# Trace metal mass balances for a lake and its catchment

P. J. DILLON[1] AND S. A. WATMOUGH[1]

[1]Environmental and Resource Studies, Trent University, Peterborough, ON, Canada (pdillon@trentu.ca)

Plastic Lake is an oligotrophic, dilute lake situated on the Precambrian Shield near its southern boundary in central Canada. The lake and its catchment, including inflowing stream, wetland and terrestrial ecosystem, have been studied continuously since 1979. The system has been substantially affected by acid deposition, resulting in long-term loss of acid neutralizing capacity, increased sulphate and altered base cation concentrations in the lake, and reduced exchangeable calcium and reduced pH in the soil. The objective of our study is to measure the size of the pools and the fluxes between the pools of 5 key trace metals (Cu, Ni, Zn, Pb, Cd). In addition, we are measuring pools and fluxes of a number of other elements (Al, V, Cr, Mn, Fe, Co, As, Rb, Sr, Tl, Bi, U, Sc). This is an integrated study of the terrestrial and aquatic portions of the catchment, and includes analysis of the transport of metals between land and water. Measurements include both total and soluble (<0.45 u) metal fractions. Hydrology is measured continuously at a number of points in the catchment, allowing us to partition the whole catchment into sub-components, i.e. upland, wetland, lake. In addition to measuring the pools and fluxes, we are focusing on the roles that deposition of strong acid and that dissolved organic matter (DOM) play in the transport of metals. The pool sizes of the major compartments of the terrestrial system (soil horizons, forest biomass) and the wetland (plant, peat, water) have been measured. Metal content of the lake water has been measured, and measurement of the sediment accumulation is underway. Fluxes that are measured currently include: input to the system via atmospheric deposition (wet-only and particulate deposition), throughfall (under coniferous and deciduous forest), litterfall, transport through the soil column (using lysimeters), export from the upland portion of the catchment, flux into and out of the wetland, flux into and out of the lake, and sedimentation in the lake. Preliminary results presented will focus on the pool sizes, some of the fluxes, and the relative importance of DOM and strong acids in transporting these metals.

# Large and systematic silicon isotope fractionation discovered in single sticks of bamboo

TIPING DING[1, 2], DEFANG WAN[1], CHENGYU WANG[1, 2] AND FENG ZHANG[1]

[1]Institute of Mineral Resources, CAGS, Beijing 100037, China (tding@cags.cn.net)

[2]Open Research Laboratory on Isotope Geology, CAGS, Beijing 100037, China

A systematic investigation on silica content and silicon isotope composition of bamboo was undertaken in this study.

Five sticks of bamboo were collected from different locations in China. The stem, branch and leaves for each bamboo were sampled and their silica contents and silicon isotope compositions were determined separately.

It is found that silica content in ash of studied bamboo vary in a large range of 38~72%. Significant variation is observed between different parts of bamboo, showing a trend of increase from stem (35~50%) to branch (58~66%) to leaves (67~72%) (Fig.1). Variation of $SiO_2$ content in ash is also found between different sticks of bamboo, reflecting the conditions of local soils.

The silicon isotope compositions of bamboo exhibit significant variation, from -2.2‰ to 1.8‰.

Large and systematic silicon isotope fractionation is discovered within each stick of bamboo, showing a trend of $\delta^{30}Si$ increase from stem to branch to leaves (Fig.2). $\delta^{30}Si$ variation between different organs within single stick of bamboo can be from 1.0‰ to 3.3‰. Considering the total range of silicon isotope composition in terrestrial samples is only 7‰, the observed large silicon isotope fractionation in single stick of bamboo is rather remarkable. It may be caused by kinetic isotope fractionation in transportation and precipitation processes of silicon in bamboo.

Significant $\delta^{30}Si$ variations are also found between same organs of different bamboos. The observed variation range of $\delta^{30}Si$ values is 2.0‰ for stems, 2.0‰ for branches and 1.7‰ for leaves, corresponding to local soil conditions. It is found that the bamboos grow in mature garden soil normally have higher $\delta^{30}Si$ values than those grow in immature soil.

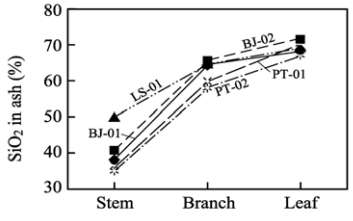


Fig.1. The silicon contents in ash of several bamboos from China

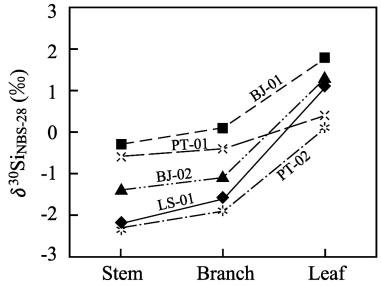


Fig.2.The silicon isotope composition of several bamboos from China