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Dating of streamwater using tritium in a post nu bomb pulse world: continuous variation of mean transit time with streamflow

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Abstract. Tritium measurements of streamwater draining the Toen catchment, a small dairy farming area in Waikato, New Zealand, ha shown that the mean transit time of the water varies with the flow the stream. Mean transit times through the catchment are 2–5 yea during high baseflow conditions in winter, increasing to 30–40 yea baseflow decreases in summer, and then dramatically older water drought conditions with mean transit time of more than 100 years. water is gained in the lower reaches of the stream, compared to y water in the headwater catchment. The groundwater store supply baseflow was estimated from the mean transit time and average b to be 15.4 × 10^6 m^3 of water, about 1 m water equivalent over th catchment and 2.3 times total annual streamflow. Nitrate is relativ at higher flow rates in winter, but is low at times of low flow with o water. This reflects both lower nitrate loading in the catchment sev decades ago as compared to current intensive dairy farming, and denitrification processes occurring in the older groundwater. Silica, from the aquifer material and accumulating in the water in proporti contact time, is high at times of low streamflow with old water. The a good correlation between silica concentration and streamwater a which potentially allows silica concentrations to be used as a proxy when calibrated by tritium measurements. This study shows that t dating of stream water is possible with single tritium measuremen that bomb-test tritium has effectively disappeared from hydrologica systems in New Zealand, without the need for time-series data.

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