

Using stable and radioisotopes to inform catchment residence times in northern Australia

Abstract

The tropical freshwater ecosystems of Australia, including rivers, creeks and wetlands, hold immense ecological and cultural value. However, significant knowledge gaps remain regarding the origin and age of water that sustains these ecosystems. With the current push to develop northern Australia, knowledge of the water that sustains these ecosystems would help assess their vulnerability to development and climate change. This project aims to investigate water sources and ages and to predict the time it will take for water (and any introduced contaminants) to move through the system by analysing water isotopes (i.e., 2H , 3H , and 18O), radiocarbon, and other water chemistry. Surface water sampling will target springs, creeks, and larger rivers, at the end of the dry season. Higher frequency samples will be collected at two focus sites to provide a more detailed understanding of the seasonal variation in water ages and transition times. Weekly rainfall samples will be collected at several sites across northern Australia to determine the precipitation isotopic signature and to develop local meteorological water lines (LMWL) for use in future studies. Additionally, sub-daily rainfall samples will be collected in Darwin. The additional rainfall data will augment the current Australian isotope dataset, which contains little data from northern Australia and the LMWLs will be available for future hydrological studies. The outcomes of this research will help predict how climate and anthropogenic impacts could affect the function of Australian wet-dry tropical ecosystems and inform water resources management in northern Australia.