



Age Distribution of Groundwater

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Groundwater at the discharge point comprises a mixture of water from different flow lines with different travel time and therefore has no discrete age but an age distribution. The age distribution can be assessed by measuring how a pulse shaped tracer moves through the groundwater system. Detection of the time delay and the dispersion of the peak in the groundwater compared to the tracer input reveals the mean residence time and the mixing parameter.

Tritium from nuclear weapons testing in the early 1960s resulted in a peak-shaped tritium input to the whole hydrologic system on earth. Tritium is the ideal tracer for groundwater because it is an isotope of hydrogen and therefore is part of the water molecule.

Tritium time series data that encompass the passage of the bomb tritium pulse through the groundwater system in all common hydrogeologic situations in New Zealand demonstrate a semi-systematic pattern between age distribution parameters and hydrologic situation. The data in general indicate high fraction of mixing, but in some cases also indicate high piston flow.

We will show that still, 45 years after the peak of the bomb tritium, it is possible to assess accurately the parameters of age distributions by measuring the tail of the bomb tritium.