

APPLICATION DES MÉTHODES GÉOCHIMIQUE ET GÉOPHYSIQUE (E.M-V.L.F) DANS LA RECHERCHE DES MINÉRALISATIONS POLY-MÉTALLIQUES DE TYPE PB-ZN-CU AU DJEBEL BOU ARIF (ALGÉRIE NORD-ORIENTALE)

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RÉSUMÉ

Le Djebel Bou Arif, où se localise le secteur prospecté, se situe au nord du massif de l'Aurès. Il comprend des formations sédimentaires d'âge crétacé recouvertes en discordance par du Miocène marin. Les indices de minéralisations polymétalliques reconnus dans la région se localisent dans un encaissant carbonaté aptien.

Dans ce travail deux méthodes de prospection ont été utilisées sur une surface d'environ : 1 km² : les prospections géochimique et géophysique (électromagnétique V.L.F) . Elles ont permis de localiser des sites potentiellement minéralisés. La méthode EM- VLF a permis de mettre en évidence deux anomalies corrélables aux données géochimiques. Des associations géochimiques caractérisant les minéralisations plumbo-zincifère et cuprifère ont été dégagées.

Le traitement statistique multivariable sur les résultats des analyses chimiques nous a permis de fixer les fonds géochimiques se rapportant aux éléments Pb, Zn, Cu. dans un contexte carbonaté.

Mots clés - Géochimie - Géophysique Electromagnétique Very Low Frequency (EM – V.L.F) - Environnement carbonaté - Minéralisation polymétallique (Pb, Zn, Cu) -Bou – Arif- Algérie nord orientale.

GEOCHEMICAL AND GEOPHYSICAL (E.M – V.L.F) METHODS APPLIED FOR SEARCHING POLYMETALLIC MINERALIZATIONS (PB-ZN-CU) AT DJEBEL BOU ARIF (NORTH-EASTERN ALGERIA)

ABSTRACT

The prospected area is located at Djebel Bou Arif situated at the north of the Aurès massif. It represents a large anticlinal structure oriented NE-SW and composed by Cretaceous sedimentary unconformity formations. These formations are on marine Miocene cover.

The Cretaceous carbonate facies contains an abundant macro/microfauna. This allows give us to them a sedimentation environment of inner platform type (Marmi, R. 1995).

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In the studied area two directions of faults can be seen : NW – SE and E – W. The polymetallic mineralization indices are often found in a Cretaceous (Aptien) carbonate and linked up with these fractures.

These mineralizations are presented in the form of different morphologic bodies : metallic veins, columns, mass, lenses or traps (pocket). The main objectives of the present work are to characterize the trace elements distribution (mainly the Zn, Pb, Cu, As and Sb) in the carbonate medium and locate the geochemical anomalies.

Two methods of geochemical and geophysical (EM VLF) prospecting have been applied together in the same area, on a surface of about one square kilometer. In this case, the study consists also on testing the efficiency of two independant methods in carbonates medium to locate bodies containing sulphides.

The lithogeochemical prospecting according to a regular sampling grid following mesh of 50x20m, allowed us to gather 230 samples carried out by plasma - spectrometry. By means of statistical processing of geochemical data, we recognized geochemical associations as well as geochemical anomalies. The first association (Pb-Zn-As) is related to sulphides : Galena and sphalarite. The second association (Cu-Sb-As) characterizes grey copper with its two main minerals tenantite and tetrahedrite. The detected geochemical anomalies is linked up either with certain well determined facies or with fractures, which is in agreement with a mineralization control which is all together lithological and structural. The chemical element Arsenic (As) goes with the two types of mineralization, and it could therefore be taken as an indicator element for prospecting Cu-Pb-Zn mineralization.

The geophysical prospecting by the EM-VLF method has been choosen for several reasons : first as a rapid and low cost method, and secondary to make qualitative correlation with the geochemical method and finally to evaluate it's performance in locating such type of mineralization.

The EM-VLF method consists of measuring, at the Earth's surface, the distortion of the electromagnetic field due to the presence of subsurface conducting bodies. As primary field one method uses the waves of low frequency emitted by the navigation station often of several thousands of kilometers far. The problem is to measure the phase component (I) and the quadrature component (Q) of the vertical electromagnetic field induced in the subsurface. The depth of investigation of this method is about 40 meters. By choosing the navigation station F.U.O (emission waves of 15.1 KHz – Bordeaux) for it's better signal, we have oriented the survey profiles in the N145°E direction, almost perpendicular to the known mineralized structures in the region. The survey profiles are separated by a constant distance of 20 m. The regular measuring step was also choosen to be 20 m.

The processing of geophysical data and their graphical illustrations (derived curves and anomalous map) show evident correlation with the geochemical anomalies.

Key-words - Geochemistry - Geophysic Electromagnetic Very Low Frequency (EM-VLF) - Carbonate medium - Polymetallic mineralization (Pb-Zn-Cu) - Bou Arif - Eastern Algeria.