Reports of the Academy of Sciences of the USSR

1965

SovietRxiv

Abstract

Full Text

Reports of the Academy of Sciences of the USSR

1965. Volume 161, No. 1

ASTRONOMY

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NEW DATA ON THE CONDITIONS OF FALL OF THE CZECHOSLOVAK TEKTITES (VLTAVINS)

(Presented by Academician V. G. Fesenkov on 9 X 1964)

On the territory of Czechoslovakia there is the only tektite field known in Europe. It differs from other fields in having the highest concentration of tektite material, a more ancient age, and better study, because it became known earlier than the other fields and is located in a densely populated, easily accessible region.

Despite the extensive literature ([1]), the conditions under which the Czechoslovak tektites (vltavins) are found and their genetic connection with the enclosing rocks have until now remained unclear. The completion of a detailed geological study of this region and the publication of a map at a scale of 1 : 200 000 ([2]), together with expeditionary work carried out by the České Budějovice Astronomical Observatory with the participation of the Committee on Meteorites of the Academy of Sciences of the USSR ([3],[4]), make it possible to present in a new way the picture of the fall of the Czechoslovak tektite shower, the occurrence of vltavins in geological sediments, and their redistribution in connection with subsequent geological processes.

The Czechoslovak field is confined mainly to the South Bohemian Basin and the eastern slope of the Bohemian-Moravian Massif (in Moravia), as well as to adjacent parts of neighboring orographic subdivisions. The principal water arteries here are the Vltava River with its tributaries the Lužnice, Malše, Otava, and the right tributary of the Morava—the Dyje with its tributary the Jihlava. The total area of the field is 10 000 km^2. Among the rocks, the Proterozoic is developed chiefly: paragneisses of the Moldanubian with acidic intrusions and separate outcrops of orthogneisses, granulites, spilites, diabases, and, very rarely, Devonian and Carboniferous sediments. Only the South Bohemian Basin is filled with younger—Mesozoic (Upper Turonian and Senonian) and Tertiary (Neogene) —sediments (Fig. 1). The actual tektite-bearing deposits are Quaternary eluvial, deluvial, and alluvial deposits, and Lower Neogene green alluvial clays, at the base with sandy lenses and basal gravel, changing upward into lignite and diatomite, with the upper part somewhat silicified. It has been noted that the tektites have neither stratigraphic nor facies confinement. In the central part

of the field—in the core of the Bohemian-Moravian Massif—they are completely absent.

The studied factual material shows that the area of fall of the vltavins covered a considerably larger territory—on the order of tens of thousands of square kilometers—with the Bohemian-Moravian Massif in the center, where processes of denudational stripping of the surface of the ancient crystalline basement predominated. In connection with this, the tektites were carried away to the west and to the east along the slopes of the massif, and one field was divided into two—the South Bohemian and the Moravian. This process continued for a long time, and the tektites became distributed more or less uniformly through the section of the alluvium of the Neogene proto-Vltava River. As a result of the subsequent faulting, the western—České Budějovice—part of the basin subsided; beyond its limits the Neogene was eroded and redeposited in the form of Quaternary sediments.

[Map]

Fig. 1. 1 —Proterozoic and Paleozoic, 2 —Mesozoic (Cenomanian), 3 —Neogene, 4 —tectonic faults, 5 —large "deposits" of tektites, 6 —medium "deposits," 7 —small "deposits"

This explains the relative scattering of tektite material, with areas of local concentration controlled by the modern hydrographic network. The main areas of concentration are Vrabče, Slavče, Nesměň, and several others.

The highly complex physicogeological history of the vltavíns has been reflected in their size, shape, and the character of their surface (sculpture). Unlike other tektites, they have almost not preserved the original forms of indivi-

individual specimens that were destroyed in the course of transport down the slopes of the massif. In contrast, for example, to australites, the frequency curve of the distribution of samples by weight shows that the present state of the tektite material in Czechoslovakia is characterized by extreme fragmentation. The result of post-tektite transport (redeposition) of moldavites was partial or complete grinding and rounding of fragments of individual specimens. In this connection we introduced into use a **grinding index** (preservation of sculpture), to which a definite transport distance corresponds (under normal conditions):

1 —complete rounding (more than 15 km);
2 —coarse grinding with preserved elements of sculpture (10-15 km);
3 —grinding and sculpture expressed to the same degree (5-10 km);
4 —coarse sculpture (1-5 km);
5 —absence of grinding; the sculpture preserves fine elements (up to 1 km).

In all, we examined 1221 specimens. On average, for the area NW of the town of České Budějovice the grinding index is 2.4, to WNW 3.2, to SE 2.9, and to SW 3.5. The average for South Bohemia is 3.3. Statistics for individual "localities" show that some of them contain moldavites of approximately one grinding index (Trhov 3.5, Slavče 3.8), while in others this indicator varies within larger

(Vrabče, Milíkovice, Dolní-Svincy) or smaller limits; moreover, in a number of cases (Tábří, Koroseky, Nesmeň) the frequency-distribution curves reveal two maxima, which indicates the concentration of material from different transport routes. Completely rounded specimens were noted at almost all "localities," and their average number for South Bohemia is about 10%; samples with completely preserved sculpture (in situ) are encountered more rarely (less than 7%), and both of these are characteristic of Vrabče.

The task of further investigations should be a detailed deciphering of the transport routes of moldavites and the development of a field method for its assessment, which can be applied to other tektite fields.

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Received
1 X 1964

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[4] Ibid., report 2, vol. 26 (in press).

Note: Figure translations are in progress. See original paper for figures.