BACKGROUND: Satellite-derived bathymetry can estimate bathymetry rapidly and cost-effectively over large and remote areas. In Canada, especially the Arctic Ocean is poorly charted, yet has rapidly growing vessel traffic. To make use of existing satellite imagery to estimate bathymetry across this vast area, I present **a fully automated system** that ingests and processes Sentinel-2 imagery to produce a) an **estimate of water depth**, and b) **detection of shallow water areas**.

WORKFLOW:

For a given area, the system works as follows:

1) Download a sufficient number of Sentinel-2 scenes with limited cloud cover
2) For each scene, screen clouds, land, snow, ice
3) For each scene, estimate bathymetry using physics-based approach
4) For each scene, perform tidal correction
5) Combine corrected bathymetry from all scenes
6) Detect shallow water areas

TESTING:

The system has been tested at ~10 locations in Canada, with a focus on the Arctic. While it is performing well (under difficult environmental conditions), I am still improving it in terms of speed, accuracy, and functionality, and look forward to testing it across a greater range of environments.
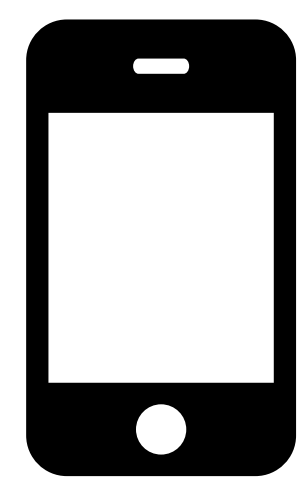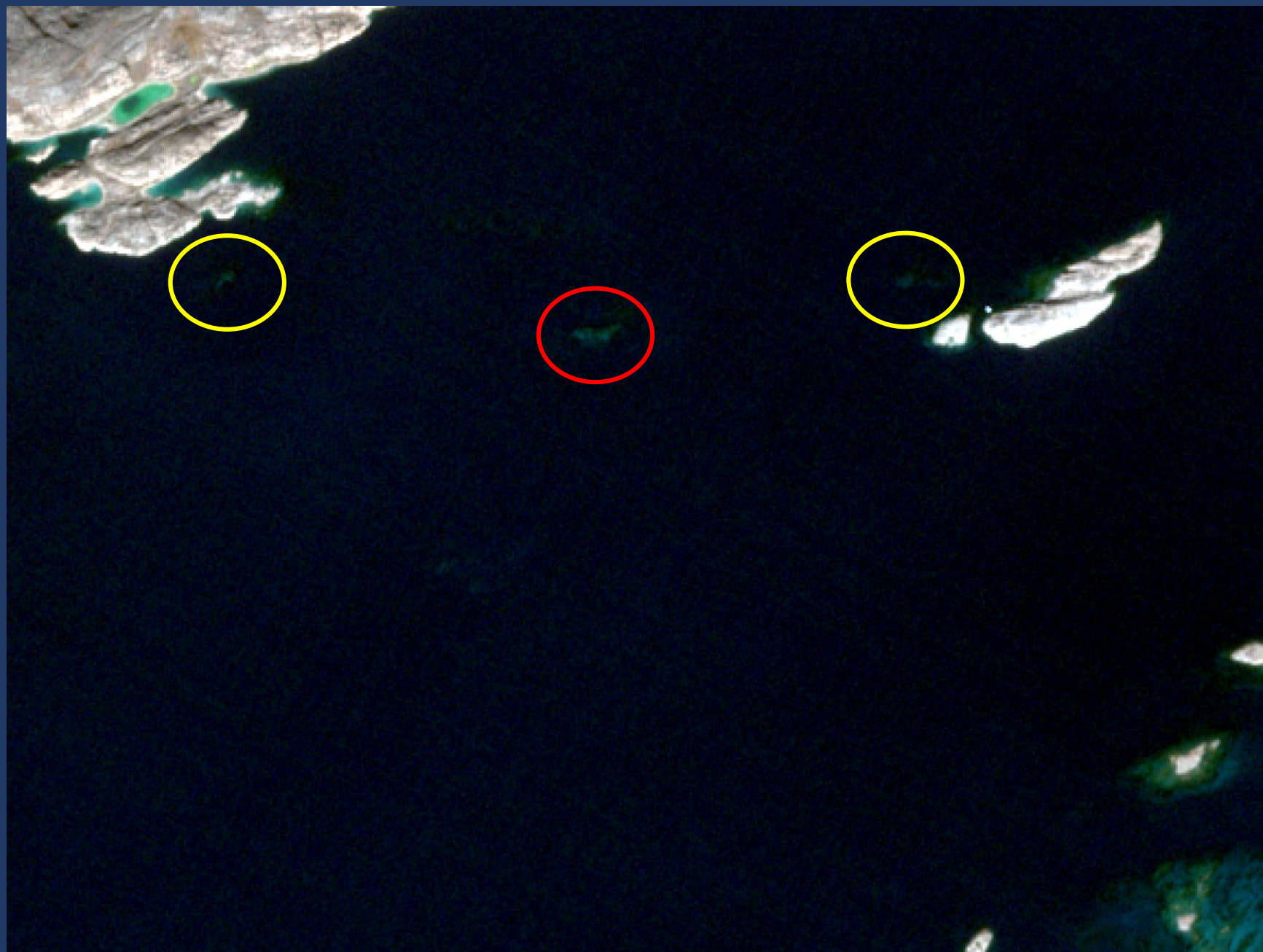
Take a picture to download the poster

Fully automated system for **S**atellite-d**E**rived b**A**thymetry and **SH**all**O**w wate**R** d**E**tection (SEASHORE)
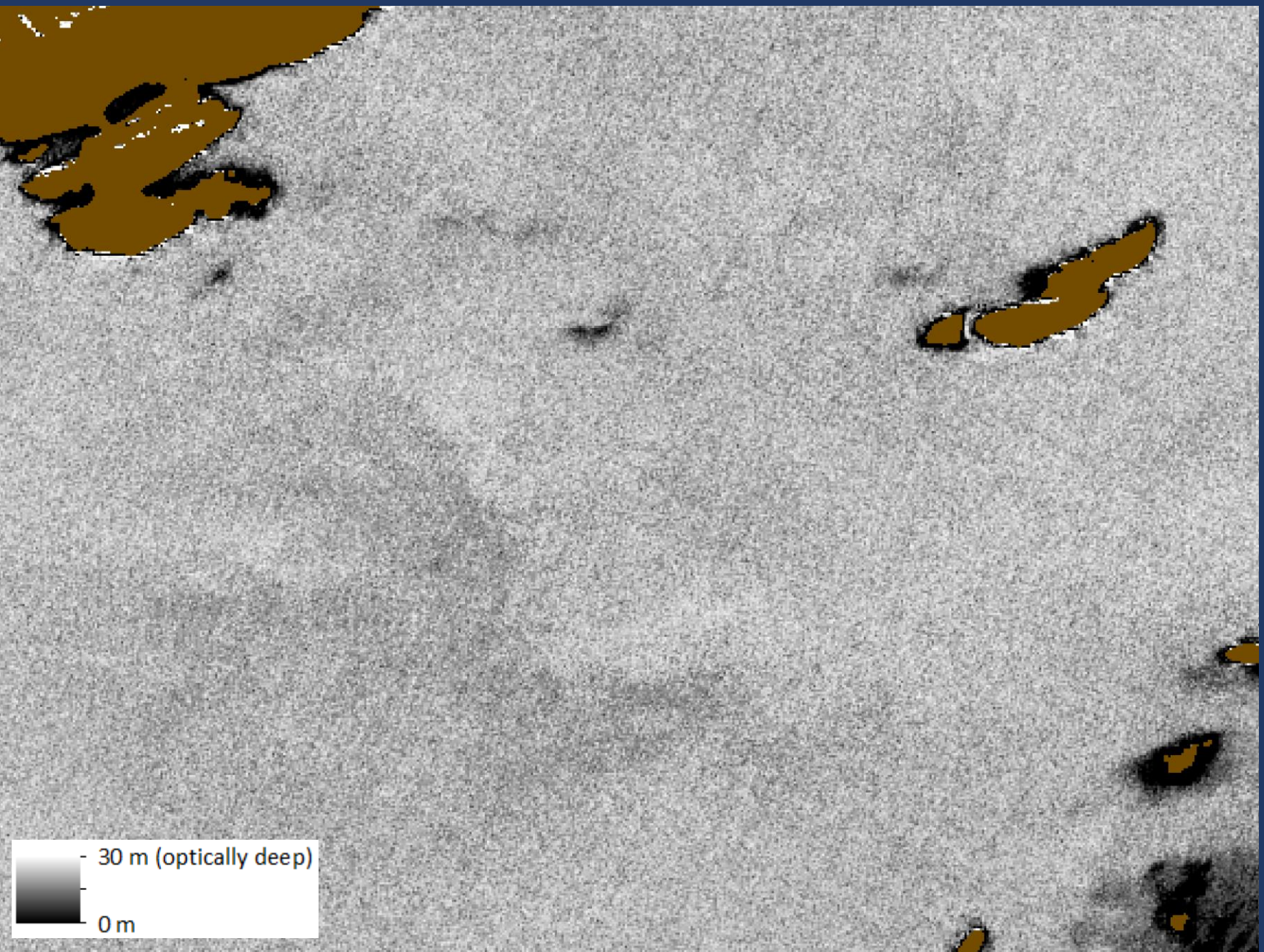
Use case 2 – shallow water detection

On 24 August 2018, the *Akademik Ioffe* ran aground on an uncharted underwater rock. Major hull damage, 80 liters fuel oil spilled. 163 people on board (no injuries). Rescue cost >$500K. The rock ◯ is >200m long and clearly visible in satellite imagery as far back as 2016.
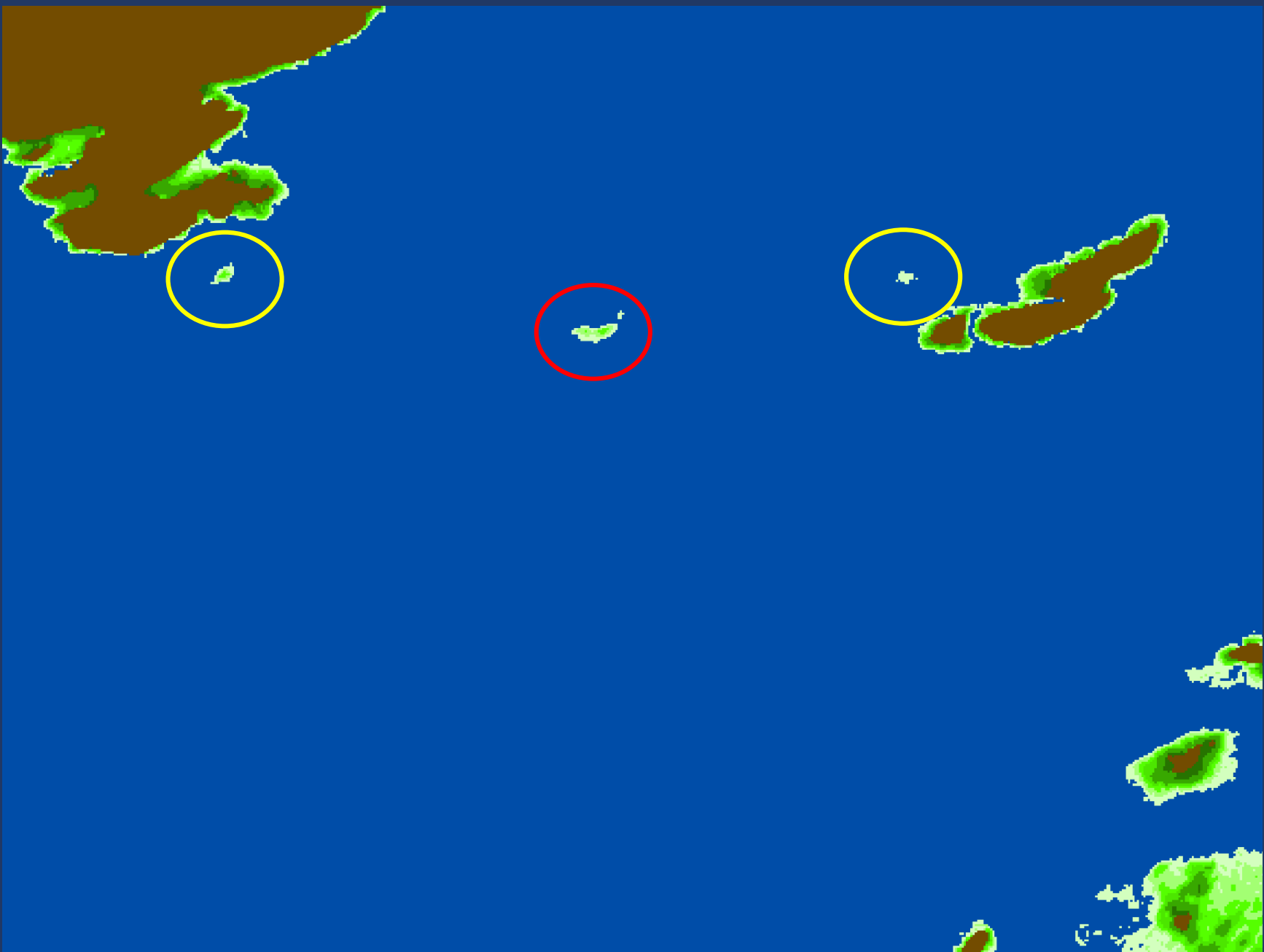
The SEASHORE system processes free satellite imagery, estimates water depth, and identifies shallow areas. It detects the ◯ rock, and several other uncharted rocks ◯ nearby.

The *Akademik Ioffe*, grounded. Photo credit: Donglai Gong

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Sentinel-2 image from 29 August 2018

30 m (optically deep)
0 m

Bathymetry derived from four cloud/ice free Sentinel-2 images

Shallow water detected for rock involved in grounding, and other uncharted rocks

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