Update on the GEM-2 Hudson-Ungava Project: Hudson Bay Lowland lineament mapping and geochemo profiling of core, northeastern Manitoba

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Introduction
The work described herein is a part of the Manitoba Geological Survey’s contribution to the second phase of the Geological Survey of Canada’s GEM-2 Hudson-Ungava Project (GEM-2). This project ran from 2013–2015.

This year’s activities in Manitoba included lineament mapping of the Hudson Bay Lowland using aerial survey and geophysical investigations. The lineament results are shown in Figure 1, and the geochemo profiling results are provided in Figure 6.

Lineament mapping
Quadrant stereonets, contour plots, and isometric views of fracture data are shown in Figure 2. The isometric view is a projection of map elements onto the plane formed by the topographic surface plane and the vertical axis. The isometric view is useful for assessing the relative orientations of fractures and their relationships to topography.

Identifying fracture patterns by compiling lineament data has been done in Manitoba over the past using various methods and different types of information, such as mapped lineaments and fractures, aerial and satellite images, and geophysical logs. This process provides a visual representation of the fracture network and helps to identify potential fracture zones.

Lineament mapping methods and results
The lineament results are shown in Figure 1. The lineaments were mapped using a variety of methods, including remote sensing, geophysical surveys, and field observations. The mapped lineaments are shown as magenta lines on the map.

δ¹³C and δ¹⁸O stable isotope
In the Hudson Bay Basin, geophysical, lithic, and biostratigraphic evidence has been used to map a large proportion of the Palaeozoic sequence within the basin, as well as to other basins, with success, but not without its challenges. Of the objectives for the GEM-2 Hudson-Ungava Project is to use biostratigraphy from δ¹³C and δ¹⁸O stable isotope profiles of cores to provide long-term correlation to help supplement the stratigraphic information gathered from the geological record.

During the GEM Energy project (2008–2012), quadrats and regular intervals of drilling were carried out in the Hudson Bay Basin and the North. The results from the drilling were used to identify the stratigraphic section carbon curves (ERC), which provide a correlation for the different carbon and oxygen isotope values. The δ¹³C and δ¹⁸O values are shown in Figure 7.

The purpose of the chemical stratigraphy program is to expand the δ¹³C and δ¹⁸O stable isotope database into the Hudson Bay Basin, and to document the isotope values in the Precambrian sedimentary rocks.

Comeault core sampling and results
A total of 36 batteau samples were collected from the Comeault core for stable isotope analysis. A large number of samples were collected from the core, with success, but not without its challenges. Of the objectives for the GEM-2 Hudson-Ungava Project is to use biostratigraphy from δ¹³C and δ¹⁸O stable isotope profiles of cores to provide long-term carbon and oxygen isotope values.

The results of the δ¹³C and δ¹⁸O stable isotope analysis are shown in Figure 8, which shows the δ¹³C and δ¹⁸O stable isotope profiles. The δ¹³C and δ¹⁸O values are shown as magenta lines on the map.

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Supplementary information
For more details and discussion, refer to Nicolas and Clayton (2015).