

structure, supplying the nutrients to the reef building. The intermediate deep water in the Pacific is  $^{14}\text{C}$  depleted, compared to the surface water, and also records the  $^3\text{He}$  anomaly resulting from hydrothermal activity. These properties of intermediate waters may be recorded in the interstitial waters in the coral reef. We use the agreement between these two parameters to check the validity of the concept of geothermal endo-upwelling.

#### REFERENCE

Rougerie, F and Wauthy, B 1986 Le concept d'endo-upwelling dans le fonctionnement des atolls-oasis. *Oceanologica Acta* 9: 133-148.

### EVALUATING DISSOLVED INORGANIC CARBON CYCLING IN A FORESTED LAKE WATERSHED USING CARBON ISOTOPES

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Dissolved inorganic carbon (DIC) is an important component of the alkalinity balance on freshwater systems. A comprehensive evaluation of DIC cycling is essential to predict the impact of anthropogenic activities, such as acid rain, on natural systems. In this paper, we will discuss isotopic and chemical data of soil  $\text{CO}_2$  and DIC (groundwater, streams and lake water) samples taken in a forested lake watershed on the Precambrian Shield, Canada. Some of the main results of this ongoing research can be summarized as follows:

Soil  $\text{CO}_2$  profiles show higher  $\text{CO}_2$  concentrations during the summer months. The average  $\delta^{13}\text{C}$  for the soil  $\text{CO}_2$  is  $-22.0\text{‰}$ ; groundwaters are characterized by a mean  $\delta^{13}\text{C}$  of  $-23\text{‰}$ . This indicates that weathering of silicates is the main process responsible for the generation of alkalinity in this watershed. Groundwater in the middle part of the basin is characterized by  $^{14}\text{C}$  activities in the range of 116 pMC to 120 pMC. These values are close to the atmospheric  $\text{CO}_2$  during 1990. Lower  $^{14}\text{C}$  activity (112 pMC) is observed in groundwater in the discharge areas. This suggests (assuming piston flow) that the mean residence time of groundwater from recharge to discharge areas is in the order of 30 years in this basin. Stream DIC in the middle part of the basin presents similar  $^{14}\text{C}$  activities to those of groundwater; however, lower  $^{14}\text{C}$  activities are observed in streams discharging into the lake. These data suggest the contribution of older water to the stream along the stream course. Carbon isotope and chemical data on lake water particulate organic carbon (POC) and dissolved organic carbon (DOC) will also be discussed.

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### INVESTIGATING CARBON SOURCES FOR METHANE AND DISSOLVED ORGANIC CARBON IN A REGIONAL CONFINED AQUIFER USING $^{14}\text{C}$

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Environmental isotopes ( $^{13}\text{C}$ ,  $^2\text{H}$ ) have been widely used to investigate the origin of methane in subsurface systems. However, few investigations have used radiocarbon dating as a means of identifying carbon sources for methane ( $\text{CH}_4$ ) and dissolved organic carbon (DOC) in groundwater. In this paper, we discuss  $^{14}\text{C}$  data for  $\text{CH}_4$  and DOC from groundwater samples taken from a regional Quaternary-age, confined aquifer located in southern Ontario. The potential carbon