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Identification of crustal tectonic domains from AI and ML enhanced analysis of multidisciplinary geophysical data.

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The lithospheric structure corresponding to different tectonic regimes exhibits significant variability. In regions with complex tectonic settings and limited geological data, it is challenging to delineate the specific tectonic domain to which the local lithosphere belongs. Various crustal/lithospheric typizations have been proposed and tested in the past, based on geological and geophysical data. However, these approaches provided only a first-order approximation, utilizing a limited subset of available data. This study aims to test the feasibility of crustal/lithospheric classification using machine learning and AI techniques, leveraging all available global and regional geophysical datasets. The testing area is confined to Eurasia and the Northern Atlantic Ocean, where tectonic settings are well-studied and understood, and there is excellent coverage in various geophysical and geological datasets. Subsequently, the proposed technique can be applied to regions with more enigmatic tectonic settings, potentially providing better insights into likely tectonic domains.

Understanding the lithospheric structure is crucial for comprehending the Earth's tectonic behavior. By employing machine learning and AI, this study seeks to develop a more comprehensive classification system that can adapt to the complexities of different tectonic settings. The integration of diverse geophysical datasets will enable a more nuanced analysis, potentially uncovering patterns and correlations that were previously overlooked. This approach not only enhances our understanding of well-studied regions like Eurasia and the Northern Atlantic Ocean but also sets the stage for applying these techniques to less understood areas. The ultimate objective is to establish a robust framework for identifying tectonic domains, which can significantly advance our knowledge of geological and tectonic processes.