EARTH OBSERVATION SYMPOSIUM (B1)
Monitoring Change in the Arctic (6)

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A NANO-SATELLITE TO MONITOR ARCTIC GEOSYSTEM CHANGES AFFECTING BIODIVERSITY IN THE CANADIAN ARCTIC

Abstract

In recent years, we have seen an increasing interest in the monitoring of Earth's landscape transformations. Of particular interest, for their severity and for the proportion of their potential impact, are those changes taking place in the polar regions of the globe. The increase of the average temperatures, produced by the global warming phenomenon, is not only rapidly changing the geomorphology of the Arctic (e.g. recession of ice landforms and transformation of periglacial areas) but also altering its biodiversity, i.e. the number of species living in the ecosystem.

At University of Montreal (UdeM), research on periglacial geomorphology and permafrost processes is carried on by the Cold Regions Geomorphology and Geotechnical Laboratory (GeoCryoLab). Notably, the GeoCryoLab investigates the response of the periglacial ecosystem of the Bylot island to its ongoing climate changes. At UdeM's sister school Ecole Polytechinque de Montreal (EPM), student society PolyOrbite is currently developing a 3U-CubeSat nano-satellite. PolyOrbite and GeoCryoLab joined forces in order to provide this satellite with an imaging system able to collect images of the Bylot island with stringent timing and resolution constraints.

Once launched, PolyOrbite's satellite will be placed in a heliosynchronous low Earth orbit (LEO) and it will pursue a twofold objective: 1) assessing the ice coverage reduction on the Bylot island over the

period going from early April to late October through a series of pictures taken at a pre-defined frequency; and 2) performing an accurate screening of the neighboring Baffin island's glaciers with higher resolution images taken in three different moments of the year (at the beginning of the winter, in the point of maximum snow coverage, and in mid-summer). GeoCryoLab expects this project to lay the foundations for the long-term monitoring of the region.

The major technological issue that we expect to encounter is the limited data budget of the downlink connection on such a small satellite. This problem will be made even worse by the power budget restrictions that are, likewise, imposed by the satellite size. In our proposal, we suggest to mitigate this problem performing on-board data pre-processing using low-power high-performance dedicated FPGA hardware. This pre-processing has the dual goal of merging multiple pictures and compressing the information to be transmitted.