Changing recharge mechanism in the Great Artesian Basin (GAB) determined by noble gas isotopes and $^{36}Cl/Cl$ measurements

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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. 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. Groundwater residence times were determined by Cl-36, He-4, C-14, Ar-39 Kr-85 and Kr-81 measurements. Our results indicate a large spectrum of "tracer ages" ranging from modern to hundreds of thousands of years. Along the flow path Cl concentrations increase in direction of groundwater flow. ^{81}Kr and ^{36}Cl data were used to distinguish between evaporative enrichment during recharge and subsurface Cl accumulation due to rock water interaction or diffusive exchange with the aquitard. It is shown that in the Western part of the GAB a changing recharge regime is responsible for the larger fraction of the observed Cl variations. In the past diffusive recharge dominated while in the Holocene ephemeral river recharge seems to be the main recharge mechanism.