

ON DOWNWARD TRANSPORT OF MATTER AT IMPACT CRATER FORMATION.  
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On the basis of examination of crater-forming processes (I-3, etc.) it was shown that allogenic rock formations within the craters were generated under conditions of downward flow of matter, spreading out from a point of maximum penetration of a striker into a target. Composition of allogenic breccias in the Kamensk, Logoy and Ilyinets craters makes it possible to estimate a magnitude of maximum displacement of detritus from its initial position in the target to localization as a member of breccias and suevites.

The Kamensk crater, 21 km across, was formed in Upper Paleozoic dislocated sedimentary rocks, overlapped by Cretaceous deposits up to 130 m thick, represented by chalk and marls. The fragments of Cretaceous rocks are scattered all over the section of allogenic breccia from its surface up to that of the central uplift at a depth of 300-330 m above the uplift mentioned. Within the deepest part of the structure around the central high the fragments of chalk and marls may penetrate into the breccia up to a depth of 570 m, with their content decreasing downwards. As to shallow peripheral part of the crater, chalk fragments in allogenic breccia may be traced up to a depth of 300-400 m and 8.5 km distant from the center. But outside the limits of the central uplift the lower boundary of Cretaceous rocks penetration into the allogenic breccia follows to a form of true bottom crater surface at elevation of 100-200m (Fig.1).

The Logoy crater, 13 km across, was formed in a two-layered target, consisted of crystalline basement rocks and overlying platform Vendian and Devonian deposits. The target in its upper part is represented by a section of Cretaceous glauconitic sands up to 30 m in thickness. Allogenic breccias and suevites fill the internal crater of this impact structure (4). Within the central part of the internal crater the fragments and boulders of Cretaceous rocks may occur in suevites up to 450 m, and in its peripheral part - up to 350 m. Taking into account the thickness of overlying Quaternary sediments, a magnitude of penetration for detritus may achieve up to 350 m.

The Ilyinets crater 3.4 km across was formed in Precambrian crystalline rocks. The presence of fragments of sedimentary rocks in the crater, filled with breccias and suevites may be considered as an evidence of the existence of a thin cover of platform sediments over the basement surface at some instant of impact. In the well, drilled 0.7 km distant from the structure's center, percentage of sedimentary rock fragments is equal to 7-10% at a depth up to 20 m and to 3-5% at a depth of 50 m, respectively individual fragments of siltstones and claystones occur up to 80 m, with the deepest fragment located at a depth of 120 m. In the peripheral part of the crater the fragments of sedimentary rocks occur in suevites up to 55 m. Prior to erosion the Ilyinets crater was estimated to be 7 km across, 500-550 m deep; magnitude of erosion up to modern surface was equal to 200-250 m. Consequently, the magnitude of vertical displacement for fragments from superficial layers of the target is about 250-300 m.

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Maximum depth of penetration of target material as a function of impact structure diameter is shown in Fig.2. The diagram is of tentative character and should be refined based on information, obtained from other impact structures. Although it is still impossible to trace a complete part of detrital fragments from an initial position to their maximum deep at the stage of excavation and rise at recoil, but our information corroborates that breccias were formed under conditions of downward matter flows, allowing, thus, to estimate a vertical component in target's matter displacement beginning from its surface and up to a final position in allogenic rocks within craters.

REFERENCES: (1) D.E.Maxwell, Impact and Explosion Cratering, ed. D.J.Roddy, R.O.Pepin and R.B.Merill, Pergamon Press, 1977, p.I003-I008, (2) R.A.F. Grieve, J.B. Garvin, Journ. Geophys. Res., 1984, v.89, N B13, p.II.561-II.572, (3) D.O'Keefe, J.Ahrens, LPSC, XYIII, 1987, p.744-745.

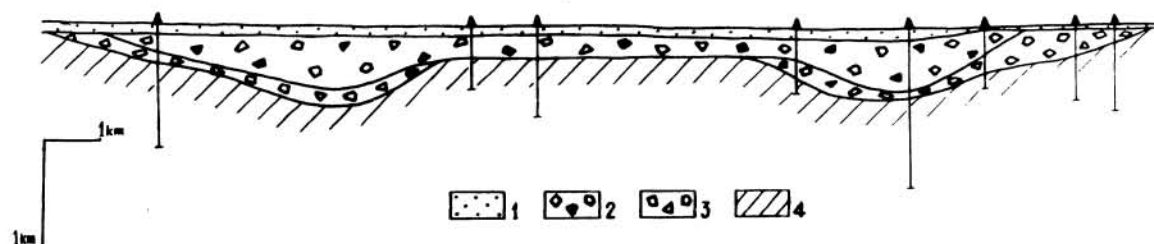


Fig. I Schematic section of the Kamensk crater. 1 - Quaternary sedimentary rocks; 2 - Allochthonic breccia containing Cretaceous rocks; 3 - Allochthonic breccia without Cretaceous rocks; 4 - Autochthonic breccia and brecciated rocks of the crater bottom.

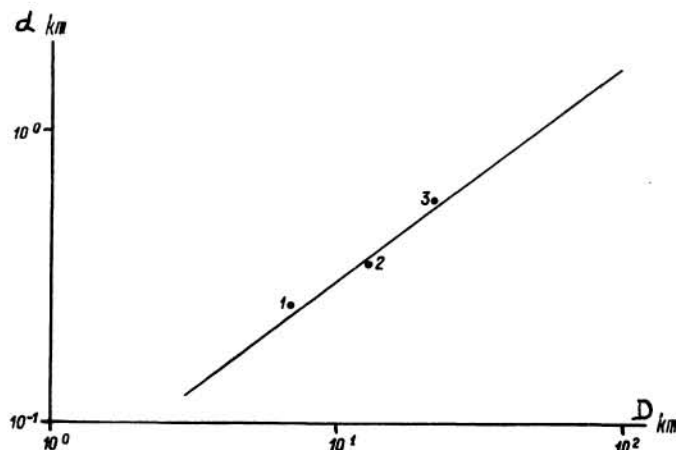


Fig.2 Vertical downward displacement of the target rocks ( $d$ ) versus crater diameter ( $D$ ).