Solute and evaporation gradients formed by episodic river recharge over-time in a dryland aquifer.

K. Meredith, S.E. Hollins, C.E., Hughes, D.I. Cendón, A. Griffiths.
ANSTO

The generally accepted hypothesis that river recharge forms the primary groundwater source in arid zone environments remains difficult to prove due to the remoteness and expense of studying these hydrologically complex systems in detail. Therefore we designed a study that would significantly advance our understanding of how a groundwater system is being recharged in a dryland region of the Darling River catchment, Australia. A range of hydrochemical and isotope tracers (Cl-, δ18O, δ2H, and 3H) measured in all components of the hydrological cycle were used in this multi-year study to understand and quantify groundwater recharge under wet and dry climatic conditions. The evaporation and concentration gradients observed in the unsaturated zone confirmed that small volumetric inputs from periodic rainfall were not the major recharge mechanism. Sampling which incorporated a large river recharge pulse from an overbank flooding event in March 2012 provided conclusive evidence for groundwater originating from high flow episodic river recharge. The use of long-term environmental data such as isotope records to understand how economically important water resources may respond to climate change with increasing temperatures and changing drought/flood regimes will be essential for future sustainability.