The chemical variation of major signature in an iron production region: the example of the "Pyrénées-Orientales" and the Canigou mountain (France) between Antiquity and Modern Period

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The Canigou mountain along with the "Pyrénées-Orientales" and the "Ariège" (France) are famous for the direct iron process. In this area, this technique has been maintained until 19th c. in hydraulic powered systems named as "moulines" in the end of the Middle Age and "forge à la catalane" in the Modern Period. The origin of the direct iron production takes place likely in the Roman republic period, when the Romans have beginning to conquer and annexe the southern reaches of the Gaul. Since 2014 in the "Pyrénées-Orientales", an archaeological survey program carries on an inventory of all the Antiquity, Middle Age and Modern Period iron smelting sites. The aim of such an inventory is the diachronic understanding of the ironmaking technical processes. Slags, as they are the prominent waste stemming from an ironmaking activity, hold chemical information potentially related to the iron reduction system. In addition to the possibility to assess the iron production (quality, quantity), the variation of chemical "signatures" as function of space and time would provide information about changes and "recipes". By the way, technic evolution such as the transition between natural or manual ventilation and hydraulic power can be investigate.
In 2016, 140 sites of tap slag heap have been discovered around the Canigou mountain. They constitute around 700 000 m3 of tap slag. 95% of this are dated from the roman antiquity. Hence, the Canigou mountain seem to be one of the most famous region of iron production in the south of Gaul between the Roman Republic to the early Roman Empire. In this corpus, 24 iron production site have been studies through slag pXRF in situ analysis. 784 tap slag analysis have been done on 10 roman sites, 1 Middle Age sites, 5 modern Period sites and 8 sites no-dated. From this first chemical analysis prospection, we are able to distinguish several groups of chemical composition according to geography and chronology.