Project Title: Periglacial and paleoglacial investigation of the Haughton impact structure and surrounding terrains, Devon Island, Nunavut

Researcher's name and affiliation:
The project is led by Dr. Etienne Godin from the University of Western Ontario, collaborating with Dr. Gordon Osinski from the University of Western Ontario and Dr. Mark Jellinek from the University of British Columbia.

Location: Haughton Impact Structure on Devon Island, Nunavut (75° 23.983' N, 89° 31.183' W), 650 km from Resolute, the nearest community.

Time Frame: From July 18, 2017, to July 31, 2017.

Number of people involved: 4

Project Description:
The Haughton Impact Structure (HIS) is an exceptionally well-preserved crater located on the western side of Devon Island in the Canadian Arctic Archipelago. This area and its surroundings is what can be qualified as a cold and dry polar desert, which is ideal conditions to study the crater geology and the geomorphology of the active periglacial processes. An in-and-out of-crater investigation on landforms such as subglacial channels, gullies and polygons will provide insight on what the main controls shaping these landscape units are. Those landforms are strikingly similar to other found in and around crater rims on Mars; thus their study on Devon provides answers as those are similar to their Martian analogues.

Our objectives are:

1. to study the subglacial channels in the area by mapping their long profile;
2. to study of periglacial features (gullies and patterned ground).
3. the continuation of long-term environmental monitoring via several weather stations installed around the crater.

Transportation to the site will be by Twin Otter to a landing strip within the Haughton Impact Structure. While on site, access to scientific sites will be accomplished using All Terrain Vehicles (ATV) and by walking. Helicopter will be used to travel (for a day) to locations not accessible by ATV.

A fuel cache stocked with Jet-B drums to refuel the helicopter will be deployed at a secure distance from water and from the camp. Propane tanks will provide combustible to cook. Unleaded fuel in jerrycans over spill-kit sheets to refuel ATV's will be stored at a secure distance from our tents.

As a continuing project from previous years, no new consultation with communities was scheduled at this time, but we are aware of the following possible concerns expressed during previous consultations. The study site is located far from protected areas and parks but nevertheless, wildlife may be present, such as polar bears, foxes or migratory birds. If found or sighted, nests, dens or animals of any type will not be disturbed nor interact with. No archeological sites are known to be located in the area – if we find a site, location will be recorded and communicated to proper authority for further investigation. If using ATV's and an animal is sighted, alternative paths will be used. Helicopter flights will be in altitude to prevent animal disturbance.

Field supplies (ammunition, fresh food) will be bought at Tudjaat Co-op store at Resolute.

A temporary camp will be erected consisting of a Longhouse-style tent (common living quarters) and four personal tents. Water for camp use (approx. 0.05 m^3 per day) will be collected from the nearby Haughton River. All combustible waste will be incinerated while all non-combustible waste will be returned to Polar Continental Shelf facilities for disposal.

At the conclusion of the field campaign, the camp will be dismantled and the terrain restored to its original state.

Methodology:

Objective 1: High resolution satellite imagery provided possible location for channels. GPS surveys of the channels long profile will differentiate subglacial channels from stream channels due to a respective distinct profile and validate assumptions based on remote sensing. Airborne photography of the channels will enable to build a 3D model for the channel, with the goal of making a geometry based model.

Objective 2: High resolution satellite imagery of gullies and polygons needs to be validated in the field. Using a tripod-mounted LIDAR (Laser pointing device) models of sample landforms (distinct type of gullies and distinct type polygons) will be acquired and analyzed using specialized geospatial software. The morphologies observed in the satellite image will be ground truth in the field using a GPS. When ground ice is found (buried ice or ice wedges) 30 ml samples will be extracted and analyzed for the water chemistry (stable isotopes).

Objective 3: Access to the three weather stations will enable the data collected to be downloaded, later analyzed and interpreted.