

Freshwater input typology as a driver of Total alkalinity and pH: Spatial and diel variability in coastal systems in Ireland

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Spatial and temporal Total Alkalinity (TA) and pH variability are compared in two contrasting estuarine coastal systems in western Ireland. Kinvara bay, a limestone area inserted into a karstic catchment area, where freshwater inputs are dominated by submarine groundwater discharge (SGD), and Killary harbour, characterized by shale, sandstone and conglomerates where freshwater income is via surface runoff in the form of rivers and several periodic streams.

Sampling was conducted in January, July, October 2018 and January 2019, to allow seasonal coverage of systems according to freshwater discharge magnitude.

Low TA values were measured in the rivers feeding into Killary (from ~20 to ~200 $\mu\text{mol}\cdot\text{kg}^{-1}$) depending on season, while SGD was a large source of TA (from ~4000 to ~5500 $\mu\text{mol}\cdot\text{kg}^{-1}$) into Kinvara. TA was significantly correlated with salinity in both sites, suggesting mixing to be the main driver of carbonate system variability. Only during an exceptionally dry season biological processes drive TA and pH variations. Net community production (NCP) is calculated to quantify seasonal variabilities associated with large and low freshwater input. At Kinvara bay, NCP scales with SGD and hence organic carbon is exported to the ocean when groundwater discharge is higher, increasing the system buffer capacity to acidification.