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Elementome trajectories: a framework for studying ecosystem biogeochemical shifts in paleoenvironmental records.

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X-ray fluorescence (XRF) and other advanced analytical techniques provide detailed information on geochemical composition in chronologically dated sedimentary sequences. These methods yield high-resolution data on elemental concentrations and ratios, enabling the reconstruction of past environmental conditions. In this contribution, we introduce a novel approach that uses multivariate analysis of all available biogeochemical and geochemical data (elementome) to characterize the trajectories of elemental composition over time and link them to drivers of environmental change. Our analysis of records from Atlantic islands, characterizing the magnitude, graduality and direction of biogeochemical shifts in paleoecological records from several archipelagos, shed light to a potential modern-time shift towards organic-dominated elementomes; and on the effect of human arrival and climate changes on the stability of ecosystem elementomes. Moving ahead, elementome trajectories hold promise as descriptive tools for paleoecology, but also in the interpretation of biogeochemical shifts at any timescale.