

EarthBank Meets LithoPlates: A Free and Fully Integrated Tool for Visualising and Analysing Geochemical Data in Deep-Time

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With the exponential growth of geoscientific data and the increasing emphasis on FAIR (Findable, Accessible, Interoperable, Reusable) data management, there is a need for fully integrated tools that enable seamless processing, visualisation, and analysis of complex datasets. LithoPlates, now freely available within EarthBank, provides a cloud-based solution that allows researchers to analyse geochemical, geochronological, thermochronological, and mineral deposit data in their palaeogeographic context.

At the core of LithoPlates is the GPlates Web Service, developed by the EarthByte Group, which enables dynamic access to pyGPlates functionalities and advanced plate tectonic models. LithoPlates integrates 11 different plate tectonic models, including the latest 2024 reconstruction extending back to 1.8 billion years, providing researchers with an intuitive and interactive tool for spatiotemporal analysis. Users can apply age-specific filters, visualise data in both present-day and deep-time reconstructions, and step through geologic time in 1-million-year intervals, unlocking new insights into tectonic evolution, material transport, and geological formation processes.

Through its full integration with EarthBank, LithoPlates supports real-time plate model switching, automated metadata analysis, and REST API access, allowing seamless connectivity with external analytical workflows. The ability to analyse datasets on-the-fly significantly enhances geoscientific research, particularly in fields such as mineral exploration, paleogeography, and geodynamic modeling.

As a free and openly accessible tool, LithoPlates aligns with broader digitalisation efforts in geoscience, supporting data reusability, laboratory automation, and interdisciplinary collaboration. Future developments will further expand model-data fusion capabilities, improve uncertainty quantification, and refine comparative analyses across multiple tectonic scenarios, offering a transformative solution for reconstructing and understanding Earth's deep-time history.

