Drainage dynamics of Lake Ojibway inferred from the isotopic signature of small lake basins

POIRIER A.[1,2], VEILLETTE J.[3], BLANCHETTE D.[3], CLOUTIER V.[3], HÉLIE J-F[1,2], ROSA E.[1,3]

[1]Geotop, Montréal, Canada,
[2]DSTA, UQAM, Montréal, Canada,
[3]UQAT, Amos, Canada.
poirier.andre@uqam.ca

Deglaciation and late glacial readvances in northwestern Quebec and northeastern Ontario brought in carbonate-rich clastic material from the Paleozoic sedimentary rocks of the Hudson Plateform. These calcareous erratics were originally formed in an oceanic context, and thus have a known strontium (Sr) isotopic composition. The study of McArthur (2001) shows that such carbonate rocks have a $^{87}Sr/^{86}Sr$ ranging 0.707-0.709. In comparison, the local Superior province contains diverse material of both much higher values (>0.720 for granitic material), and lower values (<0.706 for ultramafic material).

During the last deglaciation (ca. after 10000 years BP) Lake Ojibway, an ice-contact glacial lake which lasted about 2000 years flooded the Abitibi/James Bay region to a maximum elevation of about 390 m in the study area before draining northward into the Labrador Sea (Veillette, 1994; Barber et al. 1999).

Here we present data for 34 lakes, including physico-chemical parameters, stable isotopes of water and dissolved Sr radiogenic isotopes. The lakes occur in an elevation range (270 – 387 m asl) corresponding roughly to the depth of the flooded area. About half of these lakes occupy till/rock and clay basins while the others occupy depressions in glaciofluvial deposits formed by the melting of buried blocks of ice (kettles) detached from the retreating glacier. The Sr isotopic compositions measured in lakes found at higher elevations in bedrock/till basins suggest a greater influence of Paleozoic carbonates, in comparison with lakes located at lower elevations, where more variable Sr isotopic compositions are observed.

The peliminary hypothesis for explaining the data suggests an input of fine calcareous rock flour dispersed in the proglacial lake perhaps resulting from carbonate-rich late glacial readvances into the northern part of the lake. Further work is planned to test this hypothesis, including the measurement of dissolved Sr isotopic composition in lakes located above 390 m. Lakes devoid of Paleozoic carbonates above this level could validate the working hypothesis.

Veillette, 1994, QSR 13 945-971
Barber et al. 1999, Nature, 400: 344-348
McArthur et al. 2001 The J. of Geology 109, 155-170