REMOBILIZATION OF ZN AND PB FROM THE PALEOZOIC BASEMENT A SOURCE OF MINERALIZATION AT EL FALDEO DISTRICT, CHILEAN PATAGONIA: GEOCHEMICAL AND ISOTOPIC EVIDENCES

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INTRODUCTION

The El Faldeo district is located in the Patagonian precordillera of Aysen, Chile (72°20'W-47°27'S). The purpose of this paper is to discuss the source of the Zn and Pb mineralization using geochemical and isotopic evidences.

GEOLOGY OF THE DISTRICT

The oldest rocks in the district are upper Paleozoic schists, phyllites, quartzites, shales, and marbles. These rocks are unconformably overlayed by a 200 m thick upper Jurassic sequence of felsic tuffs and lavas (Ibañez formation). The rocks are intruded by a dacitic intrusive-efusive complex which consists of brecciated stocks, sills and felsic tuffs. In turn, these rocks are intruded by tonalitic to dioritic stocks and dikes dated at 151 Ma (Palacios et al., 1996a). The rocks in the district are pervasively altered and the primary mineral components are obscured by alteration.

MINERALIZATION AND HYDROTHERMAL ALTERATION

Hydrothermal alteration in the district is widespread affects entirely the Paleozoic and Jurassic rocks and covers approximately 12 Km^2. In the district, two types of mineralization have been recognized (Palacios et al., 1996b): Au-Ag epithermal and Zn-Pb mesothermal mineralization, constituting the last one the focus of our studies. Basic metals mineralization consists of irregular pipe-like bodies of 100 to 200 m in diameter containing stockwork and dissemination of pyrite, arsenopyrite, sphalerite, and Ag-bearing galena. Mineralization is hosted by Jurassic volcanic and intrusive rocks, which present sericitic alteration. A propylitic and silicic halo surround the mineralized bodies. Ore grades varies from 2 to 8% Zn, 0,4 to 3% Pb, and 10 to 100 ppm Ag. Although the mineralization in the Paleozoic rocks is restricted only to few veinlets, the

ore and alteration mineralogy is similar to those exhibit by Jurassic rocks. Fluid inclusions data indicate ore deposition during boiling at homogenization temperature varying between 250° to 330°C, and salinities ranging between 4 and 23wt% NaCl equiv.

GEOCHEMISTRY OF THE PALEOZOIC ROCKS

Table 1 show the statistic behaviour of Zn and Pb (analyzed by ICP) in 250 chip samples of Paleozoic rocks. In general the curves exhibit 2 break-points defining 3 different populations, which can be interpreted as negative, background,and positive anomalies respectively.

TABLE 1.- Statistic populations of Zn and Pb, defined using log-probabilities analysis

Elements (ppm)	Negative anomaly	Background	Positive anomaly
Zn	< 30	30 - 140	> 140
Pb	< 25	25 - 130	> 130

Samples of the background population are unaltered rocks, which were taken far from the district. They probably represent the normal concentration of Zn and Pb of the Paleozoic rocks. In contrast to the former, the samples that lie within the anomalous population were taken from altered rocks in the district. Samples of the negative anomaly correspond to unmineralized rocks that mainly present propylitic alteration. Mineralized samples with sericitic alteration form the positive anomaly population. Correlation coefficients of the elements considered in this analysis range between 0.72 and 0.89 in each population. These results suggest that Zn and Pb were leached from the Paleozoic rocks during propylitic alteration, and probably the elements were reconcentred in the sericitized and mineralized rocks.

ISOTOPIC GEOCHEMISTRY

Sulfur isotope data from sphalerite separates exhibit $\delta^{34}S$ values between 1.0 to 2.8 per mil. The data support that the H_2S in the hydrothermal fluid was derived from two sources: sulfate leached from the basement marine sediments and magmatic emanations (Ohmoto and Skinner, 1983; De Ronde and Blattner, 1988). Lead isotopic data from galena separates define a field above the orogenic growth curve in both uranogenic and thorogenic diagrams (Fig. 1). The position of this field could reflect a lower crust (Godwin et al., 1988) - upper crust mixing, indicating that the source of Pb had low U/Pb and Th/Pb ratios.

Isotopic data on Jurassic dioritic to tonalitic stocks evidence Sr87/Sr86 ratios of 0.706951 and 0.708203, and εNd of -2.9 and -3.7 suggesting an important crustal contribution (Parada et al., 1996).

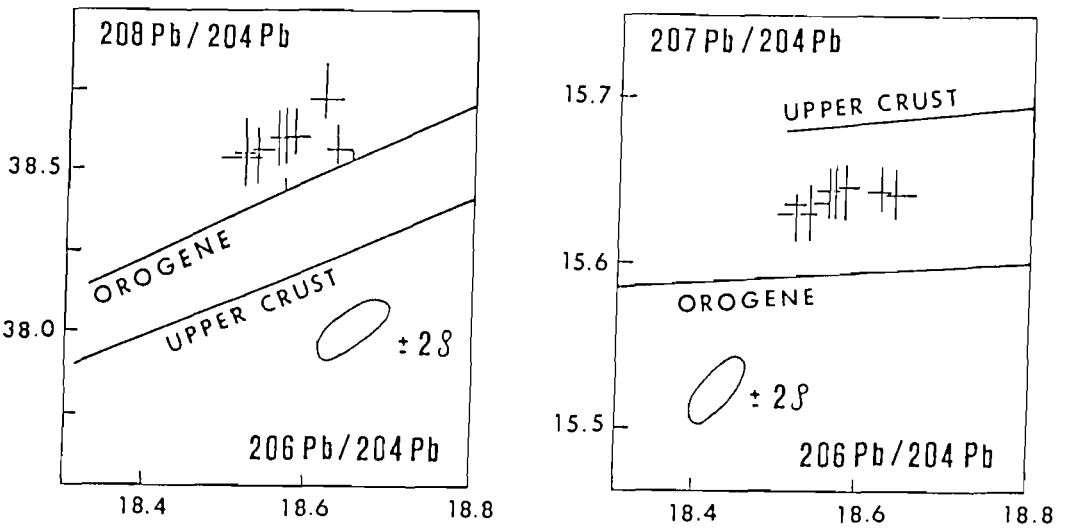

Fig. 1.- Uranogenic and thorogenic diagrams showing the lead isotopic data from galena separates.

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