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GEOROC and PetDB data usage and impact through time

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The GEOROC and PetDB databases have compiled published, peer-reviewed literature data on the geochemical composition of igneous rocks and minerals for 25 years (https://georoc.eu/; https://search.earthchem.org/). While initially the focus lay on basalt compositions from ocean islands and mid-oceanic ridges, respectively, over the decades both databases have widened their scope to include other geological settings (e.g. ocean-ocean and ocean-continent subduction zones, back arc, continental collision zones and continental intraplate settings). The databases further now include the complete compositional range of igneous rock types as well as mantle xenoliths, and minerals. Together, these compilations now comprise: 22 distinct geological settings; 351 lithologies; 533 mineral species; and the full range of geochemical analytes including all common major elements, trace and rare earth elements, isotopic ratios as well as analytical ages. Today, the two databases contain >43 million single data values from ~25,000 literature sources/journal articles, 24,793,646 mineral data points, 15,364,418 whole-rock data points, 1,706,500 volcanic glass data points, and 1,431,377 data points for glass, fluid and mineral inclusions. Continued data curation of PetDB and GEOROC with regular updates ensures that the databases continue to grow. The EarthChem Portal allows for direct and harmonized access, filtering and download from the combined databases (http://portal.earthchem.org/).

The comprehensive data collections offered by PetDB and GEOROC present a unique opportunity to the research community to undertake advanced analysis of large-scale regional and global datasets. New research questions have been tackled, making PetDB and GEOROC an essential tool for digital geochemistry. Both databases today have accumulated more than 4000 citations ranging from highly detailed, regional comparative research to machine learning studies using hundreds of thousands of data points. We present a detailed analysis of the usage of GEOROC and PetDB data products to highlight the wide range of research topics that GEOROC and PetDB have supported, and the impact of global geochemical data compilations on past, present, and future trends in the Earth System Sciences.