Solute and isotope tracers of regional flow systems in the western Great Artesain Basin, Australia

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The Great Artesian Basin (GAB) is a large closed inland basin comprising a multi-layer aquifer system, with a complex and discrete flow systems. In the area south and west of Lake Eyre in the western GAB, a major discharge zone is present where regional converging flowpaths meet. The region is characterised by linear spring discharge zones controlled by deep crustal fractures.

Spatial variations in solute concentrations and water type in the main aquifer unit as well as the springs highlight distinct groundwater sources generated by a range of geochemical processes: in general, groundwaters derived from the west are of mixed cation-anion type and variable salinity whilst those from the east are of Na-HCO_3 type and lower salinity. Some northerly-derived groundwaters contain very low sulfate concentrations, as a consequence of very reducing conditions along deep flowpaths. Superimposed on the geochemical evolution are the effects of palaeoclimate variability, diffusional exchange with aquitards, and mixing with older water as groundwater travels and evolves along flow pathways. More recently, the recognition of an external source of CO_2 along deep crustal lineaments has added another dimension to the geochemical evolution and source of the waters and solutes. Isotope signatures (O/H, Sr, S, C) are also extremely variable providing important information on the range of sources, processes and evolution along different flowpaths.

The chemistry of groundwaters in the GAB thus provide important clues and constraints to regional flow pathways. Along with novel dating tools [1], they are providing critical data in which to reconstruct past and present flow regimes in the GAB, and to help develop a new and more realistic model for groundwater flow in this continental scale aquifer system.

[1] Love *et al* this volume.