Project title: Change in Arctic Habitat Suitability for Caribou

Ref: OP2464

Keywords: Remote Sensing, snow density, ecosystem

One Planet Research Theme:

Climate & Climate Change ☒ | Earth System Processes ☒ | Anthropocene ☐ | Environmental Informatics ☐

Lead Supervisor:

Dr. Mel Sandells, Northumbria University

Key Research Gaps and Questions:
- What snow conditions compromise winter forgaing conditions for Peary Caribou ?
- How have Peary Caribou populations responded to previous rain-on-snow events?
- How can we blend remote sensing and earth system modelling to map winter foraging conditions?

Project Description: Hunting Peary Caribou is a traditional activity and an important source of food for communities in the Canadian Arctic. Caribou forage for vegetation under the snow, with diet changing seasonally (Larter and Nagy, 2006) depending on the landscape properties (Kaluskar et al., 2020). The development of high density snow through wind compaction causes damage to Caribou while scraping through snow, leaving them vulnerable to disease. Rain-on-snow events, which are increasingly common in the Arctic, create ice layers that reduce the capability of Caribou to sense and access their forage. In the Arctic, the climate is warming up to four times faster than other regions and rain-on-snow events are more likely. The trade-off between shorter winter periods leading to higher biomass versus more inaccessible foraging grounds from changing weather patterns is a complex problem (Tews et al., 2007).

Numerical snowpack models use meteorological observations to provide estimates of the changing snow density, but this is complicated by uncertainties in meteorological data, spatial variability in topography and vegetation, and simplified representations of model processes. Satellite observations at microwave frequencies are sensitive to snow properties so can give information on density and microstructure, including identification of ice lenses that result from rain-on-snow events (Langlois et al., 2017). This project will assess the potential risk to Caribou populations and develop a methodology to detect regions where foraging conditions are poor through a combination of modelling and remote sensing. The student will work with colleagues at the Université de Sherbrooke and their established indigenous community network to document rain-on-snow events and test the methodology to identify different foraging conditions.

Skills gained as part of this project will be the ability to run the Earth System model, access and process large datasets of remote sensing observations, and the ability to communicate with colleagues from a wide range of backgrounds, with the potential to develop fieldwork skills in the Canadian Arctic.

Prerequisites: This project is suitable for candidates with a numerical background e.g. maths, physics, computational sciences and preferably interest in cold environments, remote sensing and/or ecosystems. For more information, please contact Dr Mel Sandells (melody.sandells@northumbria.ac.uk).