

Te Whakaheke o Te Wai

Stable Isotopes

NIWA scientists have been collecting water samples from rivers and precipitation across New Zealand to develop isoscapes. An isoscape is a spatially explicit predictive model of isotopic values across a landscape. The stable isotope tracer research has improved our ability to calculate mixing of waters (e.g., between local precipitation, groundwater, and river water), river water age, and recharge zones. Water age metrics for rivers can inform on water security (how much water is stored) and susceptibility of catchments to diffuse pollution.



NIWA have undertaken four years of sampling precipitation isotopes at sites across New Zealand. Samples were collected and analysed for deuterium (H) and oxygen-18 (O) content. A citizen science high-elevation sampling network was used to supplement existing precipitation isotope datasets.

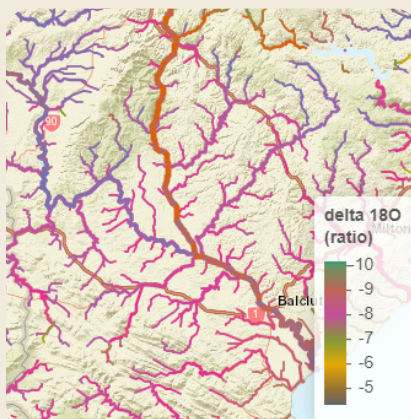
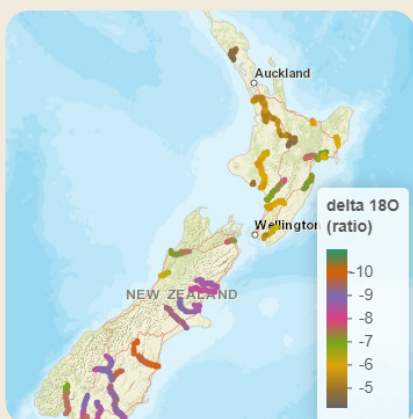


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Research involved modelling of spatial and temporal patterns of precipitation isotopes. Sinusoidal precipitation isoscapes were developed to model how annual, temperature-driven changes in precipitation isotopes vary across New Zealand. These isoscapes and river water isotope time series were used to calculate fractions of water < 3 months old in rivers.

Comparison of results with tritium and nutrient data collected from the same sites allows an understanding of how different age fractions of river water contribute to river water quality.

We have developed the first complete isoscapes of New Zealand's river network using a combination of precipitation isoscape, river sampling, and modelling. Below figures show the national scale (left) and catchment scale (right) maps for $\delta^{18}\text{O}$ data. Explore the [NIWA NZ River Maps website](#) for available isotope data for all major river catchments.



Dudley, B. D., Yang, J., Shankar, U., & Graham, S. L. (2022). A method for predicting hydrogen and oxygen isotope distributions across a region's river network using reach-scale environmental attributes. *Hydrology and Earth System Sciences*, 26(19), 4933-4951.