Geophysical Research Abstracts
Vol. 14, EGU2012-1154, 2012
EGU General Assembly 2012

Geologic controls on groundwater discharge in large tropical rivers: an environmental tracers approach

J. Batlle-Aguilar (1), G.A. Harington (1,2), M. Leblanc (1,3), P.G. Cook (1,2)

(1) National Centre for Groundwater Research and Training (NCGRT), Flinders University, School of the Envrionment, Adelaide, Australia (jordi.batlleaguilar@flinders.edu.au; peter.cook@flinders.edu.au), (2) Commonwealth Scientific and Industrial Research Organization (CSIRO), Division of Land and Water, Adelaide, Australia (Glenn.Harrington@csiro.au), (3) James Cook University, School of Earth and Environmental Sciences, Cairns, Australia (marc.leblanc@jcu.edu.au)

Tropical rivers supply large volumes of fresh water, making them attractive opportunities for new irrigation development, particularly to mitigate the impacts of drought in other regions. Many tropical rivers are perennial, with flow maintained during drier months by groundwater discharge. Determining the locations and fluxes of groundwater discharge to these rivers is required to maintain their ecological value under future management decisions.

In tropical areas, like northern Australia, the climate is characterized by two distinct seasons; on average about 90% of annual rainfall occurs in the "wet season". The Mitchell River, located in tropical north Queensland (Australia), was sampled at the end of two dry seasons. Preliminary reconnaissance sampling of the upper half of the catchment in October 2010 provided ion chemistry, radon (^{222}Rn), chlorofluorocarbons (CFCs), helium (^{4}He), and ^{87}Sr/^{86}Sr data that were interpreted to infer locations – and potentially different sources – of water discharging into the river. Then in October 2011 the Mitchell River was synoptically sampled by helicopter every 5 km along a 350 km reach. Water samples were taken from the main river channel and major tributaries for ion chemistry, ^{222}Rn, tritium (^{3}H) and ^{87}Sr/^{86}Sr ratio, and many of these sites were flow gauged. Simultaneously, groundwater samples were taken from existing bores completed in different geologies.

Hydrochemical, isotopic and hydrometric results all indicate that water from different sources, related to different geologies, contribute to maintain the river flow at the end of the dry season. Surface water or groundwater with very low residence time mostly contributes in the upper part of the catchment, while discharge of older groundwater is important in downstream reaches, where aquifers of the Great Artesian Basin (GAB) outcrop. Applying a longitudinal 1D model we are able to demonstrate the spatial variability of groundwater contribution to the dry season flow of the Mitchell River.