Calibration of stable strontium isotopes ($\delta^{88/86}Sr$) with respect to salinity and carbonate saturation in lagoon-estuarine environments

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The novel stable strontium isotope tracer ($\delta^{88/86}Sr$) has been used to constrain mass-dependent isotope fractionation processes such as carbonate formation/dissolution, where the latter has implications for climate studies related to local C cycling and CO_2 fluxes and thus "blue carbon" studies [1]. More recently, this tracer has also been applied in coastal environments as a paleo-environmental proxy [2][3]. However, there are no systematic studies using stable Sr isotopes conducted in hypersaline lagoon environments in which higher mass of carbonate production is likely to happen. The Coorong hydrological system in South Australia, located ~100 km southeast to Adelaide, represents a unique 'natural laboratory' to calibrate the $\delta^{88/86}Sr$ tracer to salinity changes across a large salinity gradient of local water bodies ranging from fresh to hypersaline (from ~0 to over 100PSU) [4]. Available results confirmed a systematically increasing trend of $\delta^{88/86}Sr$ in lagoon waters with increasing salinity and carbonate saturation state, also coupled with changes in water $\delta^{44/40}Ca$ [4]. Based on these observations, we explore the potential of combined radiogenic and stable Sr isotope tracers (i.e., $^{87}Sr/^{86}Sr$ and $\delta^{88/86}Sr$) to reconstruct the paleo-hydrology and salinity variations in the Coorong lagoon system.

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