

Dating old groundwater by multiple tracers including Krypton 81

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The Great Artesian Basin (GAB) of Australia is one of the largest groundwater basins in the world and contains the largest storage of potable groundwater in the Australian continent. Because of its vast size and the potential for large regional flow systems to occur, the GAB has been considered an ideal basin to test emerging groundwater dating techniques such as Cl-36 and He-4. However both of these techniques are subjected to large degrees of uncertainty, as they require a detailed understanding of different sources and sinks of these two isotopes. Contrasting this Kr-81 is considered to be an ideal tracer as it contains only one source, the atmosphere with no or at most minimal sub surface production. Our study area is focused on the western margin of the GAB between the Finke River system in the Northern Territory and the iconic Dalhousie springs in South Australia. This represents the direction of groundwater flow from recharge to discharge through the Dalhousie spring complex. For the first time we have provided a comprehensive suite of analyse not only of Cl-36, He-4, C-14, Ar-39, stable isotopes of the water molecule and noble gases but also, Kr-85 and Kr-81. Our preliminary results indicate a spectrum of “tracer groundwater ages” ranging from modern as indicated by C-14 and Ar-39 up to hundreds of thousands of years as indicated by Kr-81, Cl-36 and He-4. We suggest that this groundwater flow transect may represent an ideal type section for understanding different isotope systematic in order to obtain a greater knowledge of regional groundwater flow.