Geophysical Research Abstracts
Vol. 19, EGU2017-1753-1, 2017
EGU General Assembly 2017
© Author(s) 2016. CC Attribution 3.0 License.

Recent and ancient recharge deciphered by multi-dating tracer technique

Shawan Dogramaci (1), Peter Cook (2), Jimes Mccallum (2), and Roland Purtchert (3)

(1) Rio Tinto Iron Ore, Water Resources Evaluation & Services (shawan.dogramaci@riotinto.com), (2) National Centre for Groundwater Research and Training, School of Environment, Flinders University, PO Box 2100, Adelaide, SA, 5001, Australia, (3) Climate and Environmental Physics Division, Physics Institute, University of Bern, Bern, Switzerland

Determining groundwater residence time from environmental tracer concentrations obtained from open bores or long screened intervals is fraught with difficulty because the sampled water represents variety of ages. Information on the distribution of groundwater age is commonly obtained by measuring more than one tracer. We examined the use of the multi-tracer technique representing different time frames (39Ar, 85Kr, 14C, 3H, CFC 11- CFC-12 CFC-113, SF6 and Cl,) to decipher the groundwater ages sampled from long screened bores in a regional aquifer in the Pilbara region of northwest Australia. We then applied a technique that assumes limited details of the form of the age distribution. Tracer concentrations suggest that groundwater samples are a mixture of young and old water – the former is inferred to represent localised recharge from an adjacent creek, and the latter to be diffuse recharge. Using our method, we were able to identify distinct age components in the groundwater. The results suggest the presence of four distinct age groups; zero and 20 years, 50 to 100 years, 100 to 600 years and approximately 1000 years old. These relatively high recharge events were consistent with local recharge sources (50-100 years) and confirmed by palaeo-climate record obtained from lake sediments. We found that although the ages of these components were well constrained, the relative proportions of each component was highly sensitive to errors of environmental tracer data. Our results show that the method we implemented can identify distinct age groups in groundwater samples without prior knowledge of the age distribution. The presence of distinct recharge times gives insight into groundwater flow conditions over long periods of time.