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Influence of hyporheic zone hydrology on nitrogen dynamics in a semi-arid stream.

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Runoff from agricultural lands in coastal catchments provides a major source of nitrogen to streams and downstream marine environments. The hyporheic zone, though spatially a small part of the catchment, has been shown to exert significant control on streamflow chemistry and hydrology. Hyporheic zone hydrology and biogeochemistry is poorly understood within semi-arid streams, and greater knowledge of processes occurring in this zone is important for future management of both stream and marine environments.

To determine the extent of hyporheic zone exchange flows and their influence on nitrogen biogeochemistry a combination of field and laboratory experiments were performed. Stream tracer studies were performed and the data analysed using the OTIS model to characterise the physical transport processes affecting hyporheic zone exchange flows. In addition, combined water level and temperature loggers were used to monitor hillslope and near stream shallow groundwater flows to determine the occurrence of hyporheic exchange flows during significant rainfall events.

To determine if the hyporheic zone is acting as a source or sink for nitrate, a series of sediment column experiments were performed to simulate nitrogen transport and transformation in the hyporheic zone within a range of seasonal hydrological conditions. The experiment was designed to examine how the variable magnitude and chemistry of source waters affects porewater and outflowing stream water chemistry. The perfusion cores used throughout the experiment provided a one-dimensional representation of in-situ hyporheic zone hydrologic conditions.