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BOOK OF ABSTRACTS



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Forging a Path for Sustainable Development”*

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T8- S2 General Topics

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AfricaMaVal - Mineral Potential Mapping Study of European Critical Raw Materials (ECRM) of Africa

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Abstract:

The AfricaMaVal project, a 3.5-year initiative coordinated by the French Geological Survey (BRGM), fosters sustainable EU–Africa partnerships in the critical raw materials (CRM) sector. With 18 partners from 11 countries, it promotes responsible mineral sourcing for European industries while supporting Africa’s sustainable development. Work Package 1 (WP1), “Supply Potential,” led by the Portuguese Geological Survey (LNEG), assesses and maps African supply potential for European Critical Raw Materials (ECRM) through a harmonized, INSPIRE-compliant database. BRGM has developed machine learning (ML) algorithms for mineral resource assessment over the past 20 years, applied at scale since 2022. Within WP1, prospectivity maps for selected ECRMs were generated in ten countries, drawing on BRGM datasets, including 1:10M geological and structural maps and over 55,000 mineral occurrences. However, data resolution and coverage vary widely, with some countries lacking geoscientific information. Initial tests using the 1:10M BRGM/CCGM map highlighted its coherence but insufficient resolution for identifying precise mineralization zones or correlating mineral systems with geological events. To overcome this, modelling with BRGM’s higher-resolution 1:2M map was undertaken. Geological domains (orogenic belts, basins) and events (Archean–Cenozoic) were classified, enabling ML to detect underexplored areas with potential for most 2020-listed ECRMs. The method leverages cross-border geological similarities to compensate for missing data and identifies favourable or unfavourable factors for

mineralization. The project delivers multi-thematic maps integrating mineral potential with infrastructure, protected areas, and small-scale mining. These serve as first-order exploration guides and support balanced decisions between economic opportunities, environmental constraints, and social considerations.

Keywords: Africa, Mineral Potential Mapping

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Geostatistical and Machine Learning Based Groundwater Level Modelling in Southern Ethiopia: Current State and Near Prospects; Can Artificial Intelligence Help?

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Abstract:

Our current project focused on groundwater resources in southern Ethiopia is struggling with lack of reliable data. 82 water wells available in the study area are not evenly distributed, there are large areas without any information on ground water levels. Thus more sophisticated geostatistical methods using as explanatory independent variables 82 parameters such as Precipitation, DEM, Slope, TWI, Distance from rivers, LULC, NDVI, iSDA soil composition, Summer Land Surface Temperature and Evapotranspiration. Results of EBK regression are relatively satisfactory with RMS 35.9, but there are still quite many wells with error bigger than 50%. This method is still problematic for future drilling campaigns. Problem is non-linear behavior of some variables and lack of correlation of important ones. Better results were achieved with prediction using two machine learning methods: 1] Random Forest Regression (R-squared = 0.642) still exhibited a relatively high spread of (measured/predicted) difference values, reaching up to 593%, also 14 wells showing error bigger than 30%. 2] Best results are realized with Gradient Boosted Regression demonstrating robust predictive capability despite data scarcity and