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Investigating groundwater and surface water interactions by combining chemical and physical techniques over different timescales in the Tambo Catchment, Victoria, Austalia.

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The Tambo Catchment hosts the Tambo and Nicholson Rivers in Eastern Victoria, Australia. These rivers drain upper mountain catchment areas and agriculturally active lowlands, before flowing into a coastal plain environment, where the streams become estuarine. The use of chemical tracers (such as major ions, stable isotopes and radiogenic isotopes) and physical tracers (such as temperature and EC) have been effective tools in determining water fluxes in such environments on the seasonal scale; however these methods are not often combined and even less often used on event timescales.

This project investigates the interaction of groundwater and surface water in the Tambo Catchment by combining the use of major ion chemistry, stable isotopes (18O/2H), radiogenic isotopes (222Rn, 3H) and physical methods (temperature and EC). Results from seasonal sampling indicate that these rivers are variably gaining along their flow paths in response to geomorphology, seasonal water table fluctuations and the interaction between aquifers. Using recent developments in continuous 222Rn (Rn) measurement techniques, large variations in Rn concentrations in the estuary of the Tambo River were investigated by continuous measurement of EC, temperature, Rn and sampling for 18O/2H isotopes over multiple tidal cycles. Results indicate that these large variations can not be explained by simple mixing between saline estuary water and fresh water from upstream, and that flow rates or changes in groundwater discharge must be responsible. Large discrepancies in groundwater fluxes were calculated between Cl- and 222Rn mass balances on seasonal samples, suggesting that an intermediate store of groundwater is present in the upstream reaches of the Tambo River, such as bank storage. Continual logs of head, EC and 3H data from bores on the Tambo River banks suggests the presence of bank infiltration at some stages; however hydraulic loading of a deeper aquifer appears to prevent this at other stages.