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Mineralogical, chemical and isotopic evolution of recent glauconite in two contrasting marine settings

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Much of our present understanding of the Earth System's evolution comes from reconstructing palaeo-seawater composition, because seawater integrates a global signature of the geological and biological processes operating on our planet. Stable metal isotopes (e.g. K and Mg) are emerging as promising proxies for probing the functioning and evolution of crucial stabilising climate feedbacks (silicate weathering and reverse weathering). However, the lack of suitable sedimentary phases capable of recording the isotopic signature of seawater and preserving it through burial diagenesis has restricted their application, particularly in deep time. The marine authigenic clay glauconite [$(K,Na)(Fe,Al,Mg)_2(Si,Al)_4O_{10}(OH)_2$] is a largely overlooked archive that occurs from the Precambrian to present, potentially allowing us to bridge this important research gap. However, this requires a robust understanding of the formation and isotopic evolution of glauconite in modern to recent marine settings. To address this, we document the mineralogical, chemical and isotopic evolution (Sr, Nd, K and Mg) of glauconite through initial precipitation to chemical maturation at two modern sites: 1) ODP 959 in the equatorial Atlantic, where glauconites have formed in calcareous clays and oozes, occurring exclusively as infills of foraminiferal tests, and 2) the NE Pacific Oregon margin, where glauconite has formed within a chemically immature siliciclastic substrate. Comparison between sites and to changes in host sediment composition with depth allow us to infer the conditions under which glauconite reflects seawater composition and the extent to which depositional setting modifies this.