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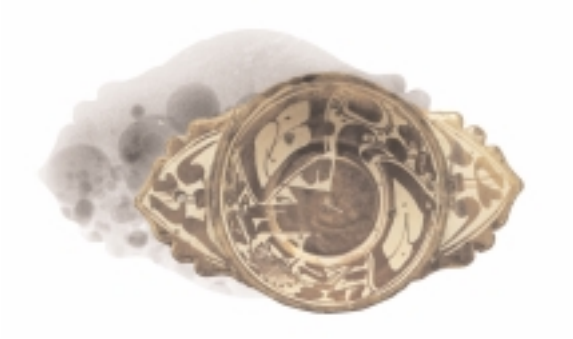

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CARPATHIAN OBSIDIANS: MYTH AND REALITY[1]

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ABSTRACT

This paper is intended to give a review on the study of Carpathian obsidian. The name implies the only source region in Central Europe, for long, the only source of archaeological obsidian in Continental Europe. Their archaeological, as well as geological research started in the sixties of the 19th century by the activity of pioneering personalities of Hungarian archaeology, geology and archaeometry. By the late 70-ies, separation of Carpathian obsidian sources from other sources of European and other Mediterranean sources could be achieved (investigations of Warren and Williams), and intensive studies continued in the past decades. In spite of several publications devoted to the subject, there are still a lot of clearly erroneous views lingering in technical literature concerning the location of the sources and allocation of archaeological specimens.

The first review of the author on the Carpathian obsidian was published in 1981: in the meantime, several research groups performed smaller or bigger research series on related finds, using various methods of analysis (NAA, EDS, XRF, FTD, PIXE-PIGE and recently, PGAA). Collection of obsidian distribution was completed using reference data as well as analysis of various assemblages dating from Middle Palaeolithic to Iron Age. Distribution maps were compiled for specific periods using percentage values. Access strategies, political implications could be claimed on the basis of changes in distribution areas.

The present study contains a review of recent achievements, prepared for the project IGCP-442 (Raw Materials of Neolithic Artefacts) as well as in the frames of the project "Raw material atlas Non-metallic prehistoric raw materials on the territory of Hungary and adjacent regions" (OTKA- T 025086).

1. INTRODUCTION

Over the glass mountains… This is a regular introduction to a lot of tales in Hungary. Perhaps it is not too much intrusion to the field of ethnography

1. This paper contains the extended version of the lecture presented on the 34th ISA Meeting at Zaragoza, Spain (Biró 2004).

to say that this clause dates back to prehistoric times, notably to the time of rare and distant, legendary obsidian sources.

Obsidian is a spectacular raw material attracting attention both in modern as well as prehistoric times. Archaeological and archaeometrical technical literature as well as hearsay and gossip abounds in references based more on legends than reality. This is the reason why the author decided to summarise again our current knowledge on one of the most important element of prehistoric mineral resources. The name, 'Carpathian obsidian' is misleading in itself as it implies origin from the Carpathes (which is no source for obsidian, being mainly composed of Mesozoic sedimentary rocks and Palaeozoic constituents) or, for a more specific geological (but false) implication, the Carpathian obsidians are not related to the Middle Miocene Carpathian Stage; they were formed in the Late Miocene Sarmatian period and all of the known and archaeologically important occurrences can be found in the Tokaj-Prešov Mountains, in NE Hungary and SE Slovakia, respectively. The term Carpathian obsidian was given by the English scientists performing the first successful fingerprinting studies and became known in international archaeometrical literature; it would no point and useless to fight against this name.

It is, however, necessary to know the raw material exactly and separate from other materials and legendary claims. Some basic facts on obsidian may help in the correct identification.

Obsidian is not a mineral but a rock. It is quenched volcanic rock, natural glass, without specific mineral composition, crystal structure or stoechiometrical formula and exact chemical composition. In course of long time, obsidian will turn to a felsitic volcanic rock with acidic composition (rhyolite) with high SiO_2 content. Typically, obsidian can be found associated with geologically very young volcanic activity, because rock glass is not very stable under surface conditions, will get crystallised or weathered in course of time. At the same time, not all the volcanic glasses can be considered obsidian and even less could be suitable for making stone tools. Not all of the sources referred to as 'obsidian' in geological technical literature yielded workable obsidian. The problem is further complicated by the fact that some of the sources have been exploited or became inaccessible till our days. Claims on non-existing sources, at the same time, can lead to not adequately founded historical conclusions and render the results of the archaeometrical fingerprinting questionable.

2. OBSIDIAN SOURCES WORLD-WIDE

Due to the specific conditions of its formation, obsidian occurs at limited regions. The last synthetical summary based on bibliographical entries by

Hans-Otto Pollmann (Pollmann 1999) resulted in mapping the potential sources all over the World (fig. 1). The source regions are visibly confined to island arches with strong volcanic activity on the contact zone of continents and oceans. Though Hungary is centred in continental Europe, it is well known that similar conditions used to exist here in the Tertiary period. Obsidian was formed here by the end of the Tertiary period.

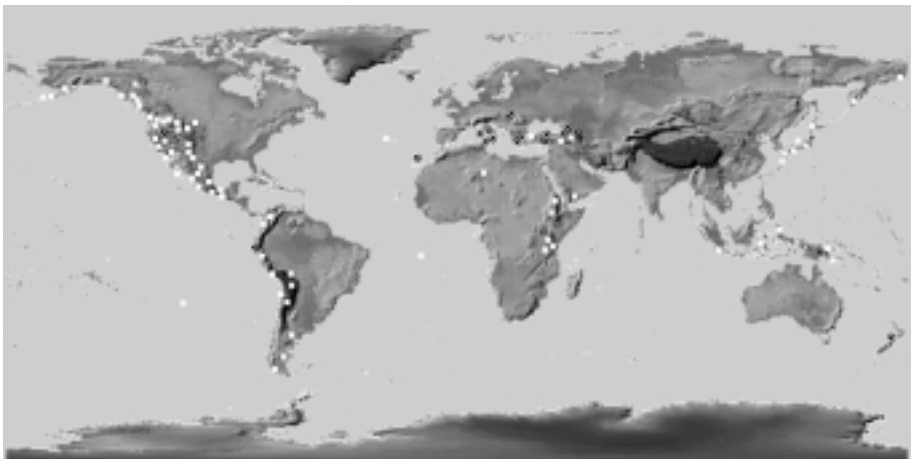

Figure 1. Obsidian geological sources worldwide after H. Pollman. Sources represented in the Lithotheca Collection of the Hungarian National Museum are marked by black dots, other sources with white squares.

Data collection by Pollmann naturally could not aim at a critical review of all cited work, thus the resulting comprehensive map contains a number of 'dots' existing perhaps only in the (modern) legends. These and constant references to non-existing sources compelled the author to collect existing evidence again, separating certain from uncertain and false.

In the comparative raw material collection of the Hungarian National Museum we are making all efforts to collect evidences from existing lithic raw materials sources (Lithotheca-Collection: Biró & Dobosi 1990, Biró & al. 2000a); look after all claims, collect and document the wealth of prehistoric potential raw material sources and try to characterise them in a manner to be recognised in the archaeological lithic industries. Naturally, we are mainly interested in Hungarian raw materials and resources available to the prehistoric population that used to live here. Obsidian is one of the raw materials preferentially collected from all over the world. All of the known European sources are represented in the Collection with abundant samples from the Near East (Anatolia) as well. On fig. 2. the obsidian raw material sources of the so-called Mediterranean region are presented, based on Pollmann's data and hand specimens in the Lithotheca.

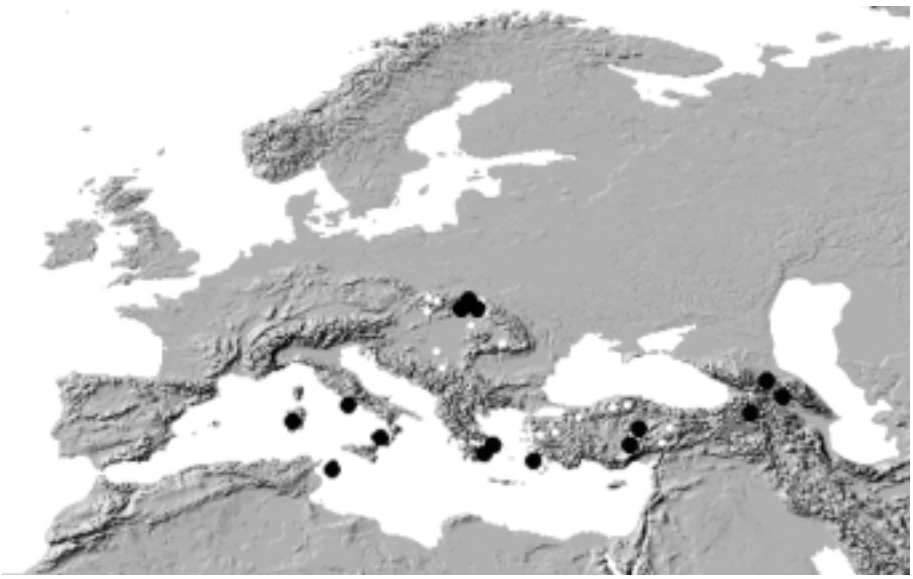

Figure 2. Obsidian geological sources of the Mediterranean region after H. Pollman and hand specimens in the Lithotheca. Sources represented in the Lithotheca Collection of the Hungarian National Museum are marked by black dots, other sources (?) with white dots.

3. THE SCIENTIFIC INVESTIGATION OF THE CARPATHIAN OBSIDIANS

Archaeological and geological study of the Carpathian obsidians started in the second half of the 19th century by pioneering Hungarian personalities of both disciplines (Rómer 1867, 1876, Szabó 1867, 1876). The Carpathian sources were, at the same time, the oldest known sources of archaeological obsidian in Europe, with the exception of Georgian and Armenian sources at the eastern fringes of the continent. The first studies on archaeological distribution made still in the 19th century were followed by a range of data collections concerning special areas or time periods e.g., those of M. Roska and S. Janšák (Roska 1934, Janšák 1935). Another wave of interest was observable just prior to modern archaeometrical studies in the fifties and sixties. In the first publication of the author on archaeological distribution of the Carpathian obsidians (Biró 1981) these archaeological data collections were summarised and completed, and the results presented on a comprehensive map. By the end of the seventies, modern analytical studies created the possibility for separating Carpathian sources from other sources in Europe and also distinguish groups of different sources within the Carpathian Basin (Warren & al. 1977, Williams & al. 1984). Ever since, several series of analytical studies by different methods (OES, NAA, EDS, XRF, FTD, PIXE-PIGE and most recently, PGAA) and different groups of scientists have

been performed and published. Archaeological distribution of the Carpathian obsidians can be followed by the help of macroscopical studies and instrumental analyses from the Middle Palaeolithic period till Iron Age.

4. RAW MATERIAL SOURCES

All the known sources of Carpathian obsidian are located in the Tokaj-Prešov Mountains, partly on the southern part close to Tokaj (Mád-Erdőbénye-Olaszliszka environs, C2E group), partly around Tolcsva and Erdőbénye-Abaujszántó, located at the middle of the Tokaj Mts. (C2T group), both of them in Hungary. The best quality and seemingly most popular raw material sources, however, are already located outside the present borders of Hungary in Slovakia; geological sources of obsidian occur in the environs of Viničky (Szőllőske) and Mala Bara (Kisbár) even today (Kaminska & Duda 1985), the chemical composition of which is closest to those occurring most frequently in archaeological context. Probably they were not the only and most productive sources-a group of sources can be supposed to the North of them, impossible to locate by now, the evidences of which are found on the Late Palaeolithic and Neolithic workshop sites of Kašov and Cejkov (Bánesz 1967, 1991). We suppose that these highest quality sources were exploited by the Late Neolithic. All of the obsidian sources in the Carpathian region are secondary: primary sources with obsidian lava flows or tuff layers including workable nodules are not known. Small nodules below the workable dimensions do occur in rhyolite tuff around Tolcsva. It is possible that the primary sources of workable nodules have been eroded but it is also possible that they will crop out sooner or later.

Rock glass similar to obsidian, mainly perlite occurs at several locations within the Carpathian Basin and these are justly mentioned among potential sources of obsidian; however, they did not yield so far archaeologically serviceable obsidian. Such localities include Hliník (Szabova-skála) in Central Slovakia, the territory of Avas (Oaş) in Romania, as well as the environs of Hust in the Ukraine.

Beside these potential sources several claims of non-existing obsidian sources were made, partly as simple mistakes ("Bükk obsidian", Tompa 1929), rumours ("Börzsöny obsidian" Bárta, J. & Petrovský-Švichmann, A. 1962), "Mecsek obsidian" (hearsay but persistent), based probably on the frequent occurrence of obsidian on prehistoric sites which served more or less as trade centres controlling larger areas. In other instances other rocks and substances resembling obsidian in their macroscopic appearance but essentially different in formation and composition including artificial materials have been erroneously identified (even described) as obsidian. One of the well-known cases is the case of black opals in the Hargita Mts., a mistake corrected by J. Nandris (Nandris 1975). Recently we have come across several specimens considered to be obsidian, the chemical composition

of which exclude their identification as natural rock glass corresponding best to modern industrial slag (Oláhlápos (Lapus)).

The above mentioned potential raw material sources and mistakes more or less coincide with the data points presented by Pollmann; with some remaining unidentified dots, e.g. on the territory of Serbia where I was not able to locate even the basis of the legend as yet.

5. CHARACTERISATION

The identification of Carpathian obsidians is a comfortably settled problem, within the known European sources as well as the local varieties. Inside the Carpathian Basin, even macroscopic identification will give adequate results, at least good guesses can be made. The Slovakian (C1) obsidian is typically transparent-translucent, often clear, having a vivid glassy lustre and a dissected cortex. Hungarian obsidians are typically non-transparent, only slightly translucent on edges, their characteristic colour is dark graphite grey (C2E), black and sometimes mahogany red (C2T), typically with fine striped patterns.

Under the petrographical microscope the obsidians will be transparent with some crystallites, the perfect extinction of the isotropic glass in crossed polarised light can be observed well. Slovakian obsidian tend to have many trichites, while in the case of the Hungarian obsidians we can observe more crystallites of definite shape and opaque grains arranged in linear patterns.

Obsidian source characterisation is mainly done on the basis of chemical composition. Namely, the chemical composition of the high silica content magma the obsidian originated from would change from volcano to volcano. The differences are apparent both in the main element composition and the trace elements, equally suitable for the characterisation of the source.

In the first, classical studies of obsidian characterisation the basis of identification was the determination of trace elements using OES. This method was not sensitive enough to reveal inter-group differences within the Carpathian obsidians, but even the first trials were adequate to separate Carpathian obsidian from the other obsidian sources of the Mediterranean region (Cann & Renfrew 1964). A more exact separation including the separation of Carpathian I-II types was achieved using NAA by the end of the seventies (Warren & al. 1977). The publication of the series of analyses comprised unfortunately only a summary of the results (Williams & al 1984). In the meantime, the measurements were started in Hungary as well; in the beginning, using AAS for main components and OES for semi-quantitative analysis of trace elements (Biró 1981), later on, using EDS and XRF on several series of archaeological and geological samples (Biró & Pozsgai 1984, Biró & al. 1986, 1988). In Romania, also X-ray spectroscopical methods were used for

the identification of archaeological obsidian (Salagean & al. 1988, Daraban & al. 2002). More recently, ion beam analytical techniques were used successfully for source characterisation of obsidian in the Nuclear Research Institute of the HAS in Debrecen, using PIXE and PIGE (Elekes & al. 2000a-b). Currently we are using PGAA for the characterisation of several lithic resources including obsidian (see the paper by Kasztovszky & Biró in the same volume). This is very favourable for the analysis of obsidian, being sensitive enough for the purpose and completely non-destructive.

Source characterisation of obsidian can be also successfully achieved using the formation age of the rock determined by FTD, independently and also in association with chemical composition data. In case of the Carpathian obsidians, the basic data were collected and published by G. Bigazzi (Biró & al. 2000b).

Characterisation studies within the Carpathian Basin yielded so far only one item that could not be fit into the Carpathian I-II categories (Biró & al. 1986:). Outside the territory of the Carpathian Basin the possibility of interacting sources increase: the confines of distribution of the Carpathian obsidian have been demonstrated so far till Istria (Williams & al 1984) and Thessaly (Bassiakos & al. 1993).

6. ARCHAEOLOGICAL DISTRIBUTION

Archaeological distribution of obsidian was mapped already in the 19th century. The first systematical collection of data was published by Flóris Rómer (Rómer 1876), followed by a number of efforts in respect of a certain territory, period or cultural unit. The data published in technical literature prior to 1980 were collected and presented on a comprehensive map, without aiming at a critical review, by K. Biró (Biró 1981). Apart from the data obtained from references, Hungarian Palaeolithic obsidian finds from the collection of the Hungarian National Museum and the Herman Ottó Museum, Miskolc were published based on personal investigations, separating the categories Carpathian I-II on the basis of macroscopical observations (Biró 1984). Later on, by the application of analytical methods and general petroarchaeological surveys, distribution data from a great number of archaeological sites have been collected and organised into a database. This approach allowed to register the changes of utilisation and circulation in a quantitative manner on a series of maps (Biró 1992, 1998).

A new impetus for distribution studies was given by the project "Raw material atlas Non-metallic prehistoric raw materials on the territory of Hungary and adjacent regions", supported by the Hungarian National Scientific Fund (OTKA)) between 1998 and 2002 (OTKA T- 025086), aiming at a regular collection of distribution data on raw materials identified on

Figure 3. Distribution data on Carpathian obsidians: a, geocoded references from technical literature; b. Carpathian 1 (Slovakian) obsidian identified by macroscopic analysis; c. Carpathian 1 (Slovakian) obsidian identified by instrumental analytical methods. Obsidian on archaeological sites are marked with squares, the location of main geological sources are indicated with empty dots.

Hungarian prehistoric sites. Collection of data was extended to references in technical literature as well as our own analytical work and observations. The work has been continued after the official closing of the projects as well. One of our specific aims is to study and characterise specimens of obsidian occurring relatively far from the source regions, and the non-destructive analytical technique applied offers a good possibility for this.

The results are plotted on geocoded series of maps (fig. 3). Compared to previous maps we are loosing many data points because not all the localities mentioned in old descriptions could be identified, but the existing data become more reliable and can serve as a basis for further synthesis.

7. CONCLUSIONS

Carpathian obsidians used to serve as important element of the raw material stock utilised by prehistoric peoples in the central parts of Europe. Their investigation offers a rare chance for unfolding the system of long-distance prehistoric trade and regular supply of raw materials. Our purpose is to support the research of both raw material resources and distribution studies with reliable, controllable objective data and study this legendary raw material in the realm of facts.

REFERENCES

Bánesz 1967: Bánesz, L., Die altsteinzeitlichen Funde der Ostslovakei. Quartär 18 (1967) 81-98.

Bánesz 1991: Bánesz, L., Neolitická dielna na vyrobu obsidiánovej industrie v Kašove. Vychodoslovensky Pravek 1991 39-68.

Bárta, J. & Petrovský-Šichmann, A. 1962: Bárta, J. & Petrovský-Šichmann, A., Paleolitické nálezy z Ipel'skej kotliny - Archeologické Rozhledy 14/3 (1962) 297-308.

Bassiakos & al. 1993: Bassiakos, Y. - Kilikoglou, V. - Souvatzis, K. - Grimanis, A.P, Provenance Studies of Obsidian from Mandalo in Macedonia, Greece. Abstracts of Asmosia 1993, Third Int.Conf. Athens 17-23 May Demokritos, Athens NCSR Demokritos 1993.

Bassiakos & al. 1998: Bassiakos, Y. - Biró, K. - Kilikoglou, V., Obsidian trade - the South-Eastern connection. Poster presented at 31st ISA Symposium, Budapest. In: Biró K.-Horváth T. (eds.), 31st International Symposium on Archaeometry. Program and Abstracts Budapest 1998 p. 22.

Biró 1981: T. Biró K., A Kárpát medencei obszidiánok vizsgálata (Investigation of obsidian from the Carpathian Basin). Archaeologiai Értesítő, Budapest 108 (1981) 196-205.

Biró 1984: T. Biró K., Distribution of obsidian from the Carpathian Sources on Central European Palaeolithic and Mesolithic sites. Acta Archaeologica Carpathica (Kraków) Kraków 23 (1984) p. 5-42.

Biró 1998: T. Biró Katalin Lithic implements and the circulation of raw materials in the Great Hungarian Plain during the Late Neolithic Period Budapest Hungarian National Museum 1998 1-350.

Biró & Pozsgai 1984: Biró Katalin - Pozsgai Imre Obszidián minták vizsgálata elektronsugaras mikroanalizissel (Investigation of obsidian samples by electron beam microanalysis) - Iparrégészet / Industrial Archaeology 2 (1984) 25-38.

Biró & Dobosi 1990: Biró, K. T.—Dobosi, V., LITOTHECA - The Comparative Raw Material Collection of the Hungarian National Museum. Catalogue. (1991) Budapest 1-268.

Biró & al. 1986: T. Biró K. - Pozsgai I. - Vladár A., Electron beam microanalyses of obsidian samples from geological and archaeological sites. ActaArchHung 38 (1986) 257-278.

Biró & al. 1988: Biró K. - Pozsgai I.- Vladár A., Central European obsidian studies. State of affairs in 1987. Archaeometrical Studies in Hungary 1 (1988) Budapest KMI 119-130.

Biró & al. 2000a: Biró, K.T., Dobosi, V., Schléder, Zs., LITOTHECA II. - The Comparative Raw Material Collection of the Hungarian National Museum. Catalogue Vol. II. (2000) Budapest 1-320.

Biró & al. 2000b: Biró, K. T., Bigazzi, G., Oddone, M., Instrumental analysis I. The Carpathian sources of raw material for obsidian tool-making. In: Dobosi ed. 2000 Bodrogkeresztúr-Henye. (NE-Hungary) Upper Palaeolithic site. Budapest, Magyar Nemzeti Múzeum 221-240.

Cann & Renfrew 1964: Cann, J.R. — Renfrew, Colin, The characterization of obsidian and its application to the Mediterranean region.. Proceedings of the Prehistoric Society 30 (1964) 111-130.

Daraban et al. 2002: Daraban, L., Cosma, C., Cozar, O., Simon, V., Znamirovschi, V., Ghiurca, I., Salagean, M. & Pantelica, A., Obsidian provenance studies. In: Jerem, Erzsébet, Biró, Katalin T., eds., Archaeometry 98. Proceedings of the 31st Symposium, Budapest, April 26-May 3. Vol. II BAR British Archaeological Reports International Series Oxford Archaeopress 2002 1043 /II 705-707.

Elekes & al. 2000a: Elekes Z., Uzonyi I., Gratuze B., Rózsa P., Kiss Á. Z. 1, Szöőr Gy. Contribution of PIGE technique to the study of obsidian glasses. NIM/BSCI Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 2000 161 836.-841.

Elekes & al. 2000b: Elekes, Z.-Biró, K.T.-Rajta, I.-Uzonyi, I.-Gratuze, B.-Kiss Á.Z. Analyses of Obsidian and Radiolarite Samples by Ion Beam Techniques. - Paper presented at 32th ISA Conference, Mexico City.

Janšák 1935: Janšák, Stefan, Praveké sidliska s obsidianovou industriou na Vychodnom Slovensku. - Bratislava 1935 1 - 193.

Kaminska & Duda 1985: Kaminska, Lubomira & Duda, R. K., Otázke vyznamu obsidiánovej suroviny v paleolite Slovenska. - Archeologiczke Rozhledy 37 (1985) 121-129.

Nandris 1975: Nandris, John. A re-consideration of the South-East European Sources of archaeological obsidian. - Univ. of London Bull. of the Inst. of Archaeology 12 (1975) 71-94.

Otkat- 025086: Raw material atlas Non-metallic prehistoricraw materials on the territory of Hungary and adjacent regions. Project funded by the Hungarian National Scientific Fund http://www.ace.hu/atlas/index.html

Pollmann 1999: Pollmann, Hans-Otto, Obsidian-Bibliographie. Artefakt und Provenienz - Bochum Verlag des Deutschen Bergbau-Museums 1999 1-151.

Rómer 1867: Rómer Flóris, Első obsidian-eszközök Magyarországon (First obsidian implements in Hungary). - Archaeológiai Közlemények 7 (1867) 161-166.

Rómer 1876: Rómer Flóris, Les silex taillés et les obsidiennes en Hongrie. Congr. Int. d'Anthr. et d'Arch. Prehist. VIII. Compte-Rendu 2 Budapest 1876 6-17.

Roska 1934: Roska M., Adatok Erdély őskori kereskedelmi, művelődési és népvándorlási útjaihoz (Data on the trade, cultural and migrational routes of prehistoric Transsylvania). Archaeológiai Értesítő 47 (1934) 149-158.

Salagean & al. 1988: Salagean, M., Pantelica, A., Daraban & L., Fiat, T, Provenance studies of obsidian from the neolithic settlement of Partza in South-Western Romania. Ist Conference on the Application of Physics Methods in Archaeology, Bucharest 1988 73-86.

Szabó 1867: Szabó József, A Tokaj-Hegyalja obsidiánjai (Obsidians of the Tokaj mts). - A Magyarhoni Földtani Társulat Munkálatai Pest3 (1867) 147-172.

Szabó 1876: Szabó József, L'obsidienne prehistorique en Hongrie et en Grece. - Congr.Int. d. Anthr. et d. Arch. Prehist., Compte-Rendu II Budapest 1876 96-100.

Tompa 1929: Tompa Ferenc, A szalagdiszes agyagmüvesség kultúrája / Die Bandkeramik in Ungarn Magyarországon - Archaeologia Hungarica 5-6 (1929).

Warren & al. 1977: Warren, Stanley - Williams, Olwen - Nandris, John The sources and distribution of obsidian in Central Europe. - Int. Symp. on Archaeometry and Archaeological Prospection Pennsylvania 1977.

Williams & al. 1984: Williams-Thorpe, O.—Warren, S. E.—Nandris, J., The distribution and provenance of archaeological obsidian in Central and Eastern Europe. Journal of Archaeological Science 11 (1984) p. 183-212.