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Prospectivity mapping of niobium and tantalum in Europe; a part of the GEOERA- FRAME project

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The prime aim of work package (WP) 3 in the FRAME project is to produce a map of Strategic and Critical Raw Materials (SCRM) for Europe, including the so-called energy and conflict minerals. In cooperation with other FRAME WPs, there was a consensus on the methodology used for the identification and selection process of the Strategic and Critical Raw Materials (SCRM) to be included in the metallogenetic map, linked mainly to information collected from existing databases (DB), such as Minerals4EU (M4EU) and European Geological Data Infrastructure (EGDI).

One main objective of WP3 is the predictive targeting based on GIS exploration tools and prospectivity assessments at continental scale. Two types of prospectivity mapping have been produced in this WP3 based on different knowledge and data-driven methods. The first method applies the latest developments in "data driven" mineral prospectivity that allows mapping at continental scale, such as the "Cell Based Association" (CBA) one method developed by BRGM. CBA is an alternative to GIS-supported prospectivity methods. It has been developed to better manage uncertainties related to cartographic data which are highly significant at continental scale. The second method is using the hybrid fuzzy weights-of-evidence (WofE) model for mineral potential mapping.

SCRM may be recovered either as primary commodities or as by-products. Carbonatite-related deposits are the primary sources of many CRM such as REEs, niobium (Nb) and tantalum (Ta). Granitic pegmatite deposits are currently the principal source of Ta. Compilation of Nb and Ta occurrences/deposits in Europe is currently going on within FRAME WP6 (see separate presentation by Reginiussen et al., this conference). The data has been used for the spatial analysis and prospectivity mapping related to geology and geotectonic and metallogenic setting at European scale.

The results of our prospectivity mapping highlight several Nb and Ta mineral potential areas

related to evolved granite to leucogranite bodies mostly in Scandinavia, Spain, France and Portugal, e.g Morille-Martinamor district, Fontão and Penouta where previous exploration activities on those elements were carried out in past. The late Neoproterozoic to early Cambrian Schist-Greywacke Complex (SGC) of the Variscan belt, in Central Iberian Zone, is also indicated as favourable area for Nb and Ta. Pegmatites in the Campo Mineiro De Lagares in the CIZ are another area of interest. Pegmatites in central Iberian zone is another area of interest, as is the case for Campo Mineiro De Lagares. The late Neoproterozoic to early Cambrian Schist-Greywacke Complex (SGC) of the Variscan belt, in Central Iberian Zone, is also indicated as favourable area for Nb and Ta. . In Sweden, the pegmatites of the Varuträskt area, close to Skellefteå, dated to c. 1.8-1.77 Ga, are clearly highlighted in the prospectivity maps. The areas related to Fennoscandian carbonatites appear also to be strongly favourable as Nb and Ta mineral potential targets. In the northern, central and southern parts of Sweden, high to moderately favourable areas are related to the numerous individual and granitic pegmatite dykes of Proterozoic age.

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