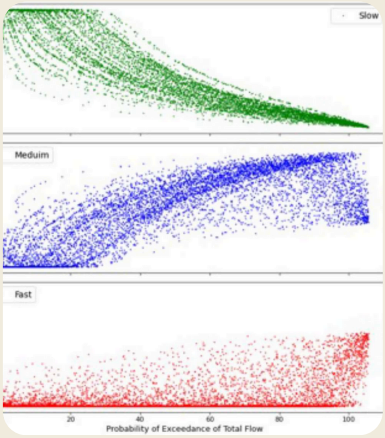
Factsheet 08

Te Whakaheke o Te Wai

BACH

The Bayesian chemistry-assisted hydrograph separation (BACH) method is being developed to estimate groundwater-surface interaction. We use routinely measured flow and water chemistry data from streams and rivers on a national-scale. Using BACH, we can estimate groundwater contribution to streamflow (i.e., baseflow separation) and potential pathways for nutrient transport through a catchment. This provides useful information for many catchments lacking spatially detailed monitoring data.



BACH is informed by:

- flow measurements
- Nutrients, including Total Phosphorous (TP), Total Nitrogen (TN)
- Other chemical analytes

Analysis of these variables allows the contribution of different flow components in surface water to be separated and quantified.

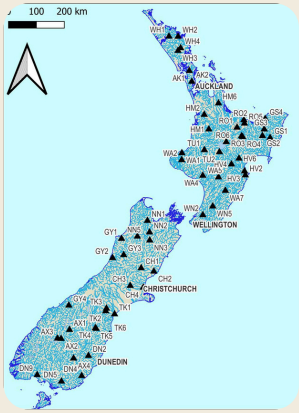
Graph showing differentiation between fast (near-surface), medium (shallow groundwater) and slow (deep groundwater) flow contributions.

BACH

BACH enables us to estimate the source of water to streams and rivers, flow pathways, and the provenance of nutrient and contaminant fluxes entering streams. BACH's strength is that it can be applied in situations where little or infrequent (e.g., monthly) data is available. The BACH method is wrapped in an uncertainty quantification (Bayesian) framework, supporting risk-based decision making. Insights offered through BACH analyses enable us to reduce uncertainty in numerical groundwater flow and transport model predictions.

NIWA and GNS Science have extended the BACH method for national-scale coverage, enabling freshwater decision-makers to understand:

- which catchments are susceptible to contamination from surface runoff and/or (shallow or deep) groundwater;
- where groundwater-fed rivers and streams may be more/less resilient to drought; and
- where land use can play a role in protecting surface and groundwater systems.



In the future, the BACH method will be extended to identify which additional routinely measured parameters could be used to further improve understanding of surface-ground water flow characteristics at the local, regional and national scales.

Oluwunmi P., et al., 2022. Chemistry-assisted hydrograph separation: A novel constraint for groundwater models. NZHS & MSNZ Joint Conference 6 – 9 December 2022, Otepoti Dunedin.