



University
of Manitoba

Arctic Remote Sensing using Drones and Spacecraft



Philip A. Ferguson, PhD, P.Eng
Philip.Ferguson@umanitoba.ca

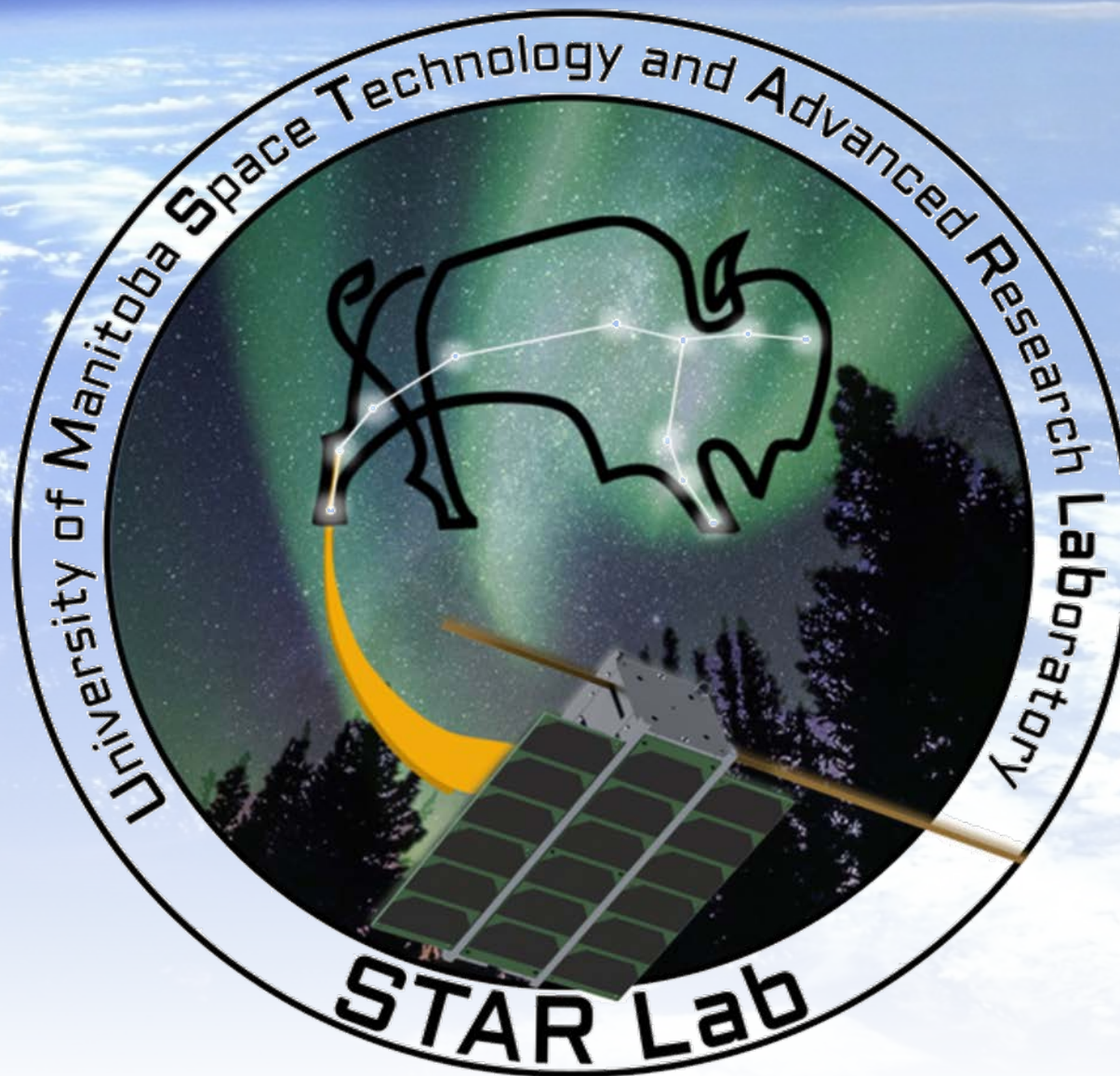
Centre for Earth
Observation
Science





Welcome to
Chesterfield Inlet
ALWAYS

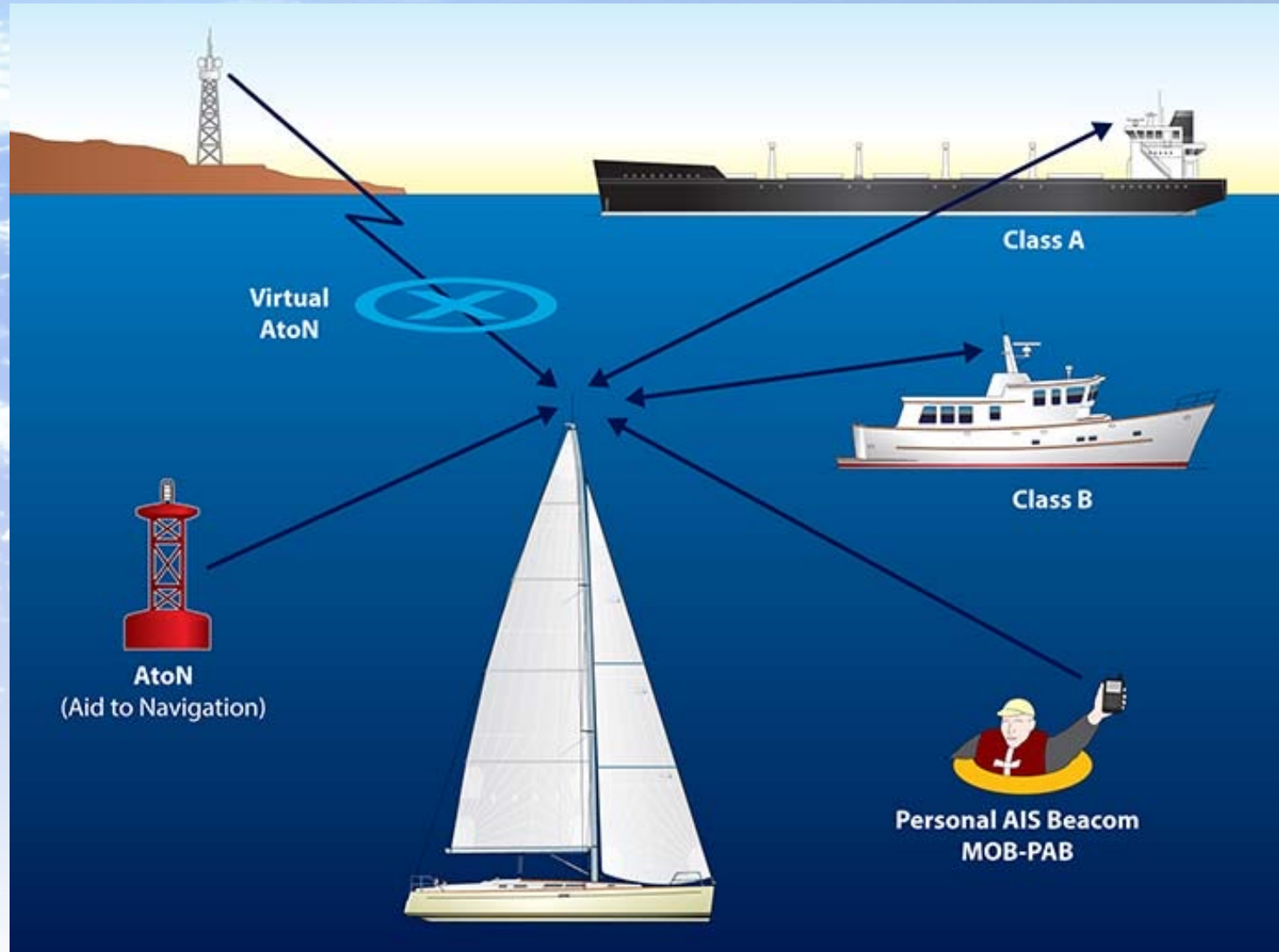
Making Space



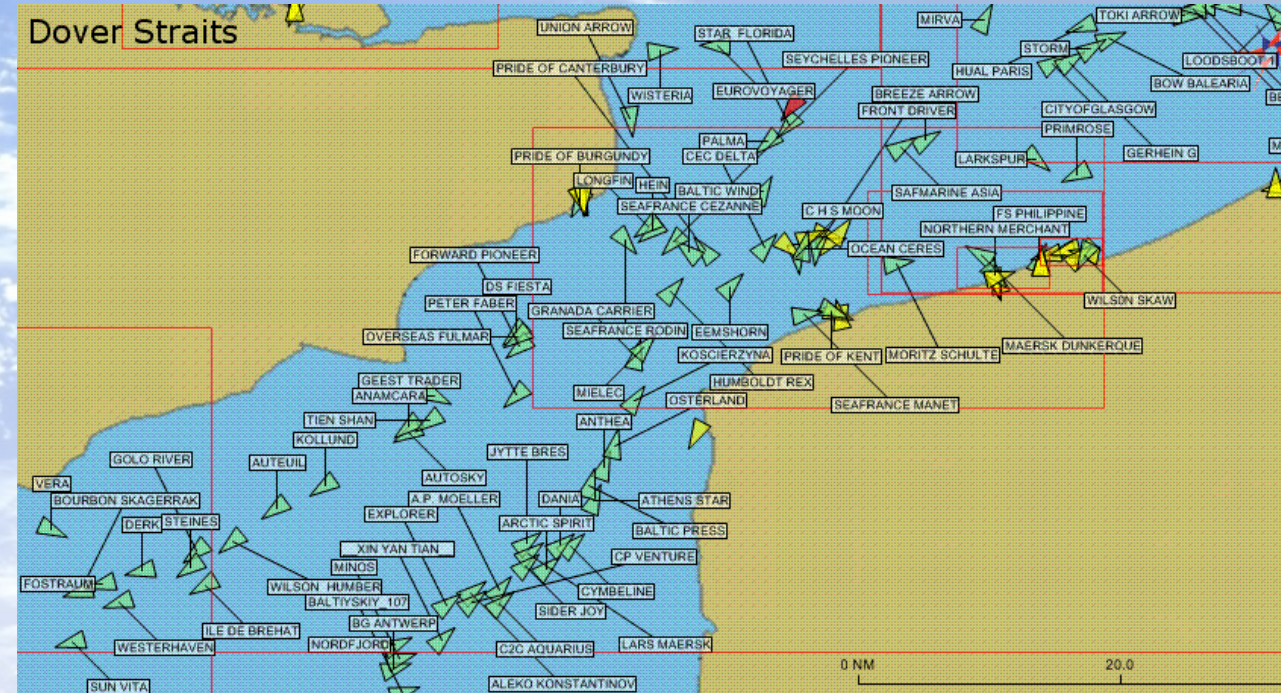


Ship Tracking

Automatic Identification System



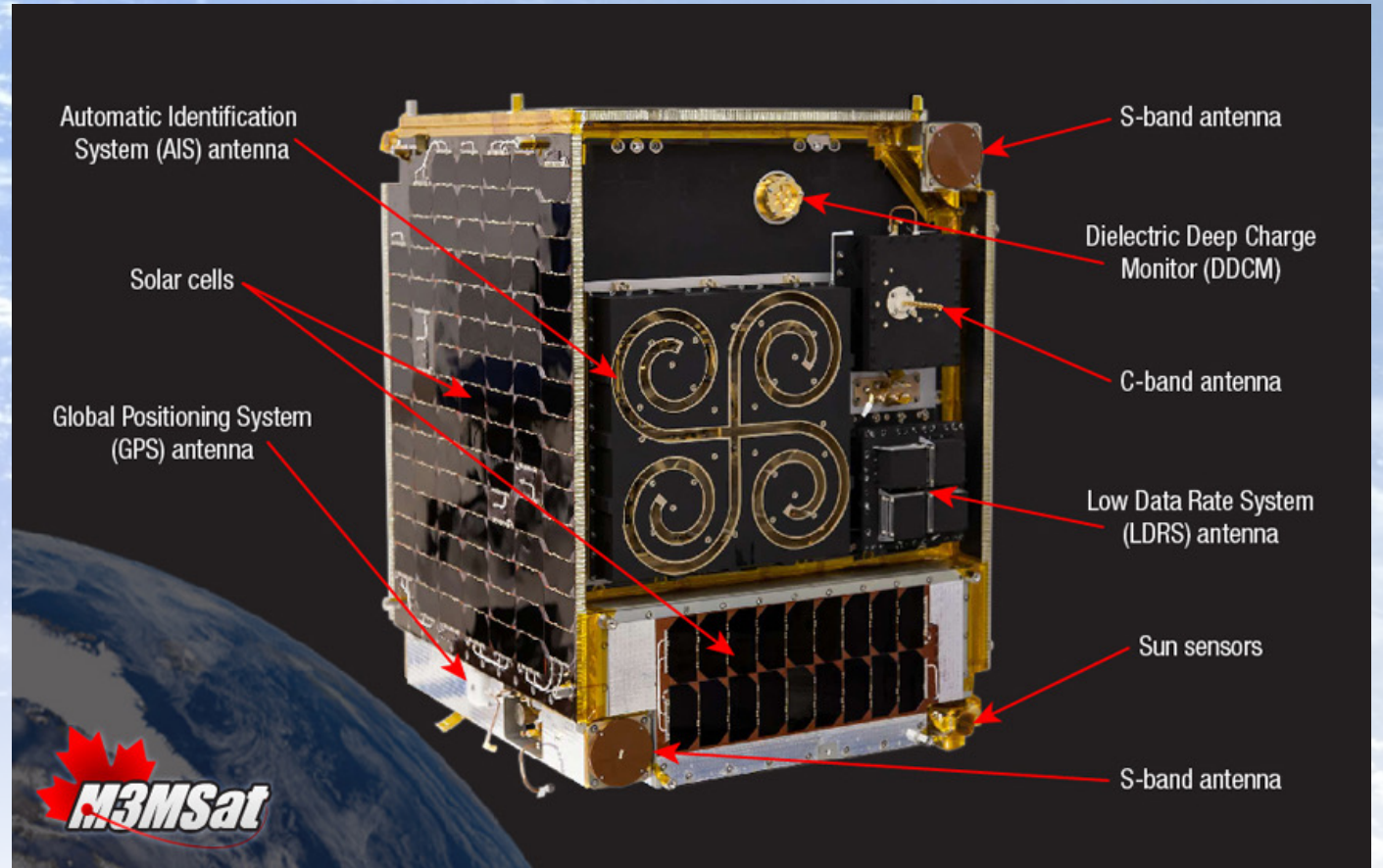
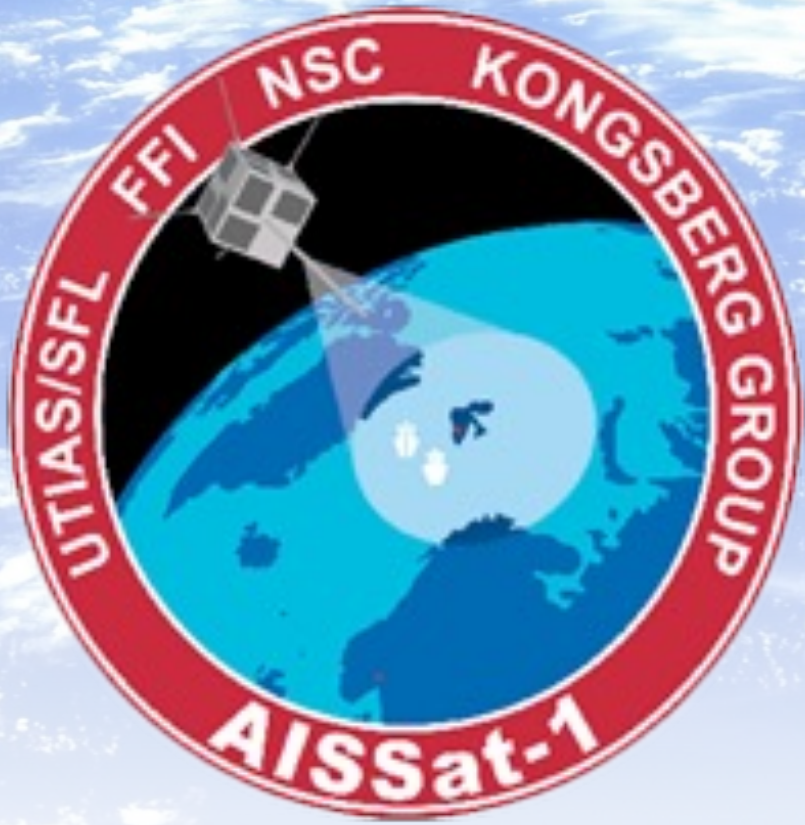
Ship Tracking (land, sea, air)



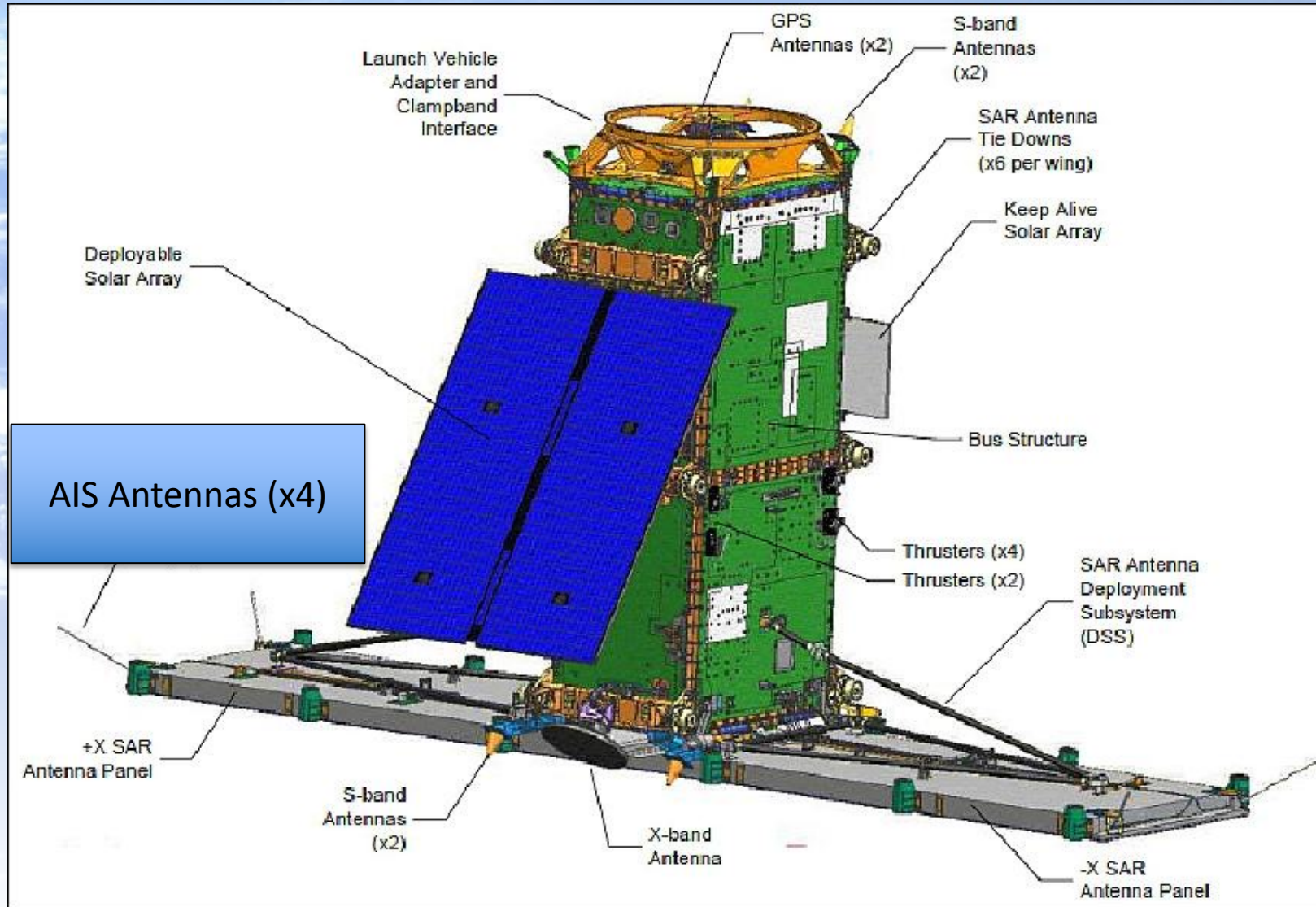
AIS From Space



Canada: Leaders in S-AIS



AIS on Radarsat Constellation Mission



Opportunities for Northern Communities

A large container ship is shown from an elevated perspective, sailing through a field of sea ice. The ship's deck is covered with numerous colorful shipping containers in shades of red, yellow, blue, and green. The ship's hull is dark, and its funnel is visible. The ice consists of many small, irregular floes, creating a textured surface around the vessel. The background shows a vast expanse of blue water and more ice floes under a clear sky.

- **Specific information / use cases:**
 - Emergency / spill preparedness
 - Shipping impacts to animal migration / habitat
- **Access to Canadian AIS information**
- **Dedicated AIS constellation**
- **Working with communities to understand need**

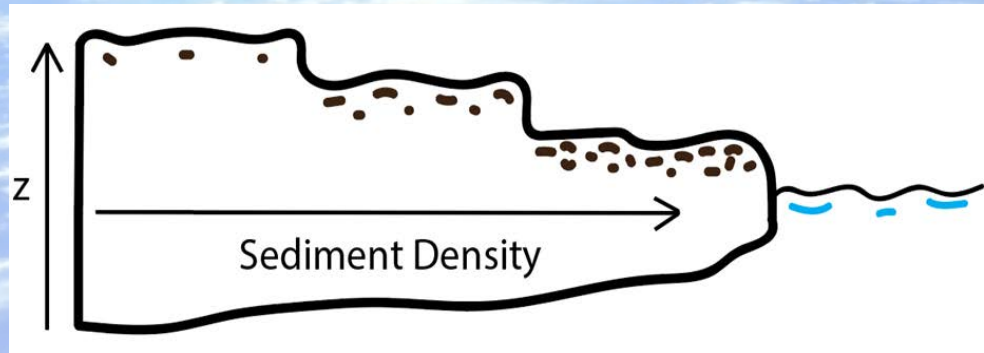
The image is a composite. The top half shows a dark blue night sky filled with numerous white stars of varying sizes and brightness. The bottom half shows a view of Earth from space, with a thin white atmosphere layer at the top, followed by a deep blue ocean, and a white, textured cloud layer covering the landmasses. The text "Drone Remote Sensing" is centered in the middle of the image, overlaid on the Earth's surface.

Drone Remote Sensing

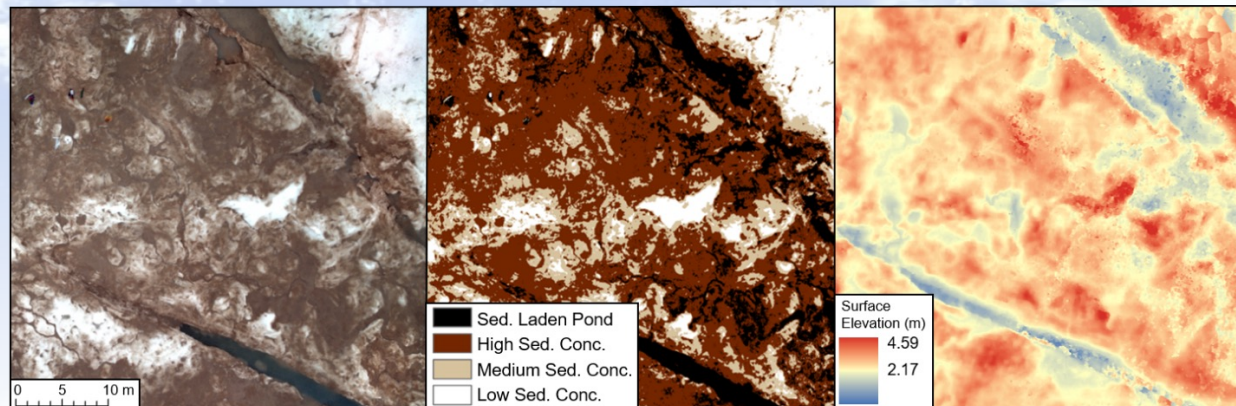
Arctic Remote Sensing Using Drones



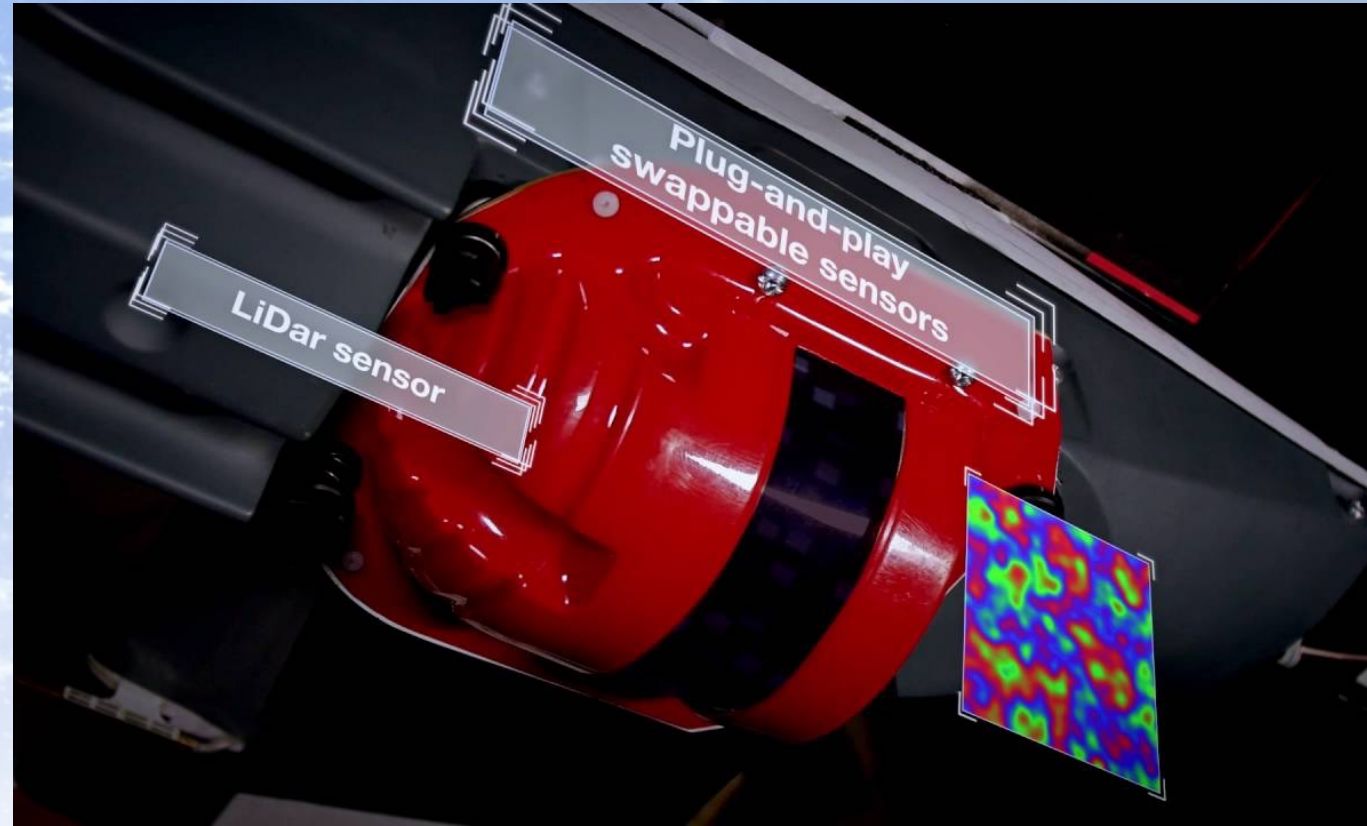
Drone and Microwave Data



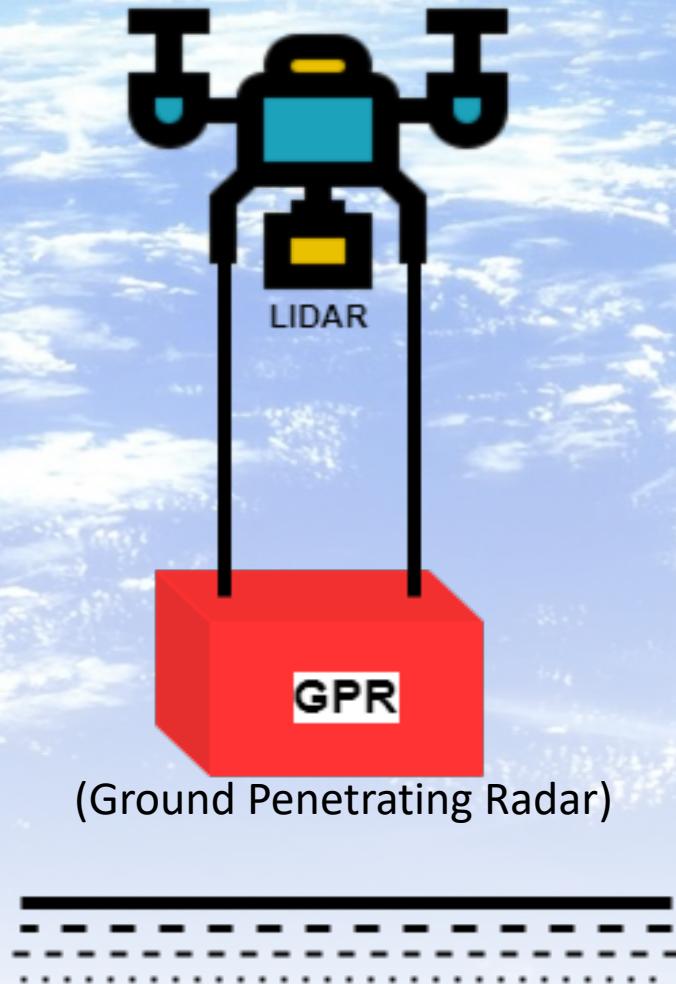
Madison Harasyn, MSc Thesis, 2019



LIDAR Drone Payloads



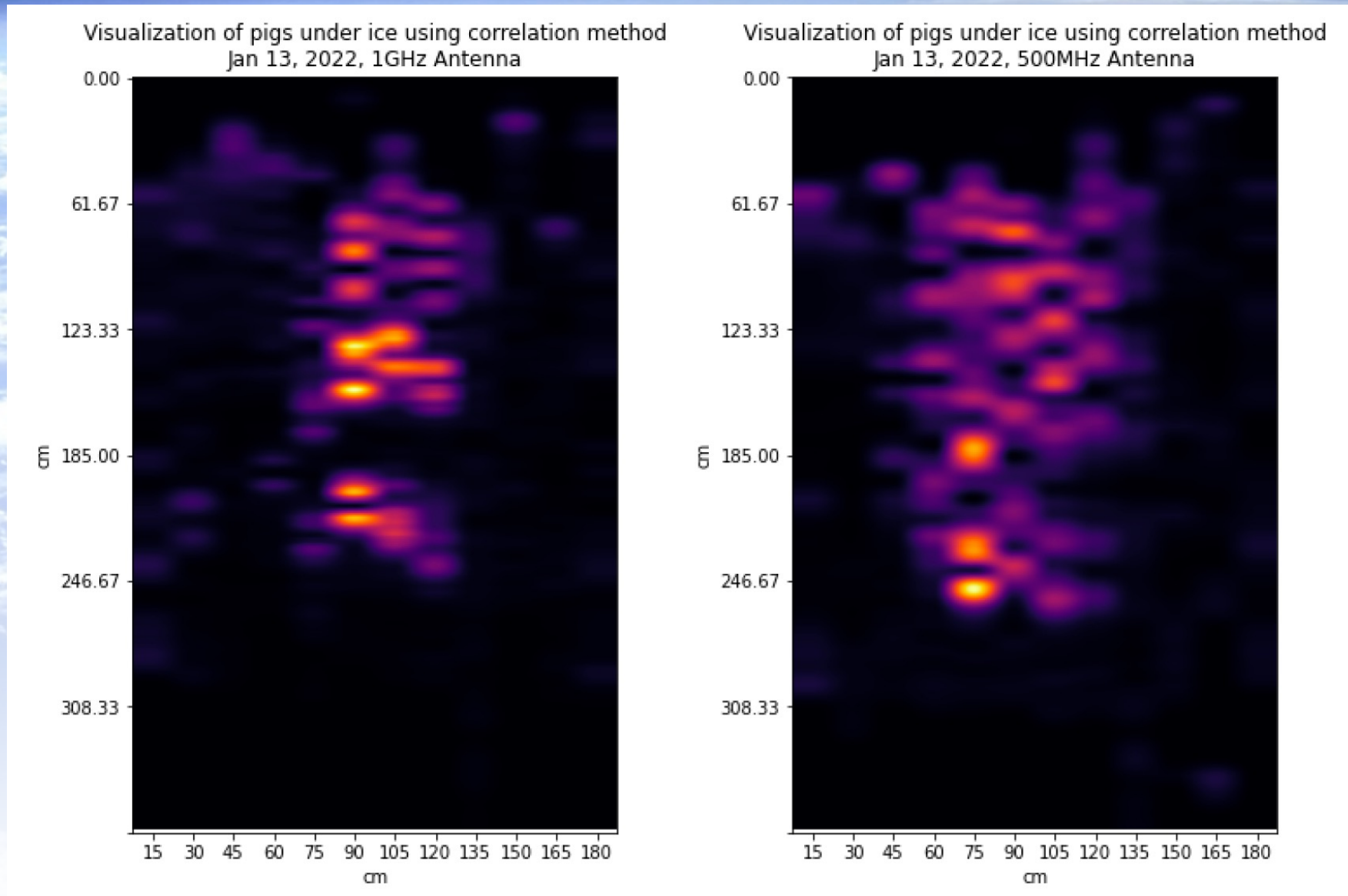
Combining Sensors



Under Ice Recovery



GPR Images





Small Satellite Remote Sensing



HOW HEAVY IS A SATELLITE?



LARGE SATELLITE



RADARSAT-2



>1000 kg



RHINO

MEDIUM SATELLITE



CASSIOPE



500-1000 kg



BUFFALO

MINI SATELLITE



SCISAT



100-350 kg



LION

MICRO SATELLITE



M3MSat

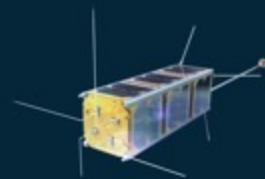


10-100 kg



WOLF

NANO SATELLITE including CUBESAT



Ex-Alta 1



1-10 kg



RACCOON

1 kg per unit



DUCK



A sense of Scale



(Photo Credit: Lockheed Martin)



(Photo Credit: Magellan Aerospace)



(Photo Credit: Canadian Space Agency)



(Photo Credit: Mike Latschislaw)

Iris (a 3U CubeSat)

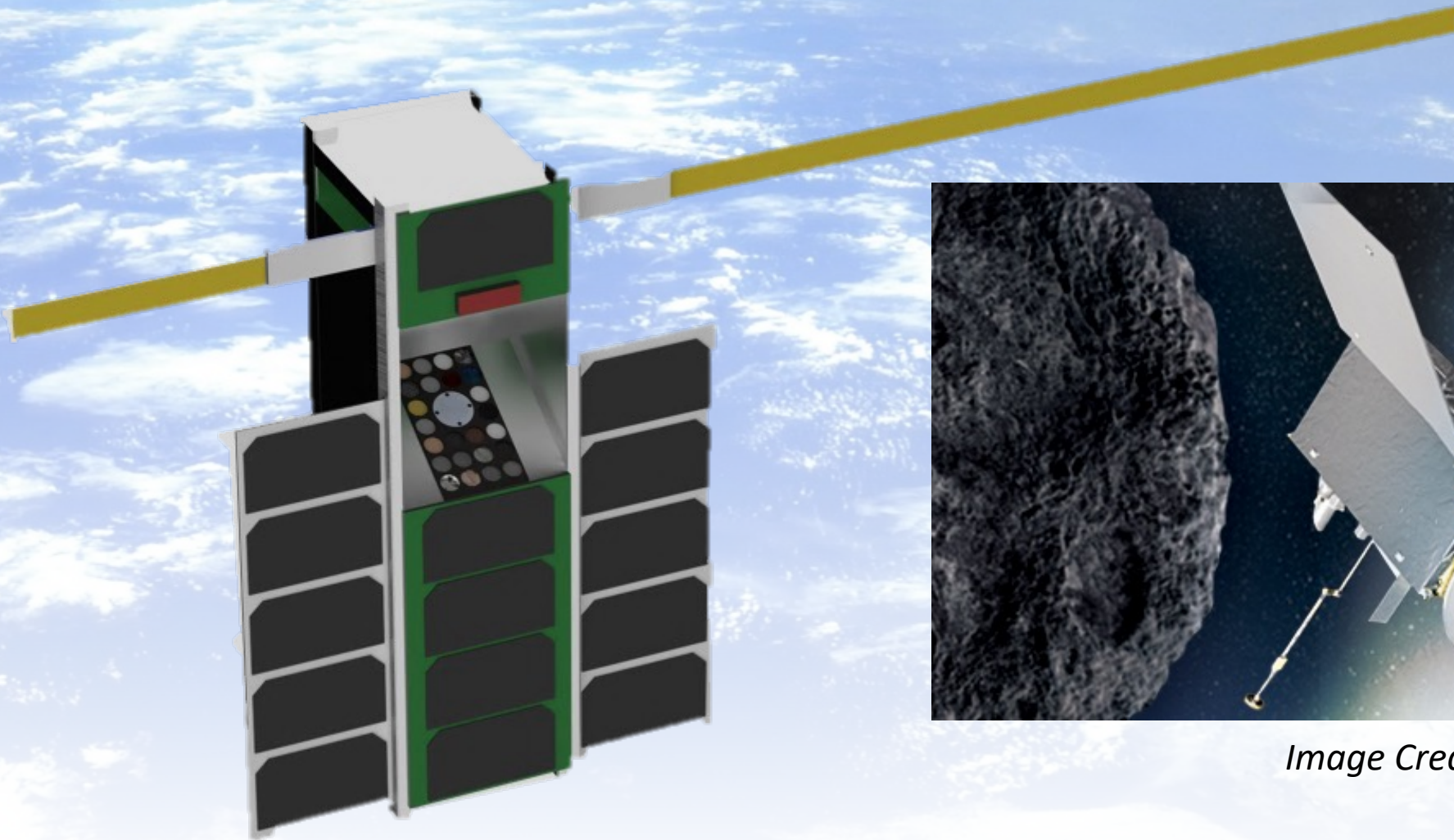
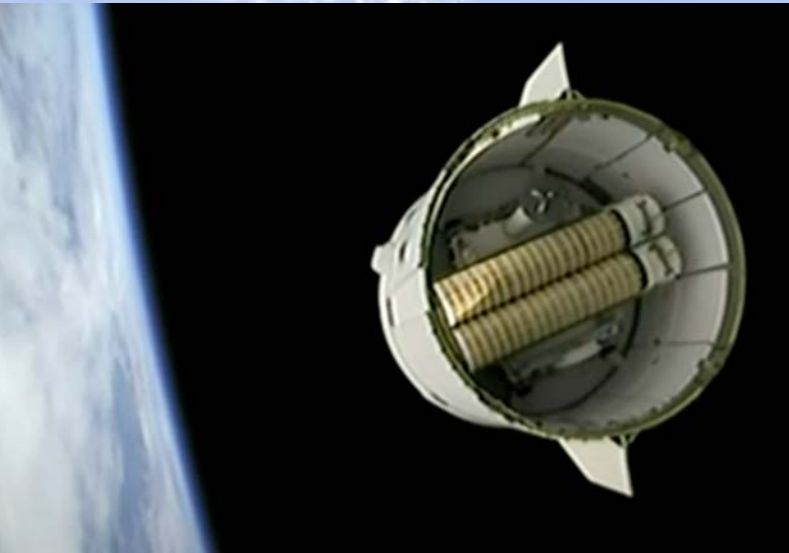
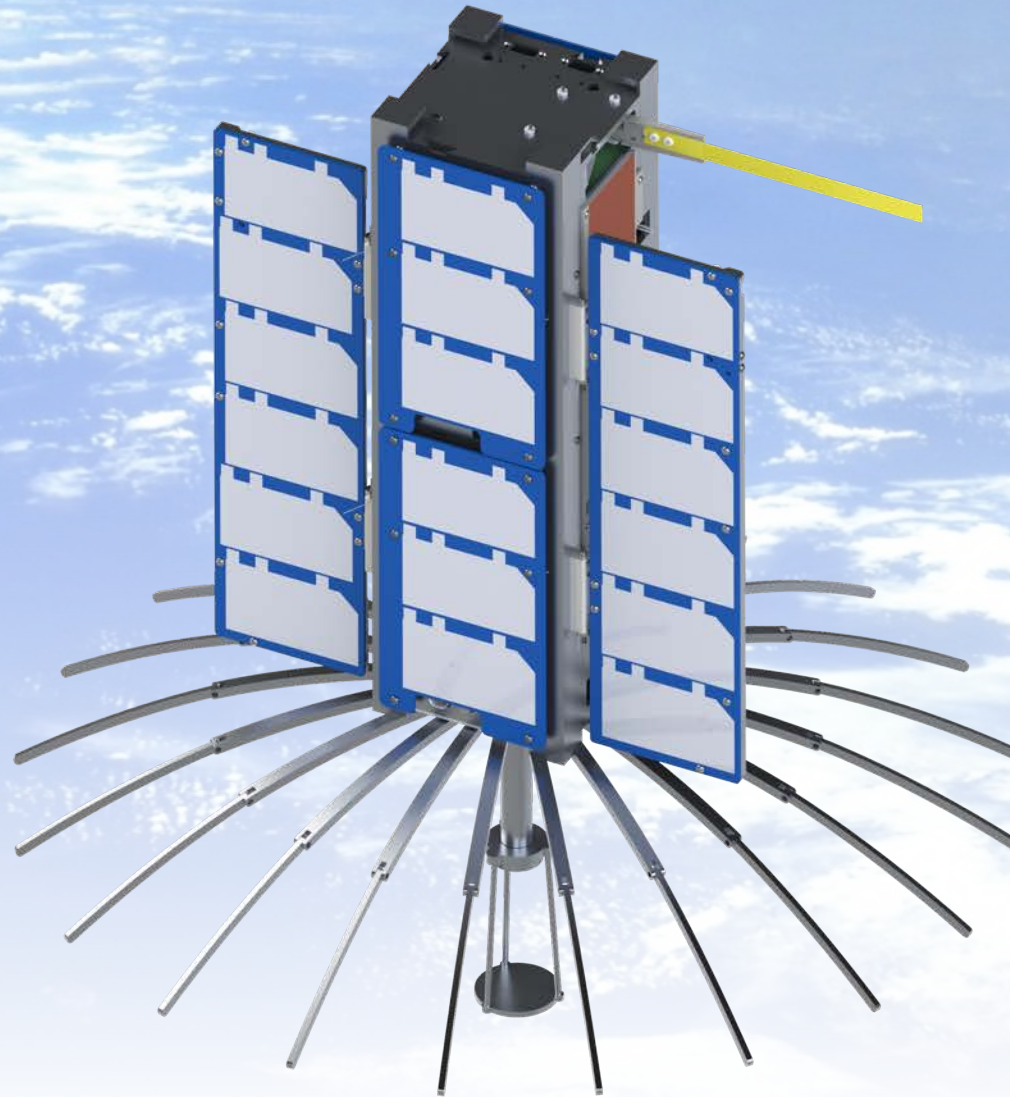
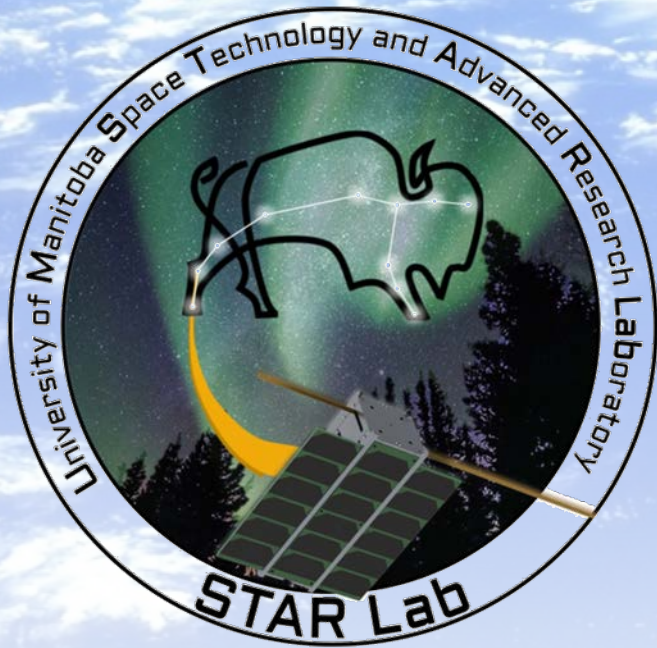


Image Credit: NASA

Iris Mission



ArcticSat Mission: Co-Development

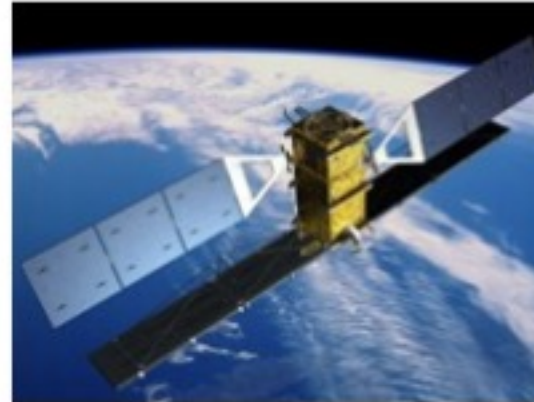


Arctic Revisit Times



RADARSAT-1

3-4 days



RADARSAT-2

3-4 days



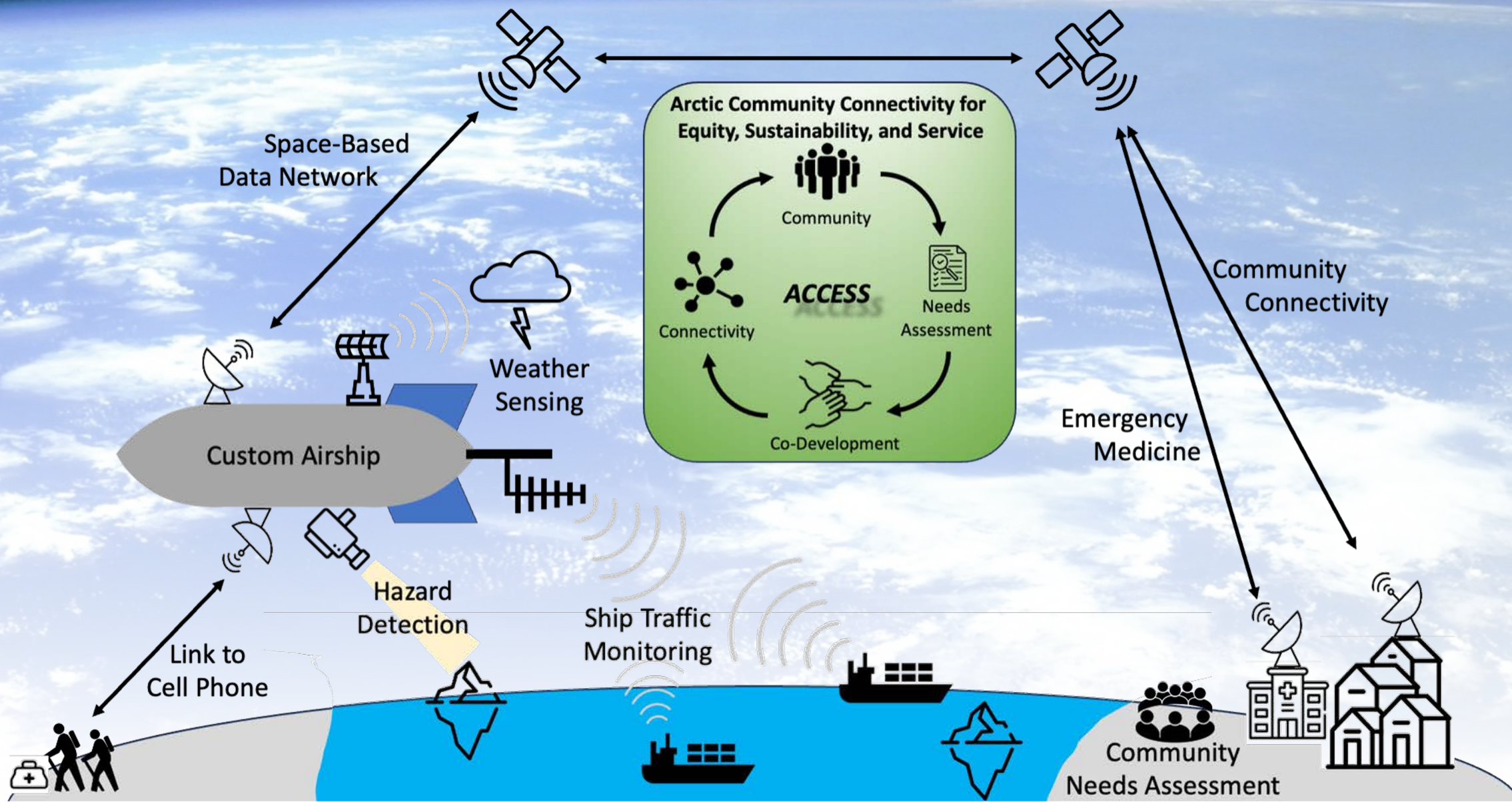
***RADARSAT
Constellation
Mission (RCM)***

6 HOURS

The image is a composite of two parts. The top half shows a dark, star-filled sky with numerous bright, out-of-focus stars of varying sizes. The bottom half shows a view of Earth from space, looking down at a vast expanse of white clouds over a blue ocean. The horizon line of the Earth is visible, separating the dark space from the bright atmosphere and clouds. Centered over the Earth portion is the text "Combining Satellites and Drones" in a bold, black, sans-serif font.

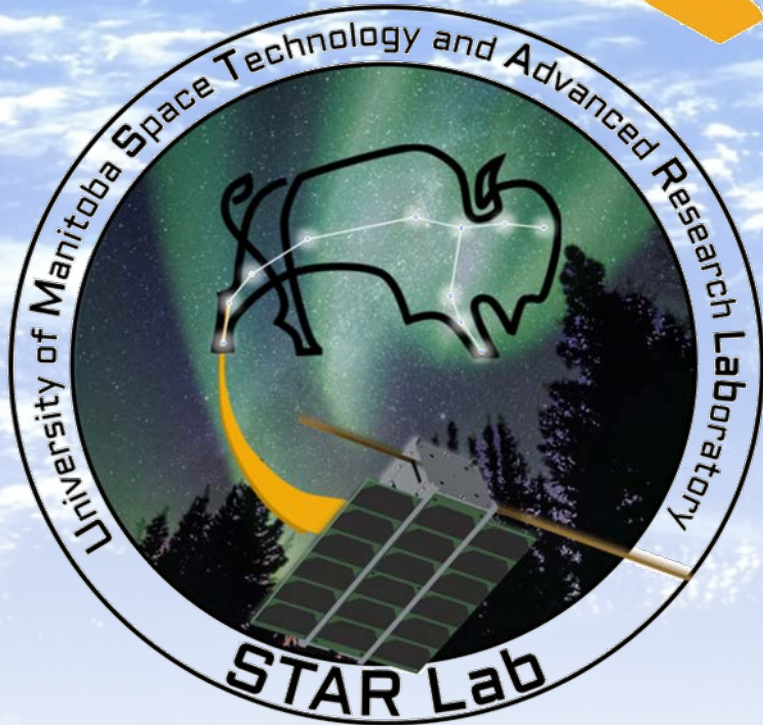
Combining Satellites and Drones

Arctic Community Connectivity for Equity, Sustainability and Service (ACCESS)





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