic processes.
(4) Estimation of crater's landscapes or their structure (patterns) uniqueness vs. the same at the ajacent regions.
(5) To look for the correlation between the modern landscape patterns and the original geologic structure of crater.
(6) To try to estimate the role of catastrophic impact origin for the following evolution of the crater's landscapes.

During the field trips the landscape and geomorphic cross-sections were constructed. They cross the crater N to S and E to W and are 13-16 km long. Trips along crater rim and across the areas outside the crater took place. After that the areas within the crater were studied in accordance with pre-field mapping with multispectral Landsat satellite image. An area about 300 sq. km was surveyed during the field trips. The observations took place at 42 points located at the bottom and rim of the crater and outside the crater. Each point was described in details with geologic/geomorphic data, surface soil, deep section of soil, hydrologic patterns, botanical square. Rock and vegetation samples were collected.

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Preliminary landscape map of Zhamanshin area [2] was produced with pre-field interpretation of May 1986 Landsat image. This map was dramaticaly modified after the field trip. Six maps of 30 x 30 km area were compiled at 1:170,000 scale: topographic (c.i. 20 m), geologic, surface deposit types, geomorphic, soil, and drainage net. They were used together with field data on vegetation to produce a final landscape map. Many new landscape areas were defined and landscape complexes outlined at the final map. This map shows two principal landscape regions: (i) connected with impact crater, and (ii) non-connected with impact crater. The first region includes three main subregions: (1) crater bottom and inner walls, (2) crater rim/ejecta plateau, and (3) crater rim/ejecta outer slopes. The second region consist of two subregions: (1) NE plains, and (2) SW plains. Ninety smaller landscape divisions took place within the principal areas.

Crater-connected landscape regions look to be intrazonal landscapes. Their patterns did not follow the general regional patterns of the area. The landscapes outside the crater (and its rim/ejecta area) fit the regional picture of geographic zonality. The final landscape map shows that landscape divisions outline the material movement patterns: concentric for crater-related landscapes and elongated-spotty for areas outside the crater and its rim/ejecta area.

Exogenic processes were found to be more active within the crater rim: the long deluvial aprons took place at the foothills of the modern rim. These aprons are larger than the aprons around the isolated remnant hills on the surrounding plains. The summit surfaces of crater rim hills are covered with eluvial material which consist of the welded ejecta breccias. Because of it the destroying of the summit surfaces is weak.

Number of landscape levels were recognized. They are connected with the morphostructure of the crater and have concentric location. The principal landscape divisions of Zhamanshin crater were well recognizable in the field in accordance with the composition and density of the vegetation, soil and surface rock types. The crater bottom is the smooth alluvial-proluvial plain which contains no manifistations of geologic structures. But the concentric patterns of the landscape complexes are sharply recognisable within the bottom both at the Landsat image and in the field.

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