Geochemical characterization of fine-grained Carboniferous strata of the Maritimes Basin Complex of New Brunswick, Canada

ADRIENNE NOFTALL AND DAVE KEIGHLEY

Department of Earth Sciences, University of New Brunswick, P.O Box 4400, Fredericton, New Brunswick E3B 5A3, Canada <adrienne.noftall@unb.ca>

The Carboniferous Maritimes Basin Complex of New Brunswick is divided into six lithostratigraphic groups; the Horton, Sussex, Windsor, Mabou, Cumberland, and Pictou groups. Unfortunately, it is often difficult to distinguish units from each other; including some of economic importance such as the Horton Group. These difficulties include: restricted outcrop exposures, lithologically similar fine-grained strata in many units, a near complete absence of radiometrically datable materials, and reworking of rare microfossils throughout the succession. In other stratigraphic successions with similar complications, chemostratigraphic approaches have been used to help differentiate units. As for the Carboniferous of New Brunswick, little such geochemical data currently exists to aid in the differentiation of these units. Accordingly, 139 samples in total have been collected from fine-grained strata in outcrop and borehole representing each of the Carboniferous groups throughout the province. For each sample, and additionally for reference standards, 55 elements were analyzed by Inductively-coupled-plasma and mass spectrometry (ICP-MS).

Broadly, the samples from each unit are geochemically all quite similar. However, several trends have been visually identified from preliminary analyses of the data that currently are being assessed through statistical analyses. For example, when ratios of Al_2O_3:TiO_2 are compared, the lower three groups (the Horton, Sussex, and Windsor) of the succession show strongly positive correlations and goodness of fit to the regression line (with R2 values of 0.669, 0.5794, and 0.8536 respectively), whereas the groups higher in the succession (the Mabou, Cumberland, and Pictou groups) have an R2 value of no higher than 0.15. When comparing plots of Na_2O/K_2O against Zr/Cr, the Windsor and Cumberland groups display relatively strong negative correlations and goodness of fit to the regression line (R2 values of 0.501 and 0.273 respectively), the Horton Group shows a weak positive correlation and goodness of fit (R2 value of 0.104), while the rest show R2 values of less than 0.090.

By further comparing the geochemical data collected from the finer-grained rocks of the Carboniferous Maritimes Basin, certain potential anomalies or trends seen throughout the groups of the succession may become apparent which can aid in a chemostratigraphic characterization of the Carboniferous of New Brunswick.

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