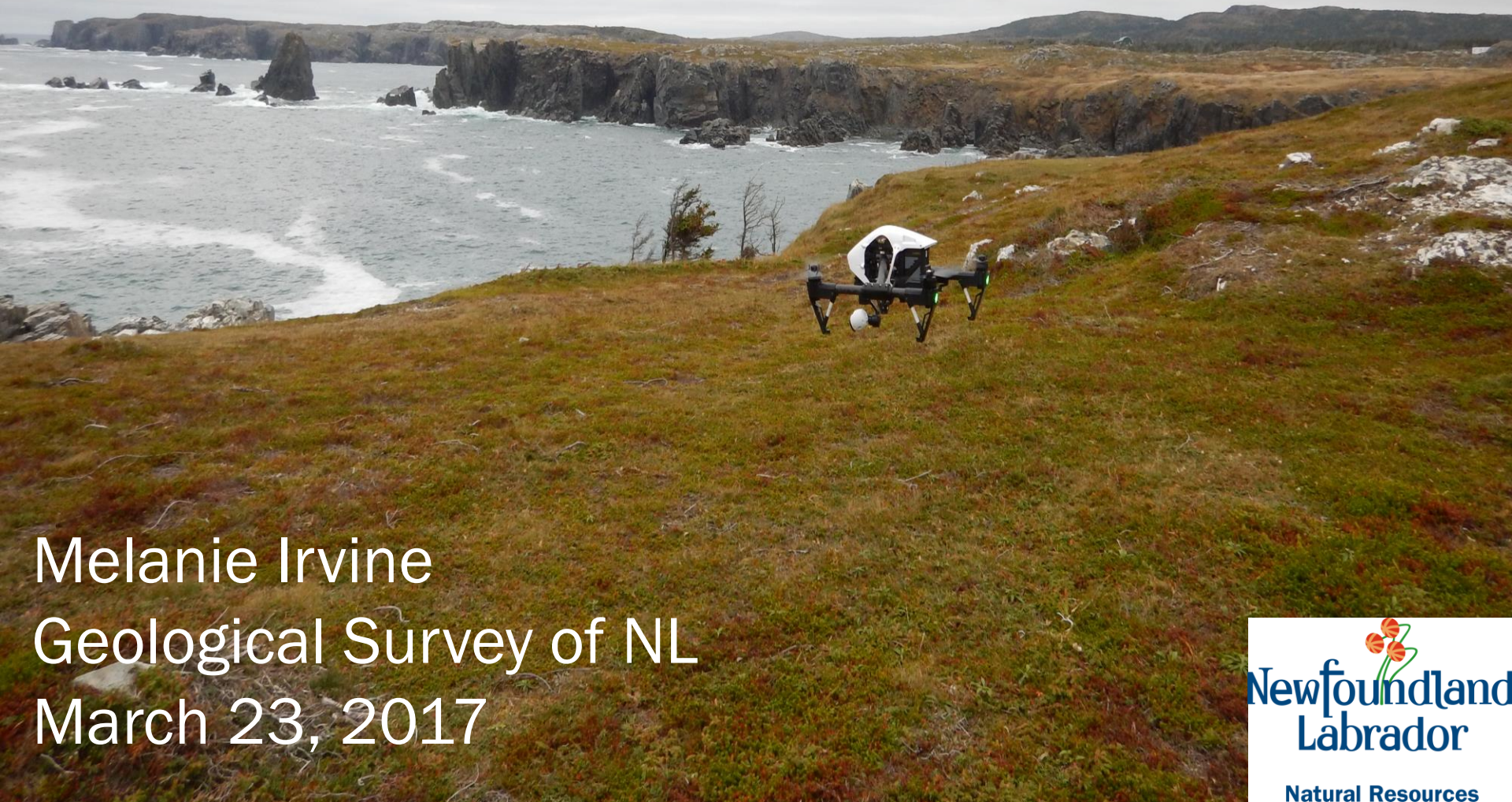


Exploring the use of UAVs in geoscience



Melanie Irvine
Geological Survey of NL
March 23, 2017

Outline

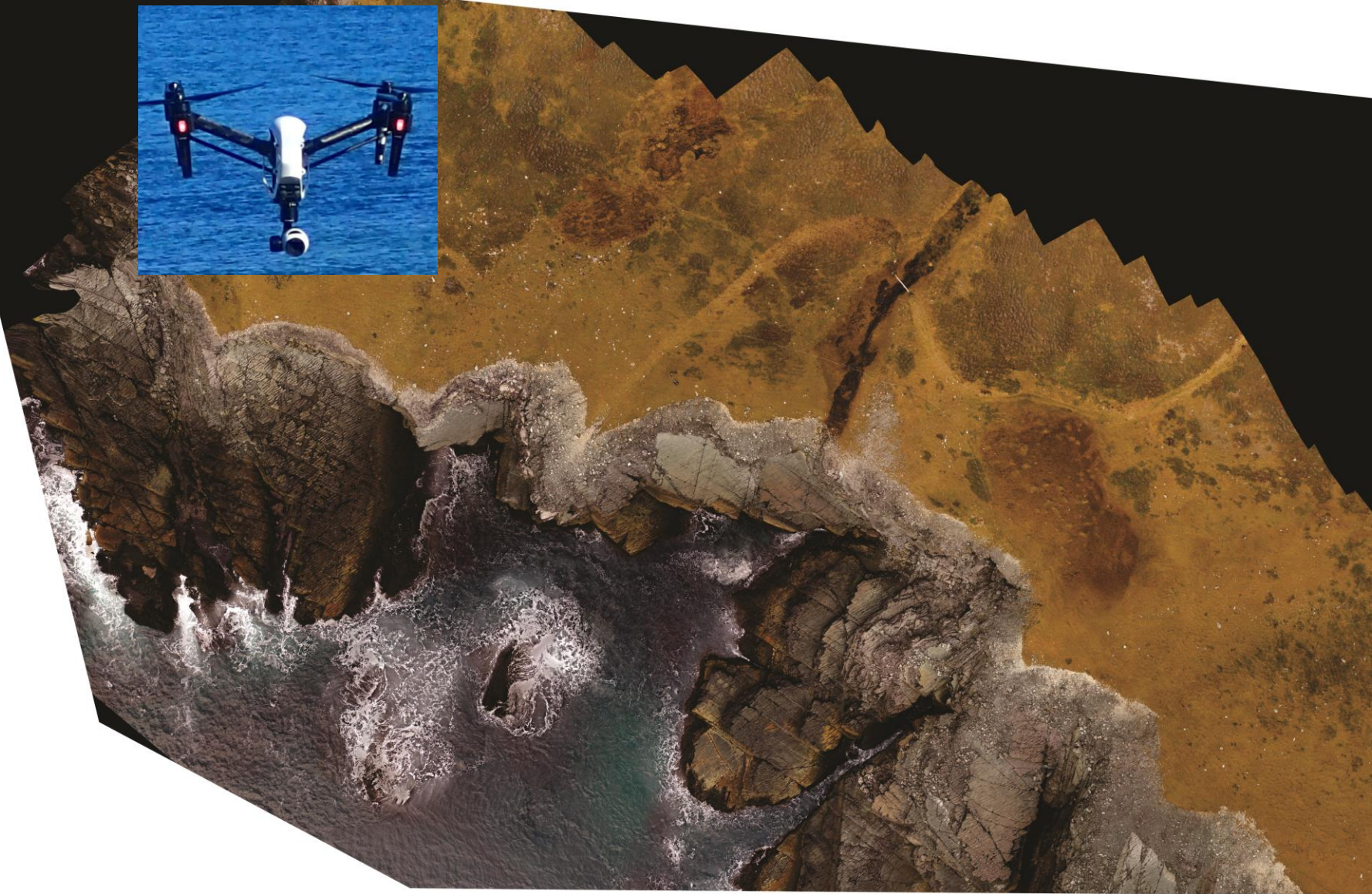
- Why use drones?
- Fixed wing vs. quadcopter
- Case study
- Results
- Next steps



Why use drones?

- Broad range of applications
 - Environmental monitoring
 - Geotourism
 - Mining
 - Mapping





UAV-fixed wing

Trimble UX5

- Rover, launcher and ground control station
- 50 min. flight time
- Speed: 80 km/h
- Covers large area
- Pre-planned, automated flights
- Long range
- Withstand high (65 km/h) wind
- Requires take-off/landing area



UX5

UAV-Quadcopter

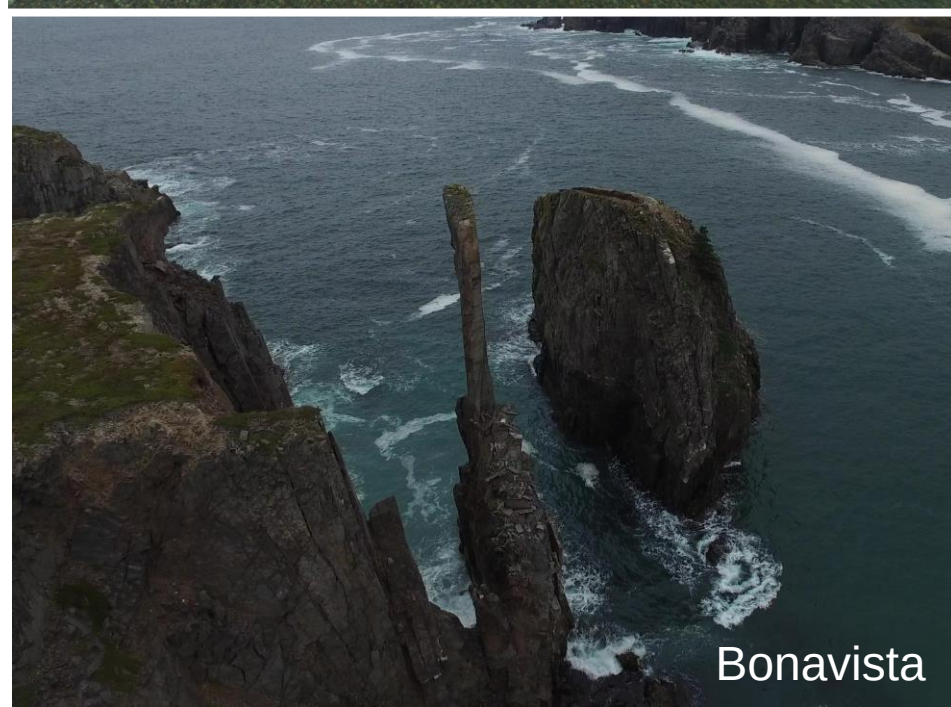


DJI Inspire 1

DJI Inspire 1

- Rover and ground control station
- 20 min. flight time
- Maneuverability
- Hover and descend
- Camera tilt
- Automated and manual flights
- Real time display
- Video

	Fixed wing	Quadcopter
Coverage	X	
Weather	X	
Camera	X	
Price		X
Maneuverability		X
Terrain		X
Apps		X
Video capability		X
Camera tilt		X
Flight plan setup		X

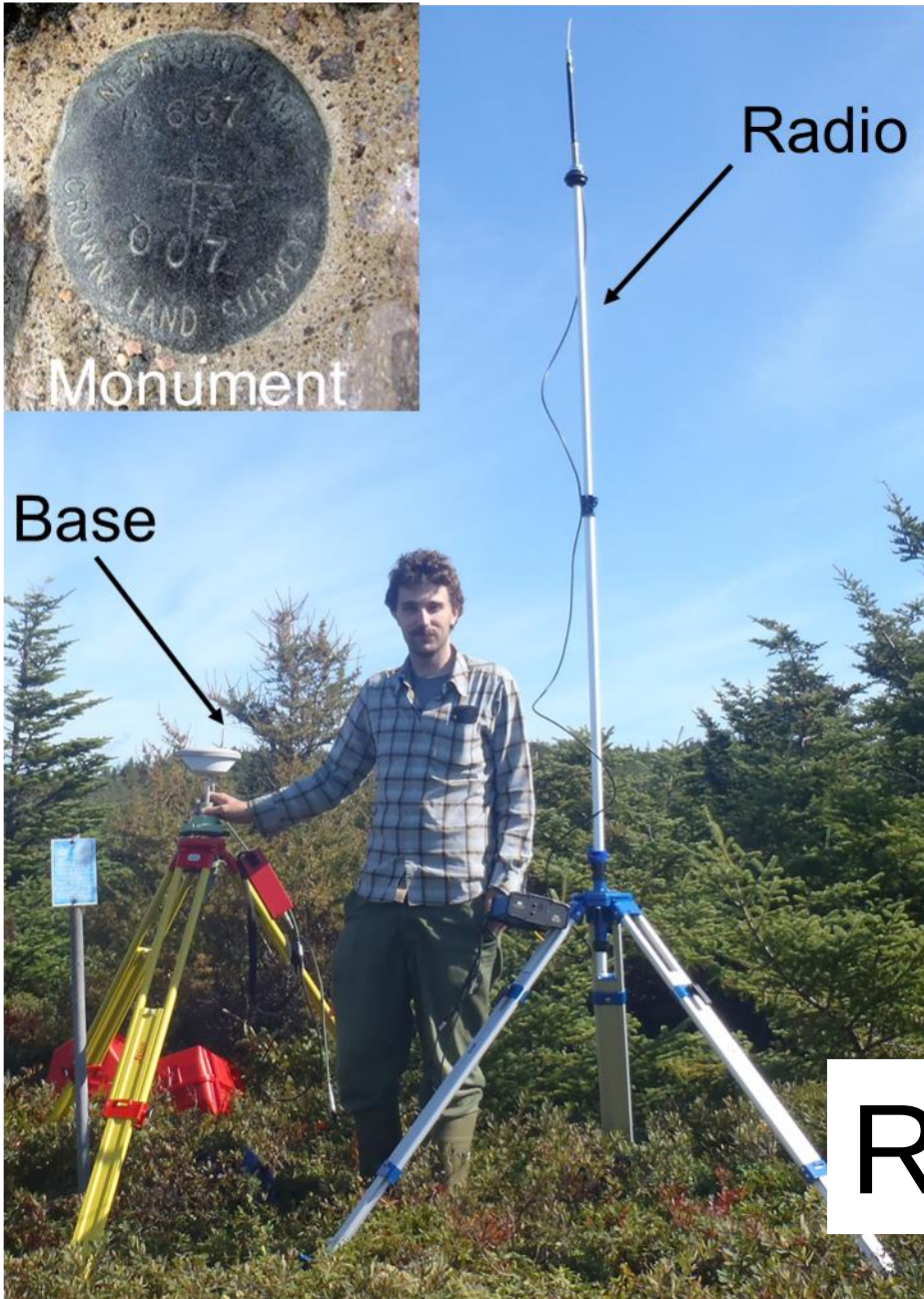




Monument

Base

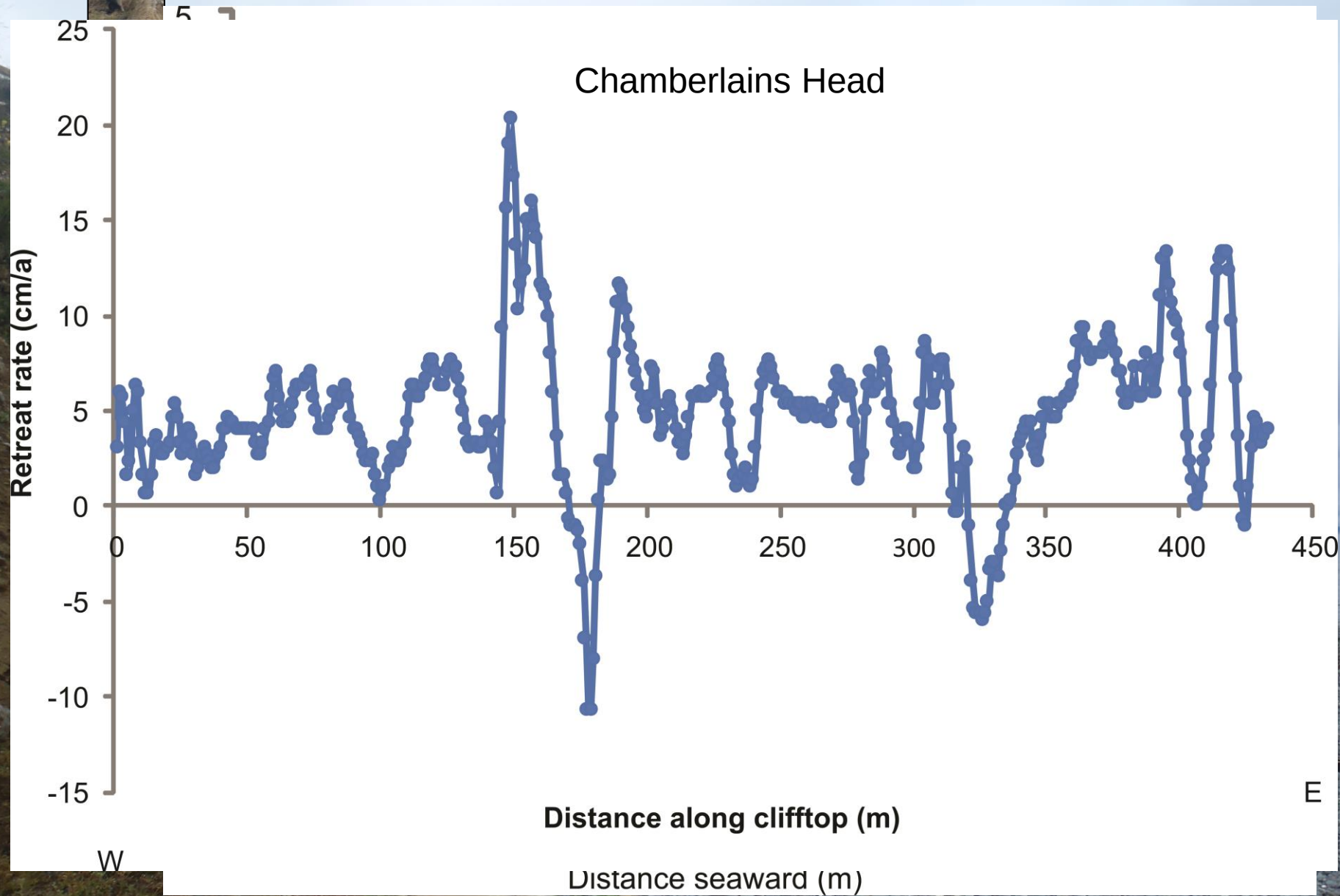
Radio



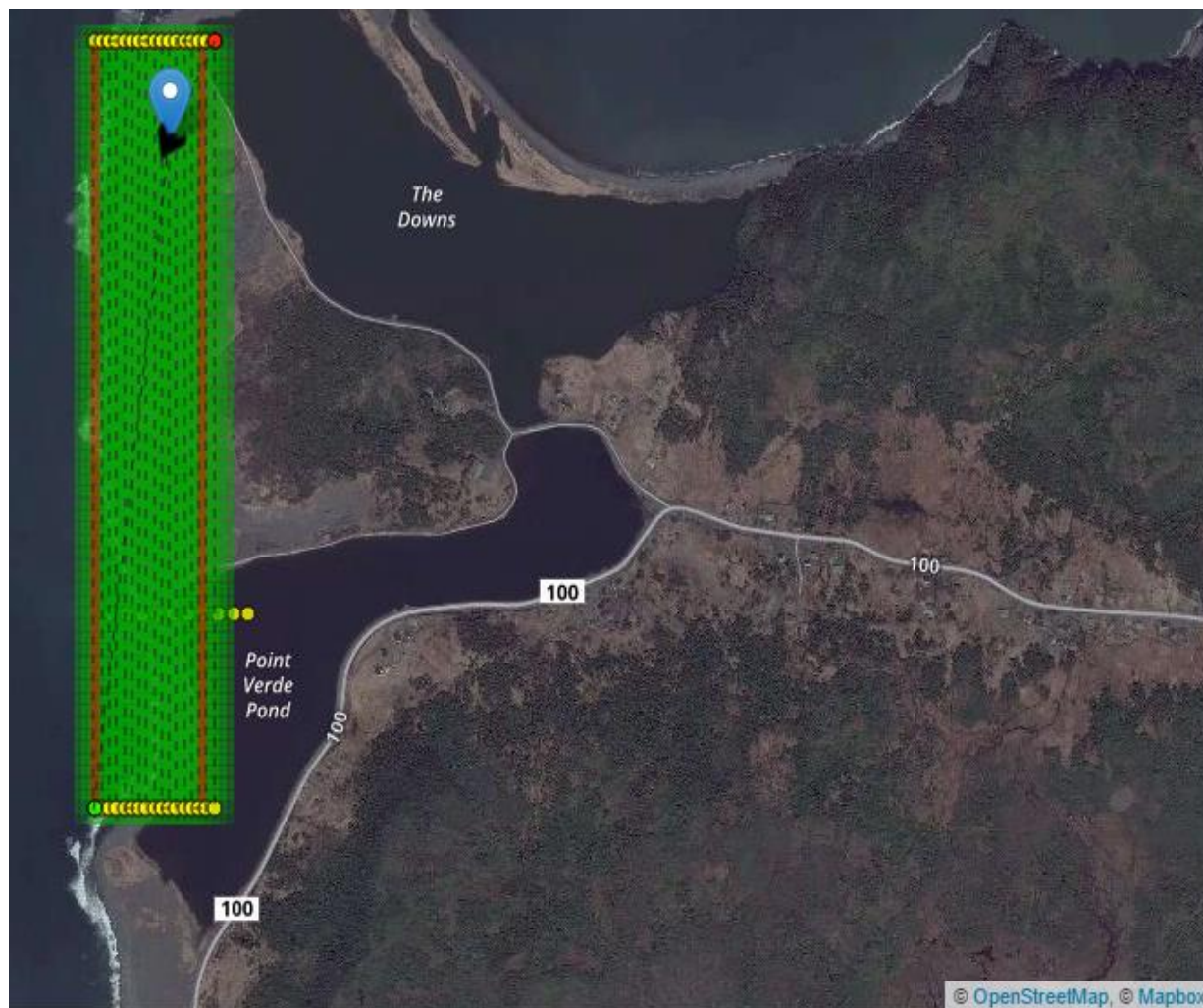
RTK



Rover



Advantages-Time efficient



17 Passes

33.01 Minutes

1.7 cm/pixel

1.7 sec/image

13.06 Gigapixels

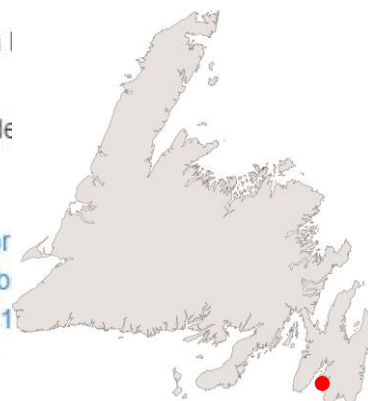
23.8 km flight

2611 Points

High Ground on l
20 m

Flight Altitude
58.7 m

Download KML for
Download AWM fo
Datalink (Not P3/I1



Take Off Start Finish Waypoint Path Boundary Image

Advantages-Quantity



Be Volume change ter



Storm surge damage, Placentia

Advantages -Access

- Inaccessible areas
 - Cliff faces
- Unsafe environments
 - Unstable cliffs
 - Hazardous mines
- Non-invasive
 - Sensitive environments (sand dunes)



Romaines Brook

Advantages

- Visualization tool
- Cost



Sallys Cove landslide

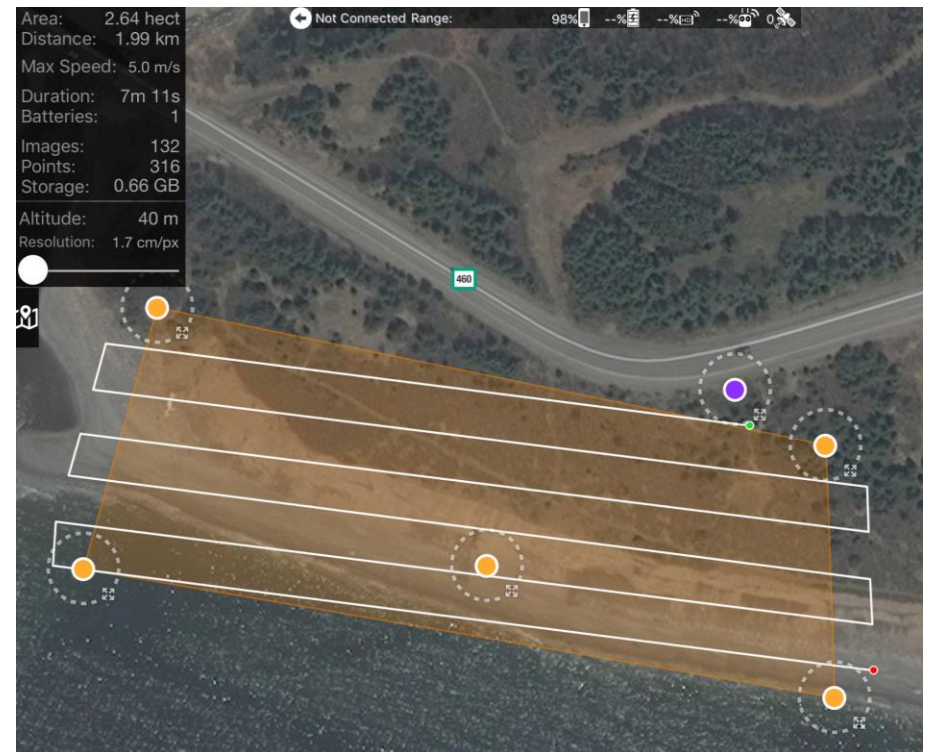
Case study: Romaines Brook

- Set-up project
- Ground control: RTK
- Fly
- Post-processing
- Analyze data



Set-up project

- Create a mission using Map Pilot
- Define boundary
- Flight details
- Download map



Ground control points

- Set up RTK
- Lay out & survey targets



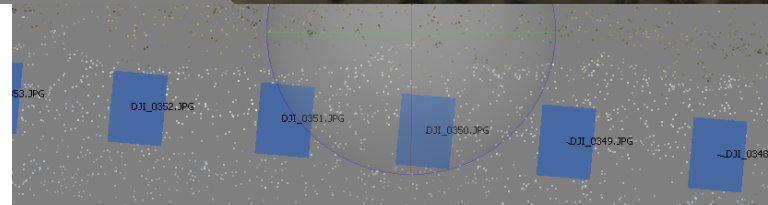
Fly

- Map Pilot
 - 80% overlap
 - 40 m elevation
- DJI GO
 - Manuel flight
 - Video
 - Camera tilt
- Litchi
 - Panorama

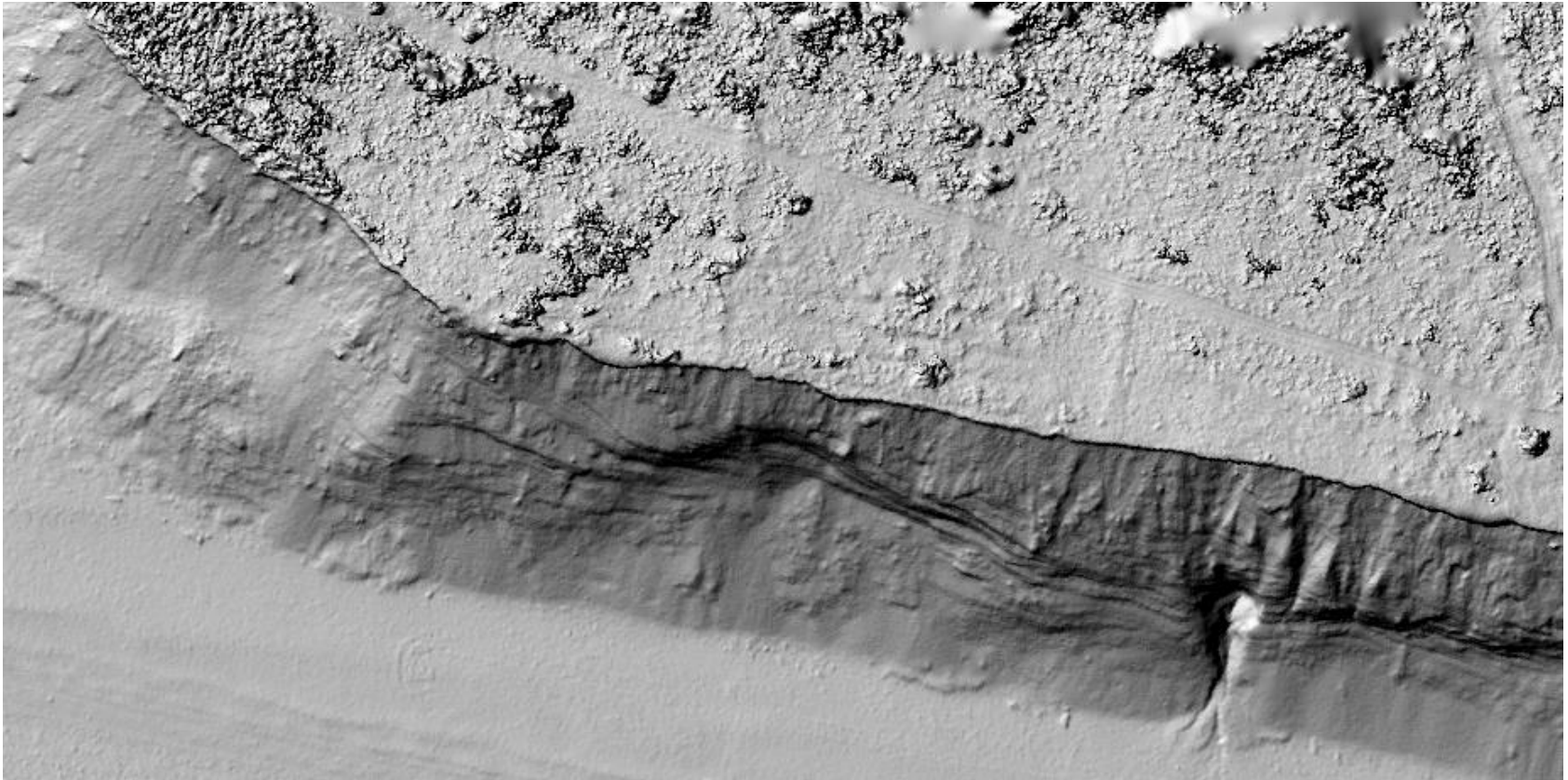


Post processing workflow

- Align Photos
- RTK
- Dense Point Cloud
- Mesh/Texture



DTM

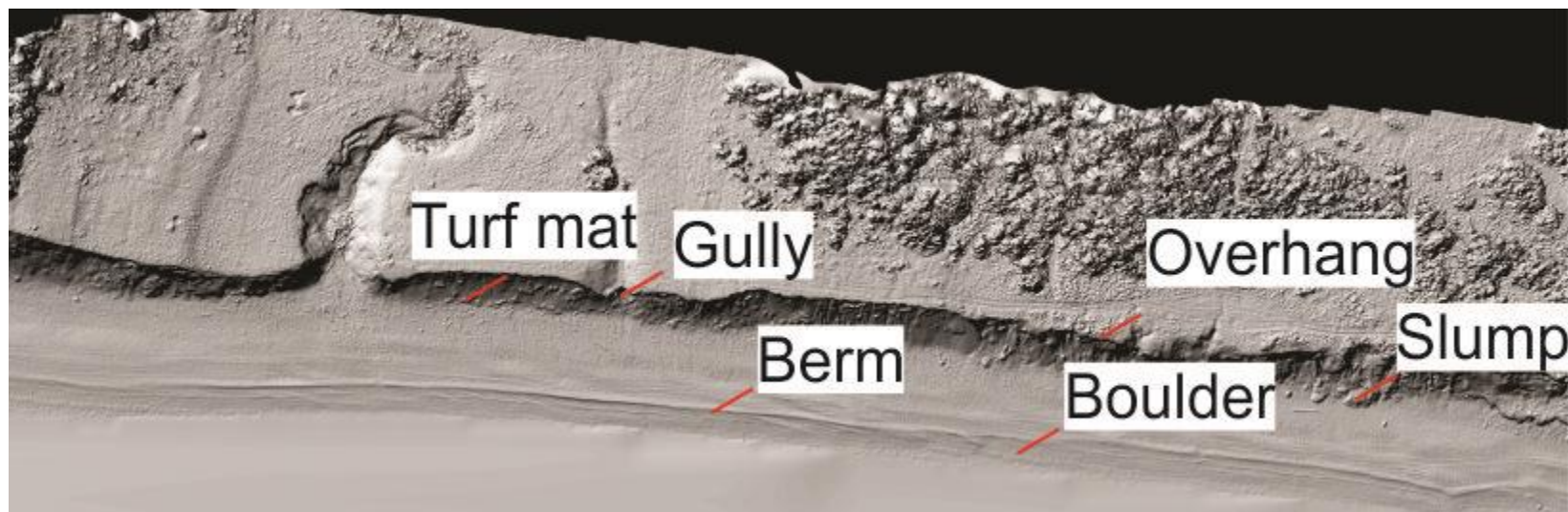
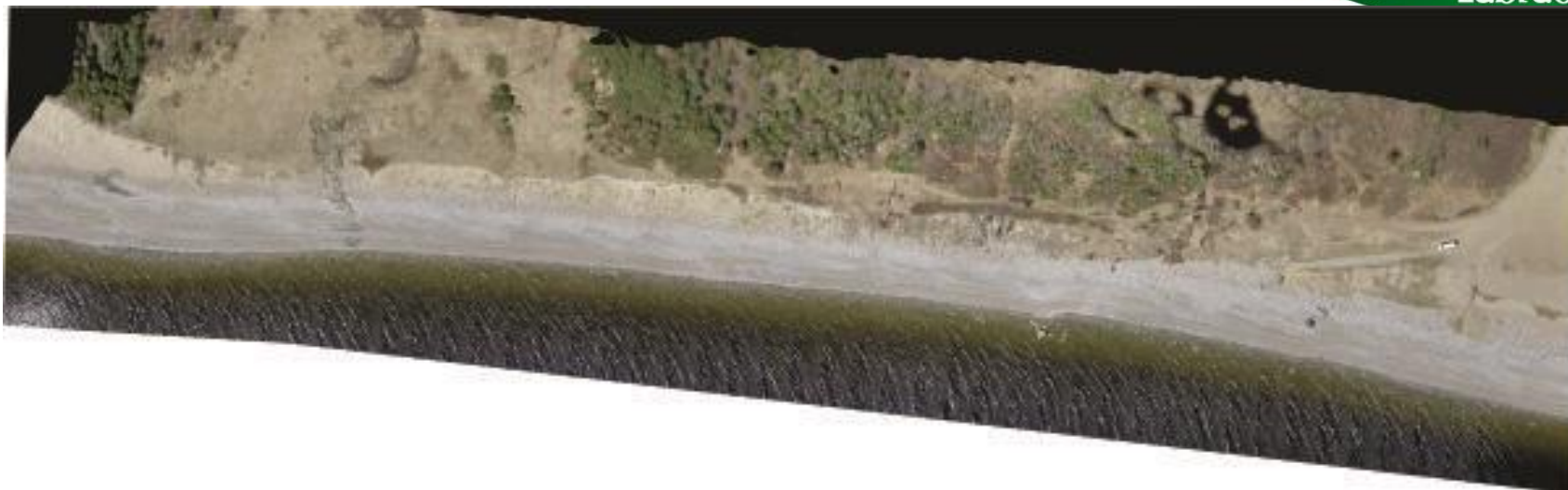


Romaines Brook

Orthophoto



Crabbes River



Ground control points

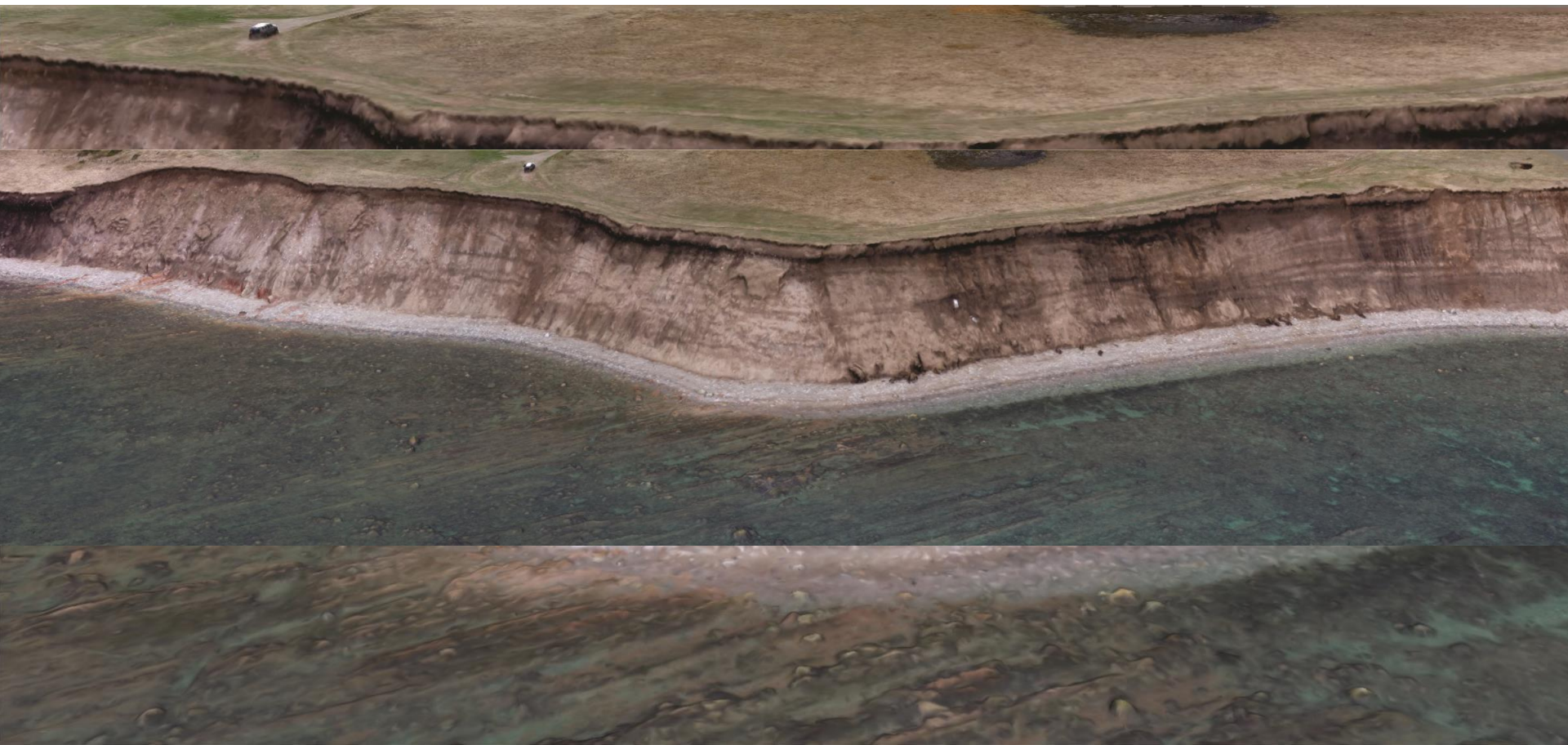


Without RTK

With RTK

Norris Point



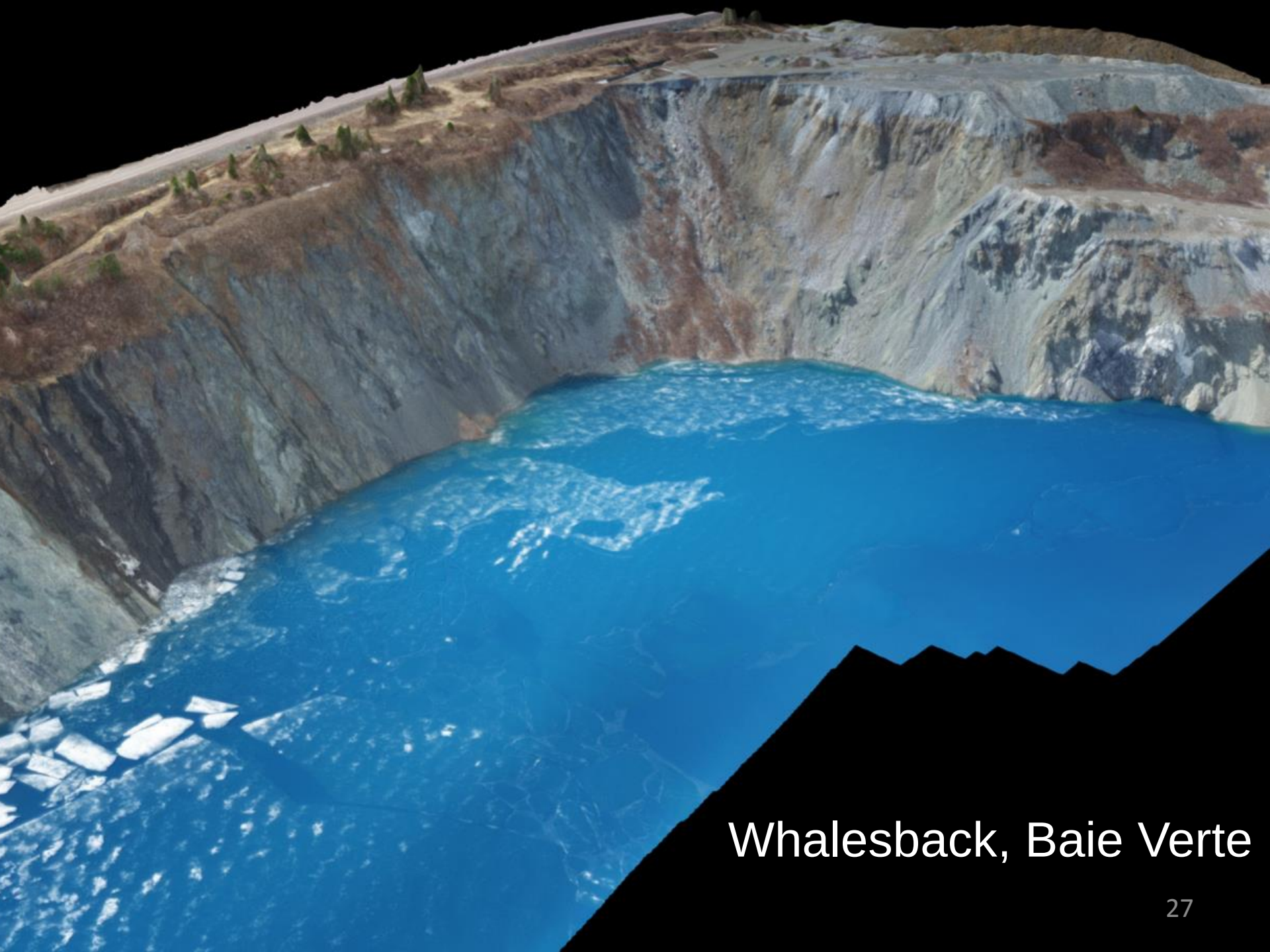


3 D Models



Sketchfab

Daniels Harbour 26



Whalesback, Baie Verte



Geological Survey NL

PRO

St Johns Newfoundland and Labrador Canada

Geoscience

EDIT PROFILE

16 Followers

3 Followings

SUMMARY

31 MODELS

COLLECTIONS

0 LIKES

UPLOADS

POPULAR MODELS

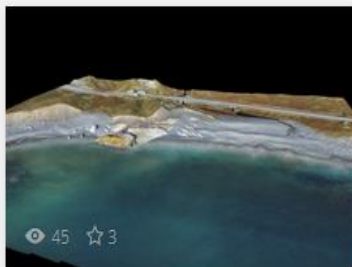
View all (31) >



450 5

Mistaken Point

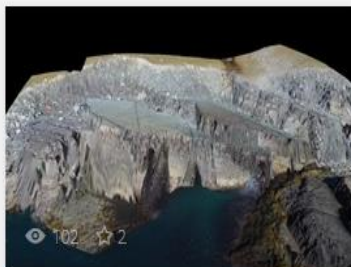
a year ago



45 3

Pigeon Cove

5 months ago



102 2

MP Fossil Bed 2016 Model versi...

4 months ago



24 2

Sweet Bay Rattle 60m

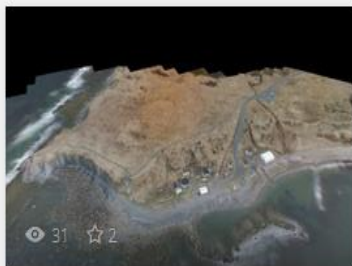
5 months ago



74 2

Crabbes River South

6 months ago



31 2

Green Point

10 months ago



161 2

Sally Cove Slide

10 months ago



62 2

Bonavista Light House Island

a year ago

ABOUT

Geological Survey of Newfoundland
Labrador

CATEGORY

Organization / Scientific Organization

WEBSITE

<http://gis.geosurv.gov.nl.ca/>

MEMBER SINCE

January 12th 2016

STATS

1.5k views

34 likes

88.9M triangles

44.5M vertices

SKILLS

Photogrammetry

Panorama's



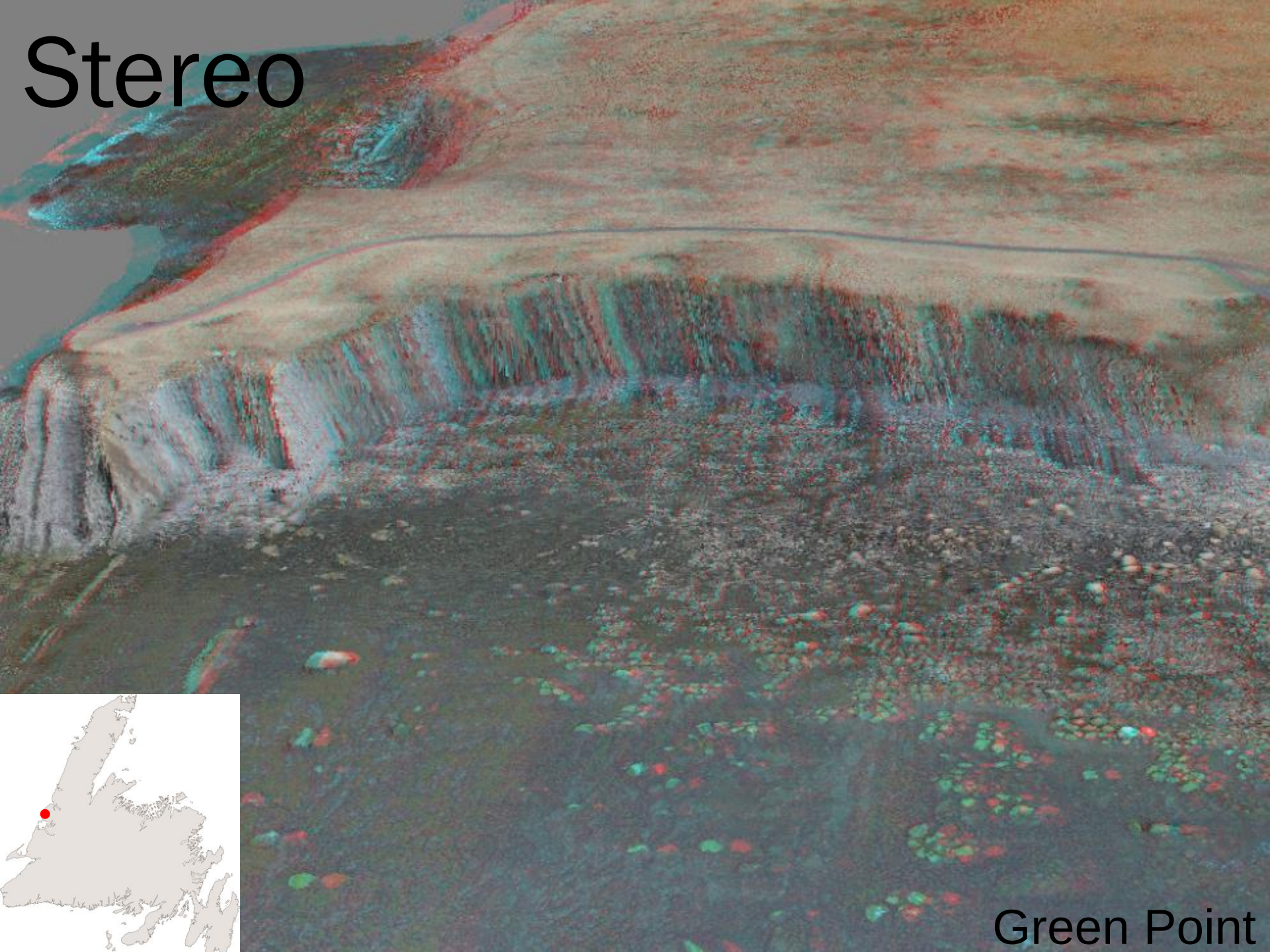
[ArcGIS Online Panorama's](#)

Videos

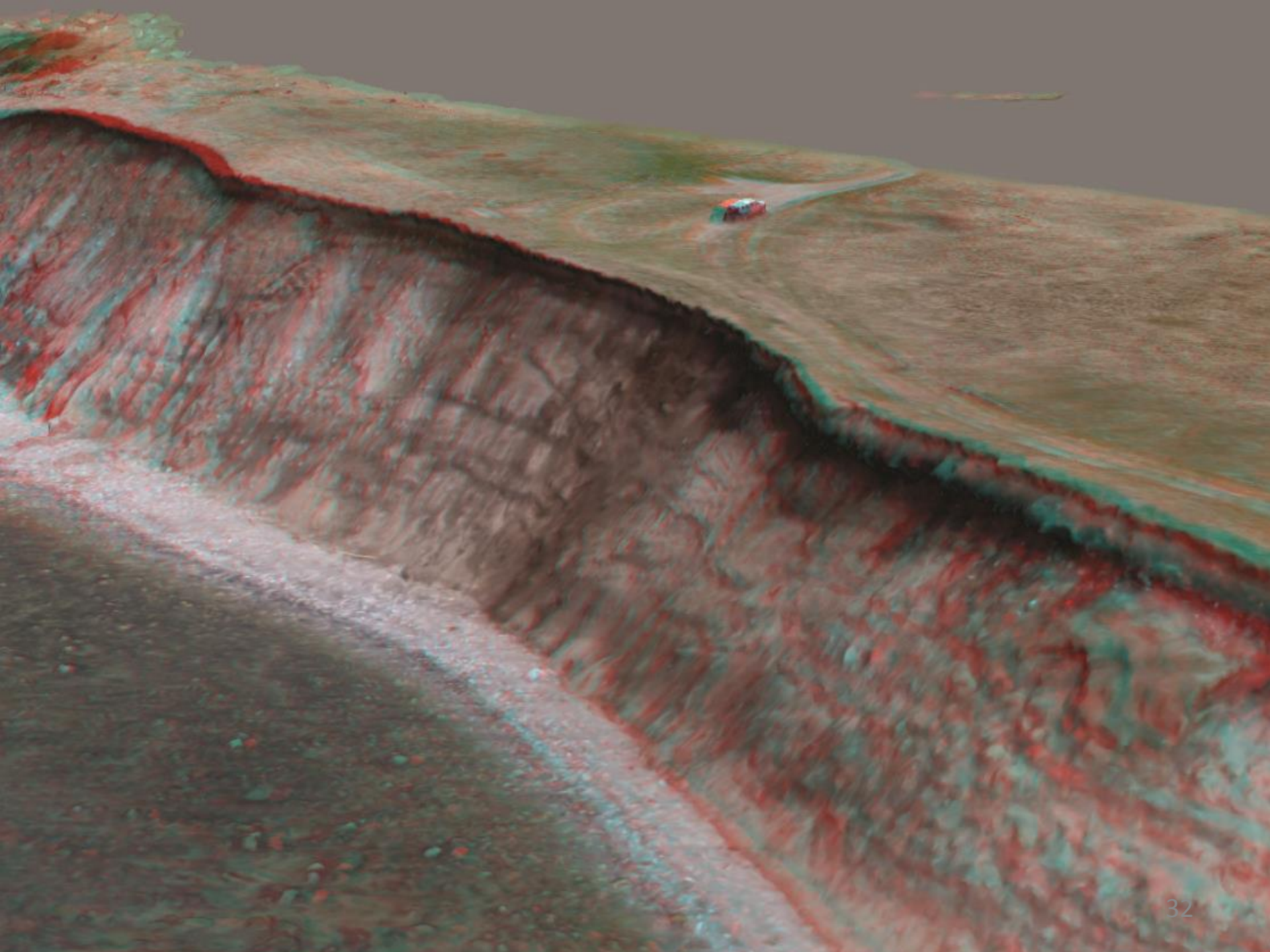


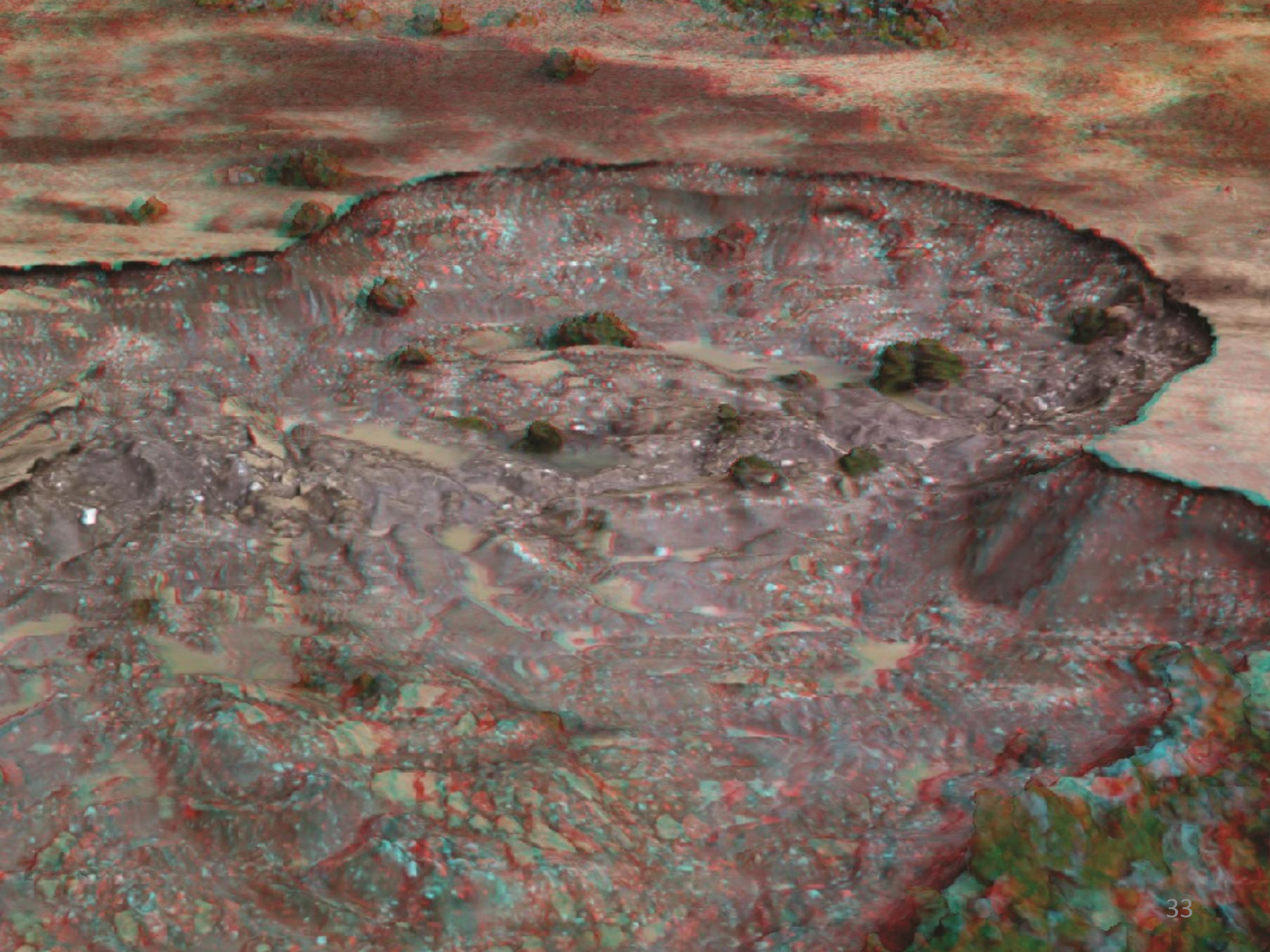
Bonavista

Stereo

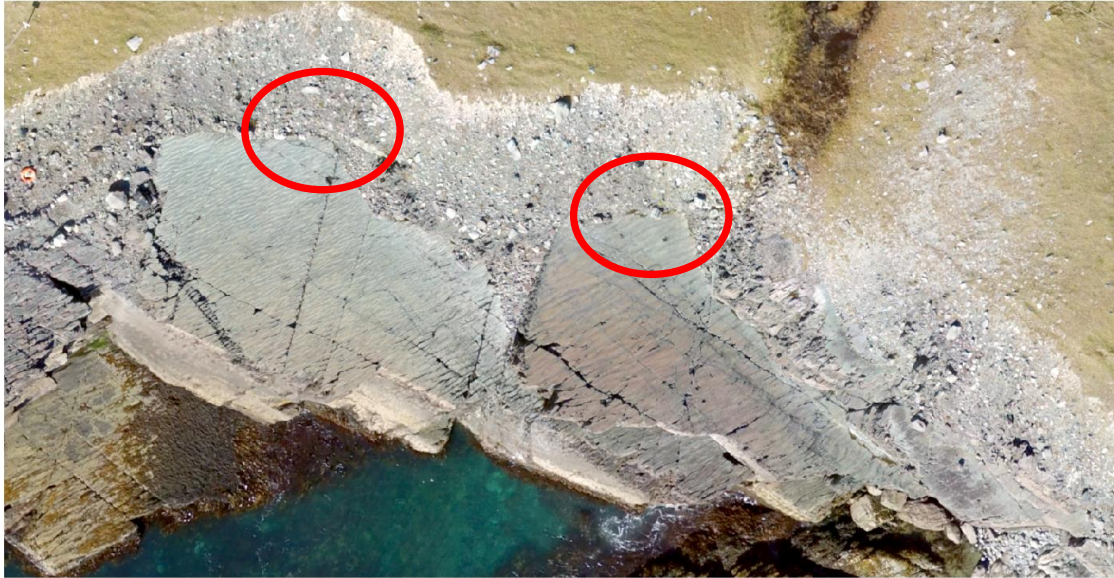


Green Point





Mistaken Point-UNESCO



2016



2015

2016



2015



Erosion rates

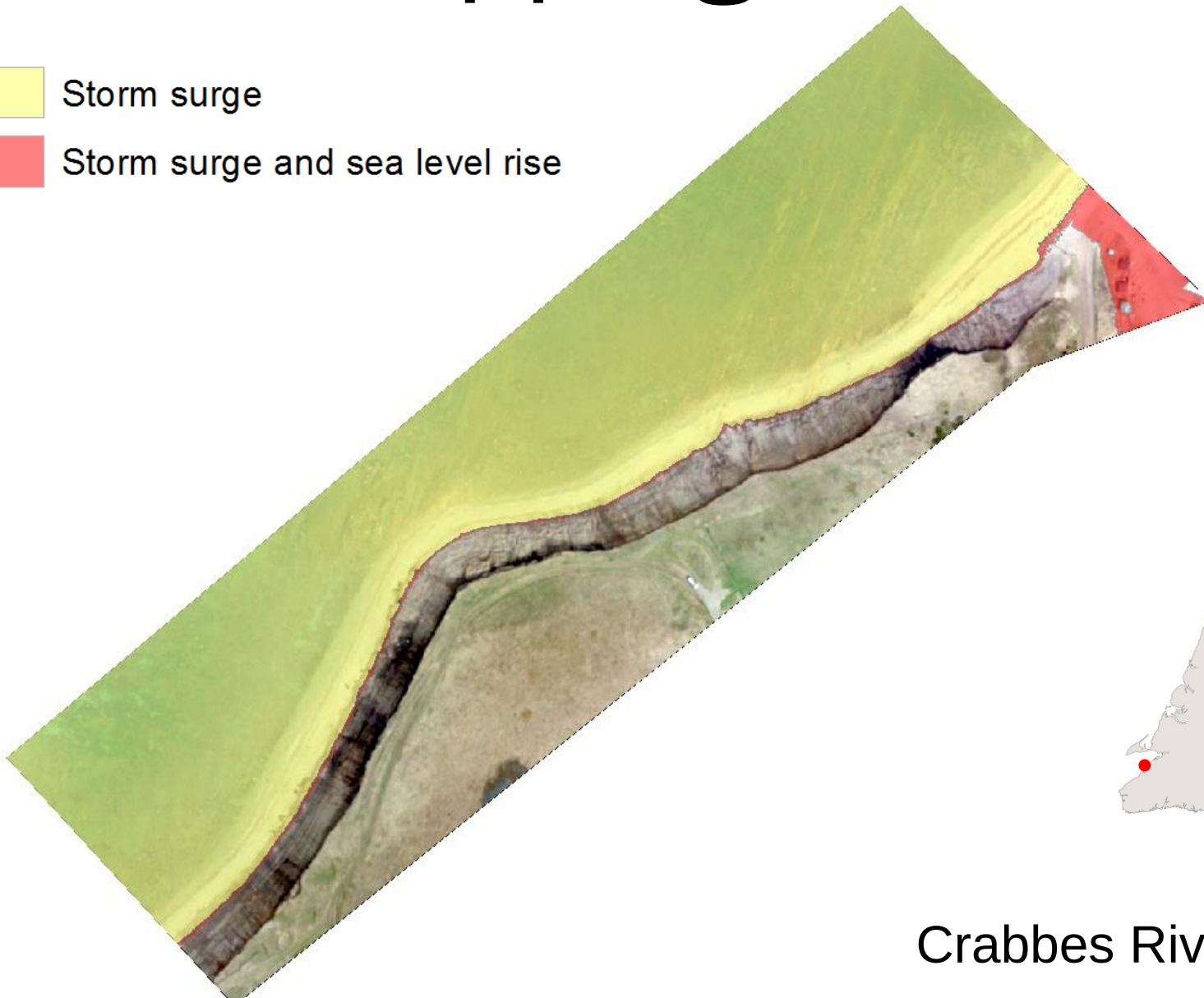


Avg: 60 cm/a,
Max. 180 cm/a



Flood mapping

- Storm surge
- Storm surge and sea level rise



Lessons learnt

- GCP critical
- Inaccuracy of base map
- Altitude check
- Image quality
- Weather (cold, RDF, wind)



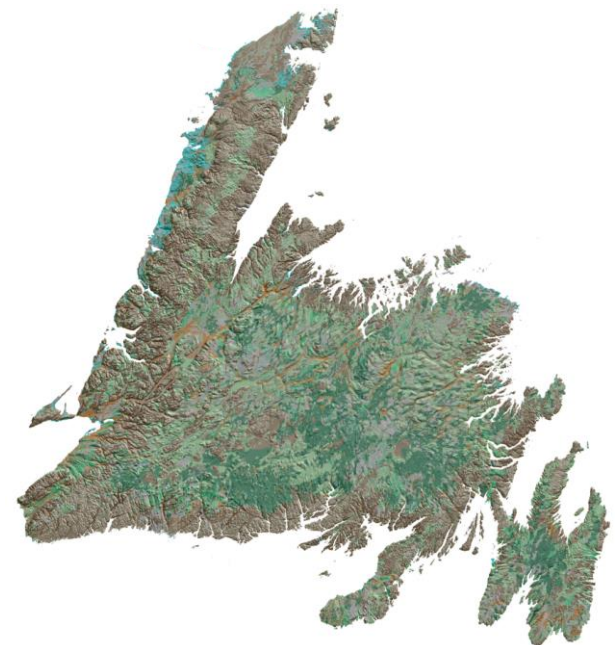
Next steps



DJI Inspire 2



DJI Mavic



Thank you!



Thank you to Larry Nolan, Gillian
Roberts and Heather Campbell