Morning Shine Dome Sessions – Surface Water Groundwater Interactions

Mapping groundwater discharge and water chemistry in a perennial stream in northern New South Wales

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The objective was to improve the understanding of groundwater contributions in maintaining the flow regime, hydrochemical environment and ecological processes in the perennial section of a stream in northern NSW. This is part of a larger project investigating hydrogeochemical and ecological responses in the hyporheic zone of streams which aims to develop ecohydrological models that improve understanding of the ecological impacts of groundwater drawdown from human activities. To identify and map groundwater discharge zones, a 1.5 km section of permanent pools and flowing reaches of Horsearm Creek in the Namoi Catchment fibre-optic cables were deployed. These cables recorded surface water temperature every 20 min over a 3-day period in February. Fifty-seven surface water samples were collected and analysed for radon activity, electrical conductivity (EC), dissolved oxygen (DO), nutrients (NO3-, NH4+ and PO43-), redox-sensitive parameters (Fe2+ and Mn2+), DOC and organic matter fluorescence (FDOM). Stream discharge was gauged at eight cross sections. Surface water temperature anomalies indicated localised inflow of relatively cool groundwater (~20 °C). These zones of suspected groundwater discharge had high radon activities compared to surface water at sites without groundwater discharge. The discharge sites also had a geochemical signature with an EC distinct from upstream surface water, higher dissolved oxygen levels (~5 mg/L), and contained relatively high nitrate (0.5 mg/L) and low DOC (<0.5 mgC/L). Combining these physical and chemical tracers allows groundwater discharge and associated water quality to be mapped and provides a basis for developing a conceptual framework for its eco-hydrological functioning. Depriving streams of their groundwater contribution could increase periods of no-flow and adversely alter water quality, with implications for ecohydrological processes and functioning in the hyporheic zone of streams. Understanding these processes is important for assessing impacts of groundwater drawdown caused by human activities.