

Cluster analysis of stream sediments from the site Plavica (NE Macedonia)

Клъстърен анализ на речни седименти от района на находище Плавица (СИ Македония)

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Introduction

Using geochemistry of the stream sediments is a method for determining the potential of heavy minerals. This method is used to determine the potential of large areas drawing on the fact that chemical and mineralogical composition of the sediments provide information on parent rocks and geology of the area. This paper presents the results of investigations of stream sediments in Kratovo-Zletovo volcanic area in which the site is located where Plavica with previous research determined the presence of Cu and Au (Bogoevski, 1998; Serafimovski, 1998, 1999; Stefanova, 2012, 2013). The results of chemical analysis were statistically processed with used cluster analysis.

Results

Studies of stream sediments were made of 49 elements with a special interest in the contents of Au and Cu because this area find copper mineralization with interesting contents of Au. Prospection was carried out on an area of approximately 70 km². The contents of main elements are shown on Fig. 1.

The results of completed trials statistically processed with cluster analysis (Symons, 1981) used to group items according to the level of similar distributed in space. These data are processed according to procedure Weathed pair-group average using as a measure familiarity is used for the correlation coefficient. The study of geochemical characteristics of stream sediments showed that the resulting disintegration of rocks occurring 2 sets of elements: those that originate from ore of the region and elements that originate from petrogenic minerals.

This separation of components of the two groups are due to the fact that the test space note two types of rocks: Tertiary volcanic rocks and ore bodies. Typical elements of the first group are: K, Mg, P, Th, Zr, Y, Be, Al, Rb, Na, Ba, Li, Hf, Cs, Ce, Sr, and Al; for the second group can be distinguish following elements:

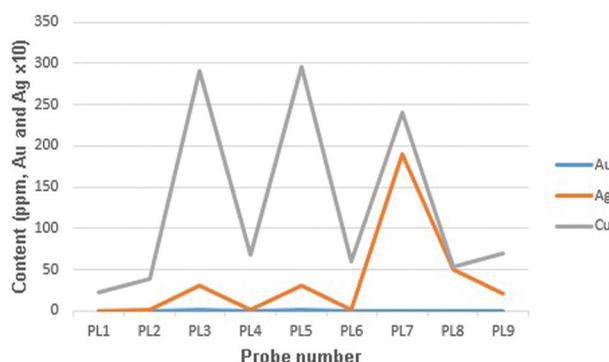


Fig. 1. Diagram of distribution of the Au, Ag, and Cu in the stream sediments down the deposit Plavica

Au, Ag, Cu, As, Bi, Co, Cr, Cd, Ga, Ge, Mo, Ni, In, Tl, Pb, Re, Nb, Sb, Se, Sn, Ta, Te, U, V, W, Zn, and Hg. Other elements such as Ca, Mn and S are associated with the two groups respectively entered in the composition of rocks and ore bodies.

Ore elements (Fig. 2) are divided into 3 clusters. The 1st cluster includes Ni, Co, and Ca. Gold as an element enters the 3rd cluster which occurs in association with Mo, Wn and Re. In this cluster enters also Cu, Fe and S. They may indicate the possible link of Au with copper sulfides considering that the mineralization in this area comes as a handy copper ores. In the second cluster comes association of Pb-Zn and Cd which is characteristic of polymetallic ore. The joint appearance of Ni and Co is geochemical justified.

The elements entering the construction of petrogenic minerals form 4 clusters (Fig. 3). Out of clusters remain Ti and Be that according correlation factor they have not any correlation with any element of the cluster. Stronscium showing negative correlation relationship with potassium.

The 3rd cluster can be distinguished association of La, Th, and Cs, which is characteristic of the very few countries. Zirconium and Hf usually occur together.

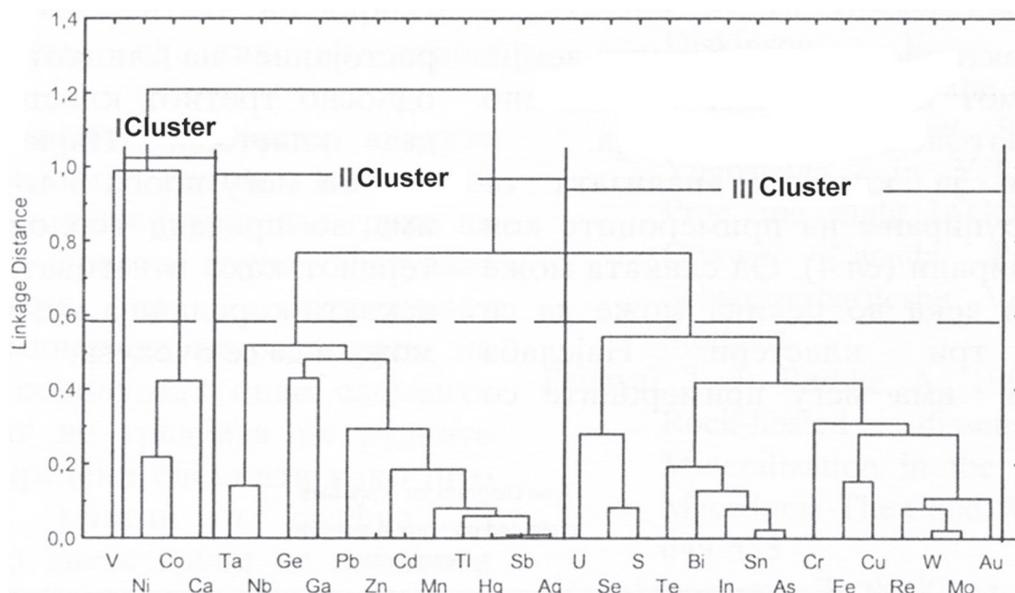


Fig. 2. Ore elements cluster

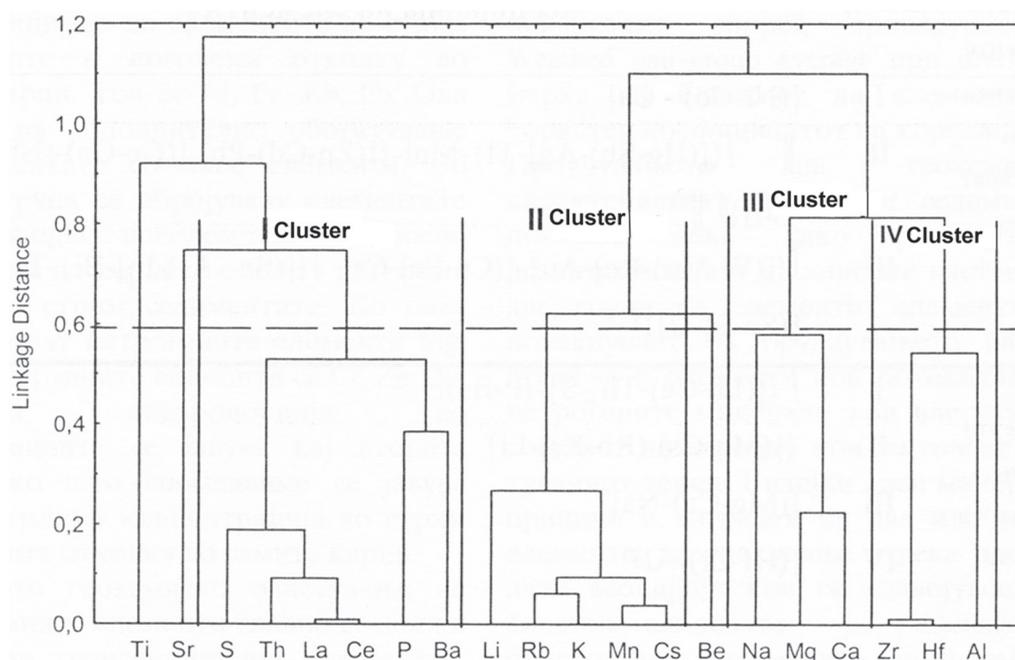


Fig. 3. Rock elements cluster

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