

MORPHOLOGY OF THE TERNY ASTROBLEME BASED ON THE FIELD OBSERVATION AND SAMPLE ANALYSIS. Roman V. Krochuk¹ and Virgil L. Sharpton¹, ¹University of Alaska Fairbanks, Geophysical Institute, 903, Koyukuk Drive, P.O.Box 757230, Fairbanks, AK 99775-7230, USA (roman@gi.alaska.edu; buck.sharpton@gi.alaska.edu)

Introduction: The Terny impact structure is located at 48°08'N; 33°31'E within the Ukrainian Precambrian Shield. At its present erosion level ([1]; ~700 m below the original pre-impact surface) no morphological evidence of the crater remains. However because it is located within an economically significant Fe-ore belt, mines and quarries provide considerable surface and subsurface access to the substructural characteristics of what was originally a central peak crater approximately 8 km in diameter.

Last year we conducted field work at the Terny structure. Special attention was given to the area of intense deformation which appears to delineate the central uplift (Fig. 1). Extending from the P-2 mine to the United mine (profile A-A'), samples were collected at depths of 365 and 920 m. Here we report the initial results of this study.

Previous research shows some differences in location of the central peak of this eroded astrobleme [2, 3].

Fieldwork observations: The following sequence was observed extending outward along the profile from P-2:

Zone 1: Near P-2, randomly oriented, large (hundreds of meters) blocks of Kryvoriz'ka and Konksko-Verkhovtsevska series rock. Contacts between these blocks are sharp and marked by thin cataclastic zones. Almost no breccias and melt rocks were observed in these interblock contact zones.

Zone 2: Approximately 500-600 m from P-2, veins filled with breccias and partly melt rock emerge in significant amounts, occasionally forming large bodies of melt rock.

Zone 3: The peak amount of melt rock in mine walls was observed about 700-800 meters from P-2, where they form bodies up to 20-30 m thick.

Zone 4: Beyond that zone most exposures in the mine walls are large crustal blocks separated by impact breccia and some melt rock veins. Melt rock occurrence systematically and gradually decrease beyond Zone 3.

Sample analysis: Existing peak pressure estimates from planar elements orientation in samples show the following: within the P-2 mineshaft area planar deformation features (PDFs) are relatively infrequent and about 90% of them occur within the basal plane {0001} of quartz suggesting peak pressure up to 5-7 GPa.

As breccias and melt rocks start to show up (Zone 2) both the amount and orientation of PDFs increase.

Within breccia clasts, 80-90% of quartz grains have planar elements. Virtually all of those quartz grains have {0001} oriented PDFs, and 40-50% of quartz grains have single {10 $\bar{1}$ 1} oriented PDFs. Melt rock contains some undigested clasts of (or containing) quartz. About half of the quartz grains within the melt were strongly recrystallized thereby obscuring or completely erasing the diagnostic evidence of shock. Those grains exhibiting PDFs show up to 4 sets of planar elements including basal {0001}, up to 3 sets at {10 $\bar{1}$ 1} and occasional occurrences of ω {10 $\bar{1}$ 3} and π {10 $\bar{1}$ 2} features. Melt rocks within this area contain evidence for the highest peak pressures found within the Terny structure – up to 16-20 GPa.

Further toward the United mine shaft peak shock pressures gradually decline with the melt rocks consistently showing evidence of higher pressures than the breccia clasts.

Preliminary ³⁹Ar/⁴⁰Ar isotopic age study has been conducted. The whole rock data from the melt rock provides us with the estimate of 290±10 Ma, but this age of the crater formation should be supported by single mineral analysis.

Suggested central uplift location: The area where PDFs indicate rapid decreases in peak pressure is most likely the location of the edge of the central uplift. Such sharp decreases occur ~600 m from P-2 at horizon 365, ~800 m from P-2 at horizon 920, and in the northwest part of the Pervomaysky quarry near the surface.

Based on this information, we propose a new location for the center of the Terny structure, approximately coincident with the P-2 and P-1 mines (Fig. 1). A new GPS-based location was acquired for this location: 48°08'01.7"N; 33°31'34.2"E. This is a significant difference compared to the 48.02°N; 33.08°E from [4] and is ~ 11km off latitude and ~ 30km off longitude.

Conclusions and upcoming studies: Data collected during the 2002 fieldwork provided us with the information necessary for better understanding of the morphology of the buried central peak crater. The studies in progress now are the isotopic age of the crater using ³⁹Ar/⁴⁰Ar and planar element distribution in minerals from rocks of different locations within this important yet poorly studied impact structure.

References: [1] Krochuk, R.V. and Sharpton, V.L. (2002) In: *LPS*, XXXIII, no.1832; [2] Valter,

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A.A. et al. (1981) Reports of Academy of Science of Ukr.SSR, Ser.B, #2, 3-6; [3] Eremenko, G.K., Yakovlev, V.M. (1980) Reports of Academy of Science of USSR., #2, 449-451; [4] Grieve, R.A.F. and Robertson, P.B. (1979) Icarus 38, 212-229

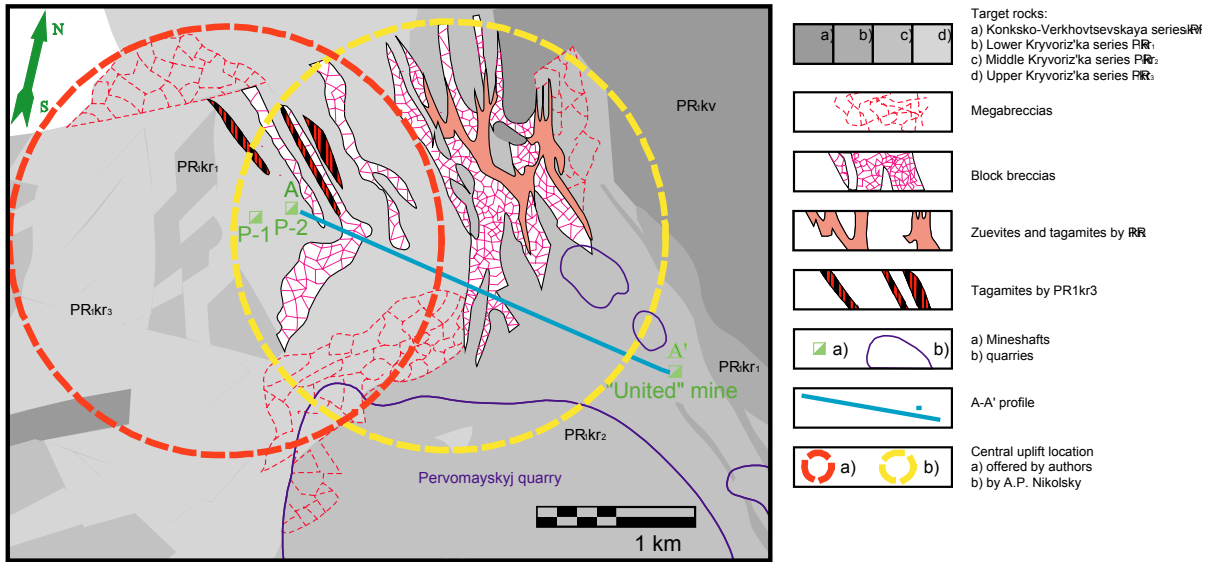


Fig. 1. Proposed central peak location for the Terny astrobleme