

Minerais, métaux, isotopes: recherches archéométriques sur les mines de plomb et d'argent en Valais, Suisse

[GUÉNETTE-BECK Barbara](#); january 20, 2006

Supervisor: Dr. Vincent Serneels, Université de Fribourg; Prof. Hans-Rudolf Pfeifer, Institut de Minéralogie et Géochimie

The many lead and silver mines of the Valais testify of an important mining activity in the past, without however revealing neither the importance of the mineralizations, nor the era of the exploitation. The purpose of this research is to understand why the large mines are concentrated in one region, and to determine the history of their exploitation. The uniqueness of this work lies in its interdisciplinarity, more precisely in the application of mineralogical methods to solve historical problems.

In order to evaluate the lead and silver mining resources of the Valais region, 57 mines and ore deposits were located and sampled. The isotope signatures of Pb (74 analyses) and the compositions of the chemical elements (45 analyses) were determined. The largest activities are in the Siviez-Mischabel area, located in the South of the boundary formed by the Rhone, Bagnes and Lötschental valleys. According to their lead isotope signatures, they are linked to mineralizations of the Caledonian (408 to 387 my) or tardi-Hercynian (333 to 286 my) orogenies. In those times, the old continent was very heavy and underwent a thermal subsidence. First fractures of great significance were formed. Through these major tectonic events, large extended ore deposits can be formed. Other mineralizations are found in the helvetic regions situated north of the Rhone and the Entremont valley (the Aiguilles Rouges basement, Mount Blanc basement and the covering sediment). Because they are from post-hercynien to tardi-alpine age (there are no mineralizations of tertiary age), they are mainly linked to granite intrusions, the sources of juvenile lead. The mines found in these tectonic units are significantly less extensive than those of the Siviez-Mischabel area, leading to the assumption that the respective mineralizations extend accordingly.

The history of exploitation of the mines can be determined by four different sources: mining archaeology, historical texts, metallurgical waste, and the comparison of the isotope signature of the lead from accurately dated archaeological objects (currency, jewels etc), with those of the ores. This last approach was applied and developed within the framework of this research. The lead isotope signatures of 221 lead or silver objects from the Iron Age to the Middle Age were compared with approximately 1800 samples of ore of the most important ore deposits in Switzerland and Europe.

Before the Roman time up to the 1st century, lead comes mainly from the mines of the Iberian Peninsula then in full activity. A contribution of the mines of Central Europe, in particular of the Vosges, remains to be confirmed. From the 1st century on, lead was mainly imported into Western Switzerland from Northern Germany (Eiffel region). The lead mines in the Valais region, in particular those of Siviez, begin their exploitation at the same time, mainly to meet the local needs, but also for export to the lemanic basin and of lesser importance, beyond. As from the 4th century, the need of lead was met by the production from local mines and the recycling of old objects. This change of supply is probably related to the tensions created by the

Germanic invasions during second half of the 3rd century; as a consequence, the Swiss market is not supplied any more by the north, i.e. the Rhine valley.

Silver production is confirmed starting from the end of La Tène, shortly after the appearance of this metal in the Valais region. Since no objects of Roman origin were analyzed, nothing is known for this period. From the 5th century on, silver production is again confirmed. However, significant silver production from local mines starts only in the Middle Age with the coinage, in particular Carolingian and Episcopal minting from the Valais region. The sources of silver differ according to their use: besides some exceptions in particular towards the end of La Tène and the tardi-Roman, the jewels and objects of worships were often created from recycled silver, contrary to the coins the silver for which comes from the local mines. A different source of silver is observed according to the location of coin manufacture: Objects originating from the Valais region are clearly distinguished from those from the Plateau Suisse.