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Automated Detection of Anthropogenic Rare Earth Element Contaminations

The rare earth elements (REEs) are among the most crucial metals for high-tech and green energy applications and are considered critical raw materials. For example, neodymium (Nd) and dysprosium (Dy) are major constituents of wind turbines, with as much as several hundred kilograms in a single wind turbine magnet. The progress of high-tech applications and E-mobility will increase the global demand for REEs. However, the increasing usage will inevitably result in an elevated anthropogenic input of critical raw materials, such as REEs, into natural environments. Such emerging contaminants are already ubiquitous in river waters, seawater, and even tap water worldwide. Since many critical raw materials may harm living organisms when exposed to elevated concentration levels, monitoring these materials in Earth's ecosystems will become a crucial task in the near future. This monitoring requires extensive data, some of which are already available through scientific publications and databases. Thus, there is a need for solutions that assist in the surveillance of large environmental datasets.

As part of the QuARUm project, we transferred the geochemical domain expertise on the natural behaviour of REEs into a data assessment method that automatically detects anthropogenic REE contaminations. In the future, we aim on continuing the work on developing low-code and easy-to-use data analytics that simplifies working with REE related samples. This line of work aims to improve the low-code language used in the data analytical process and increase the replicability of data processing by automating it.

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