## **Non-Technical Project Summary**

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## Research objectives and rationale

This project is a continuation of research that was previous submitted to the community of Grise Fiord before the 2014 field season. Exceptional sediment exposures of Cretaceous age (144 – 66 Million years ago) on the central to southern part of Axel Heiberg Island and Devon Island provide a unique window on the Cretaceous Arctic paleoenvironment and climate history of the past. Cretaceous temperatures ranged from relatively cool conditions of the early Cretaceous into the peak warmth about 94 Million years ago, one of the warmest periods in Earth history. These temperatures of the geological past are well understood for low latitude regions, but only few paleontological, paleobotanical and organic geochemistry data are known from the Arctic. The Glacier Fiord locality on Axel Heiberg Island is of great scientific importance since it exposes a nearly complete section of Cretaceous sedimentation documenting paleoenvironmental changes of the Sverdrup Basin over an entire geological period that was highly influenced by a greenhouse climate.

### **Research questions**

- 1. How did Arctic environments react to the massive volcanic eruptions and their gas emissions that took place during the Cretaceous in the High Arctic, called the High Arctic Large Igneous Province?
- 2. How warm was the Arctic region during the Cretaceous and how small was the temperature gradient between low and high latitudes during that time?
- 3. How did the Cretaceous polar marine ecosystem react to climate changes, weathering patterns and associated runoff into the ocean? For example, how was marine plankton affected by those changes?
- 4. What biotic crises took place in the Cretaceous Arctic Ocean and how did life recover?

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#### Duration and location of field research

- July 3: Arrival of team members in Resolute
- July 5: Flight by Twin Otter from Resolute to Sherwood Head, Axel Heiberg Island Continue with helicopter from Sherwood Head to Glacier Fiord (1. Field locality)
- July 15: Camp move from Glacier Fiord to Lost Hammer Diapir by helicopter (2. Field locality)
- July 24: Camp move from Lost Hammer Diapir to Strand Fiord by helicopter (3. Field locality)
- July 31: Pick-up by twin Otter and transport to Noranda Landing Strip on Devon Island
- July 31: Further transport to Eidsbotn Graben, Devon Island by helicopter (4. Field locality)
- August 9: Pick up by helicopter, transfer to Noranda Air Strip and continued transfer by Twin Otter back to Resolute, termination of field season.

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#### Field methods

In the field we measure sedimentary section and record all observations such as lithological changes, macrofossil occurrences, colour changes, grainsize changes, and sedimentary structures such as ripples marks. Then every 1 to 5 m we are collecting a sediment sample, which we take with a pick-ax and put into a labelled bag. Each sample bag will be labelled with a number. Each section will have a location (Latitudes and Longitudes) for its start and end point.

Samples will be shipped to laboratories at Carleton University in Ottawa, University in Frankfurt (Germany), and University of Nebraska, Lincoln, USA where material will be broken down for microfossil content and analyzed geochemically.

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