

Identifying water sources, including groundwater discharge, to estuaries using stable isotopes of oxygen and hydrogen and strontium

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Identifying and quantifying the dominant sources of water (meteoric, surface water runoff, groundwater discharge, and seawater) to estuaries is important for determining a balance of water, nutrients and other chemical constituents to the estuary. By observing linear relationships between the stable isotopes of oxygen and hydrogen with salinity, different sources of fresh water can be discerned spatially across an estuary. This technique proved useful in determining between meteoric and surface water runoff, in both brackish and hypersaline estuaries [1,2]. When combined with strontium and calcium concentrations, the proportion of fresh versus brackish groundwater inputs from carbonate aquifers to an estuary can also be discerned [3,4]. The use of these naturally occurring geochemical tracers have been used to successfully identify the dominant sources of water to estuaries in the USA, Mexico, and Australia. In the hypersaline estuaries of Florida Bay, USA and Shark Bay, Western Australia, surface water runoff contributed closer to the coastline, while meteoric water was the dominant source of freshwater away from the coastline. Fresh groundwater was found to contribute 2% of the total volume in Biscayne Bay, USA and 25% in Celestun, Mexico.

[1] Swart & Price (2002) *Limnol. and Ocean*, **47**, 1234-1241.

[2] Price *et al* (2012) *Marine & Freshwater Research*, **63**, 952-

966. [3] Stalker *et al* (2009) *Estuaries and Coasts*, **32**, 694-

708. [4] Stalker *et al* (2014) *Estuaries and Coasts*, *in press*.