Mapping the coastal margins of South Georgia

Fine scale mapping

Stakeholder Prioritisation Workshop

DPLUS065 Coastal Mapping Project – Grant aided by the Darwin Initiative through UK Government funding

Satellite images courtesy of Digital Globe Foundation

#SouthAtlanticCoastalMapping

Agenda

- Introductions
- Coastal Habitat Mapping in South Georgia – an update on the project, and how it may be useful
- From broad to fine scale – the issue of scale & resolution
- *Group Exercise*
- Next Steps
- Close

Satellite images courtesy of Digital Globe Foundation

This is the only agenda there is!

There are no pre-conceptions…

We want to develop the best coastal habitat maps that deliver your “needs”

Satellite images courtesy of Digital Globe Foundation

Why do we need coastal habitat maps?

- Before we can plan and manage – need knowledge
- These “satellite-derived” broad and fine scale habitat maps will be a first for South Georgia
- Not a one-off: developing a legacy for the future – creating models, methods and systems for subsequent iterations

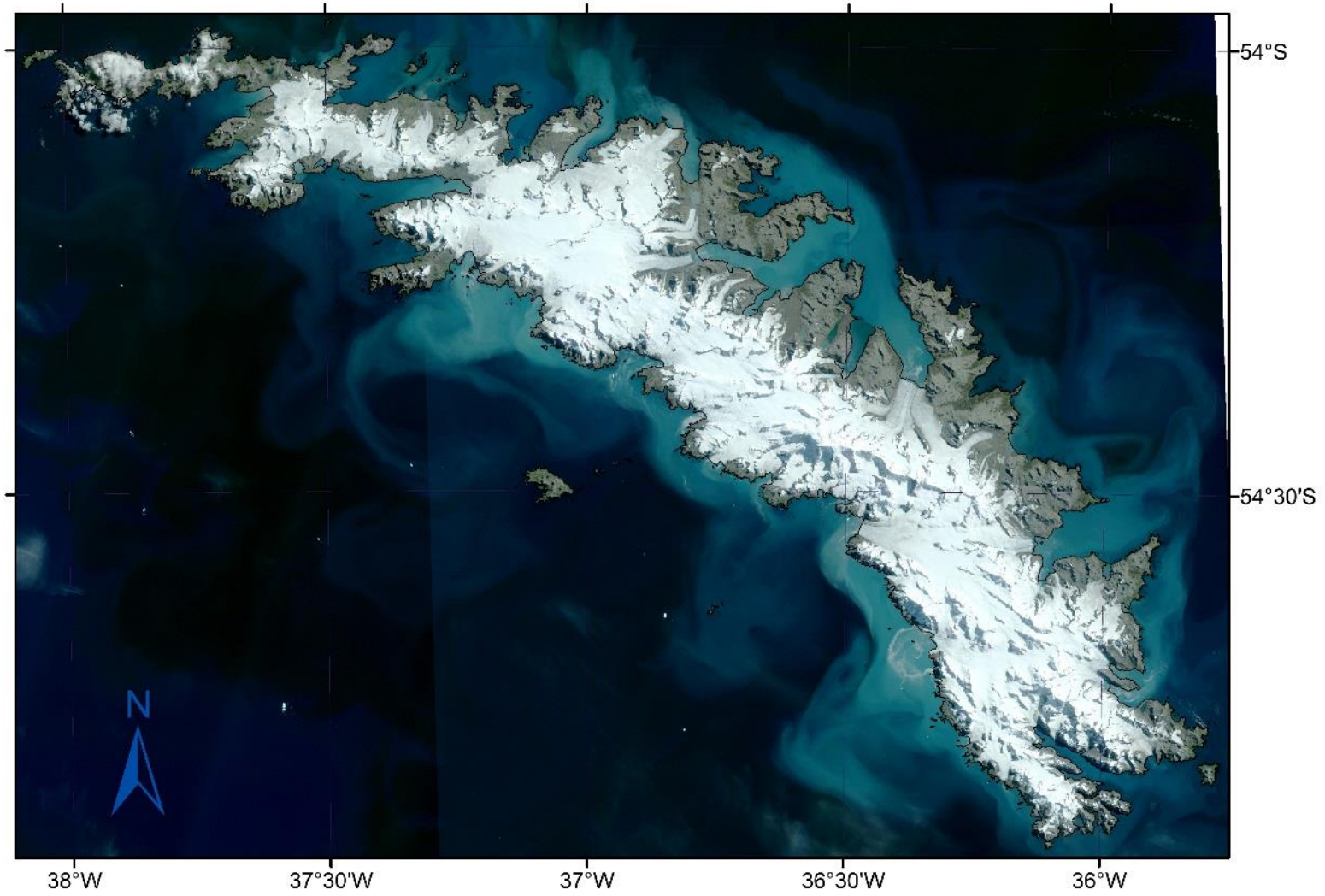
Satellite images courtesy of Digital Globe Foundation

Project update: Work Package 2

- Broad scale (Stage 1) coastal habitat maps
  - Develop cloud-based modelling system for future use.
  - Train software (machine learning) using ground validation data to classify “free to access” satellite data (10m resolution)
  - Latest iteration delivered at end July 2018

Satellite images courtesy of Digital Globe Foundation

South Georgia Sentinel 2 Imagery: February 22nd, 2018



Map Created by B. Black on July 31st, 2018

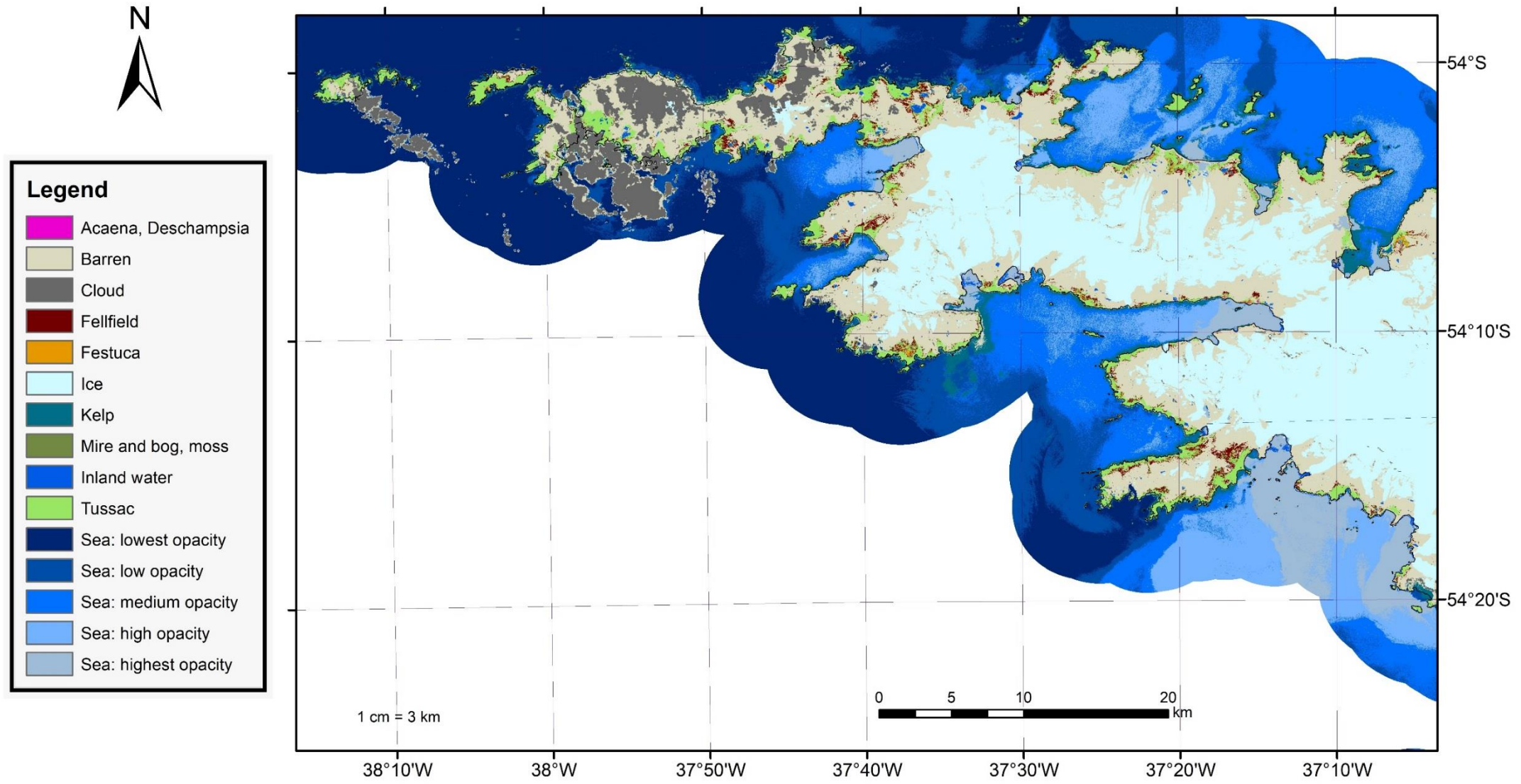
Input Sentinel 2 imagery processed by JNCC

1 cm = 7 km

Groundtruth: Poncet et al., 2007, SGHT Rodent Monitoring 2017, SMSG, B.Black (from imagery)

Satellite images courtesy of Digital Globe Foundation

South Georgia Landcover Classification: North



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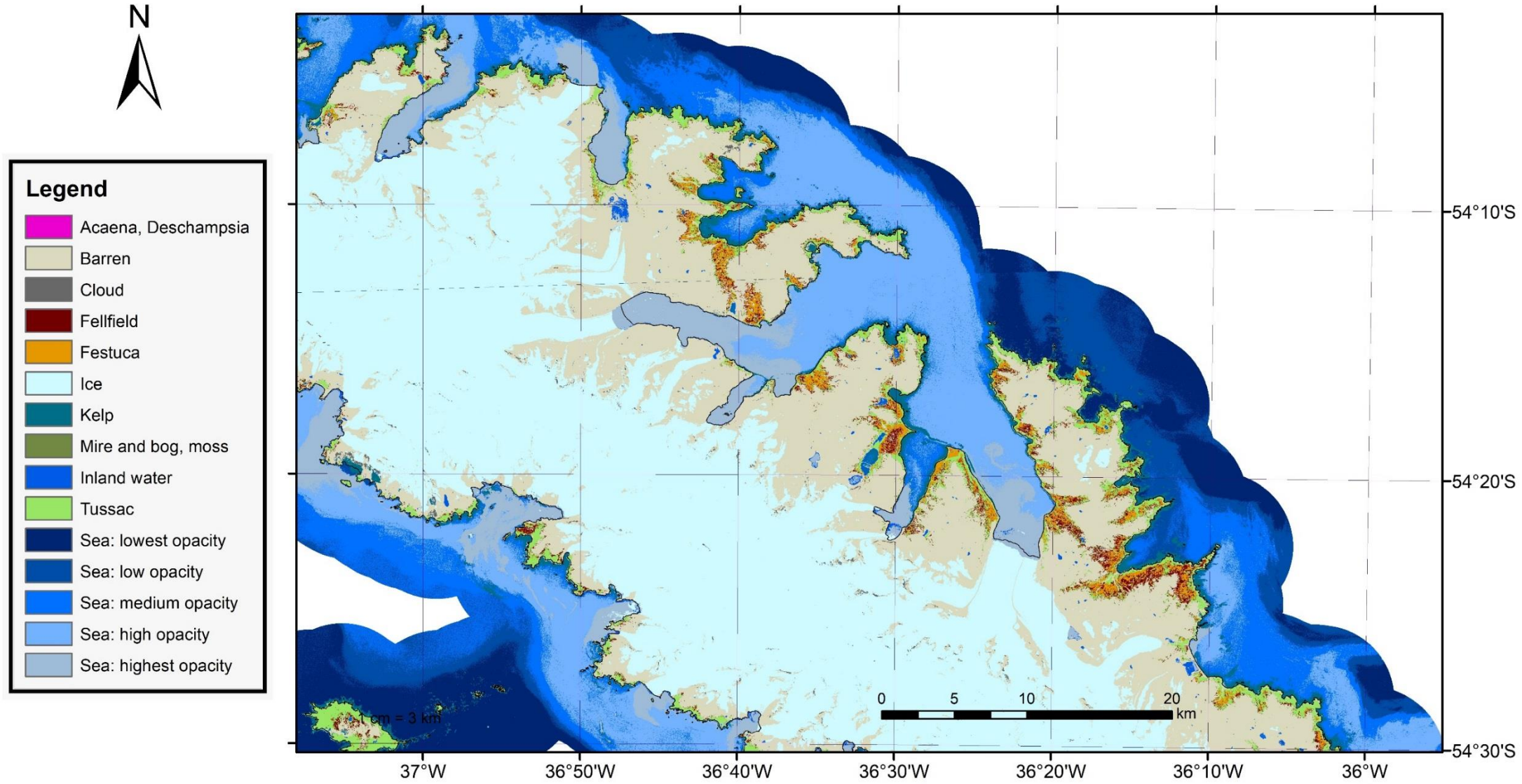
South Georgia Landcover Classification: Central



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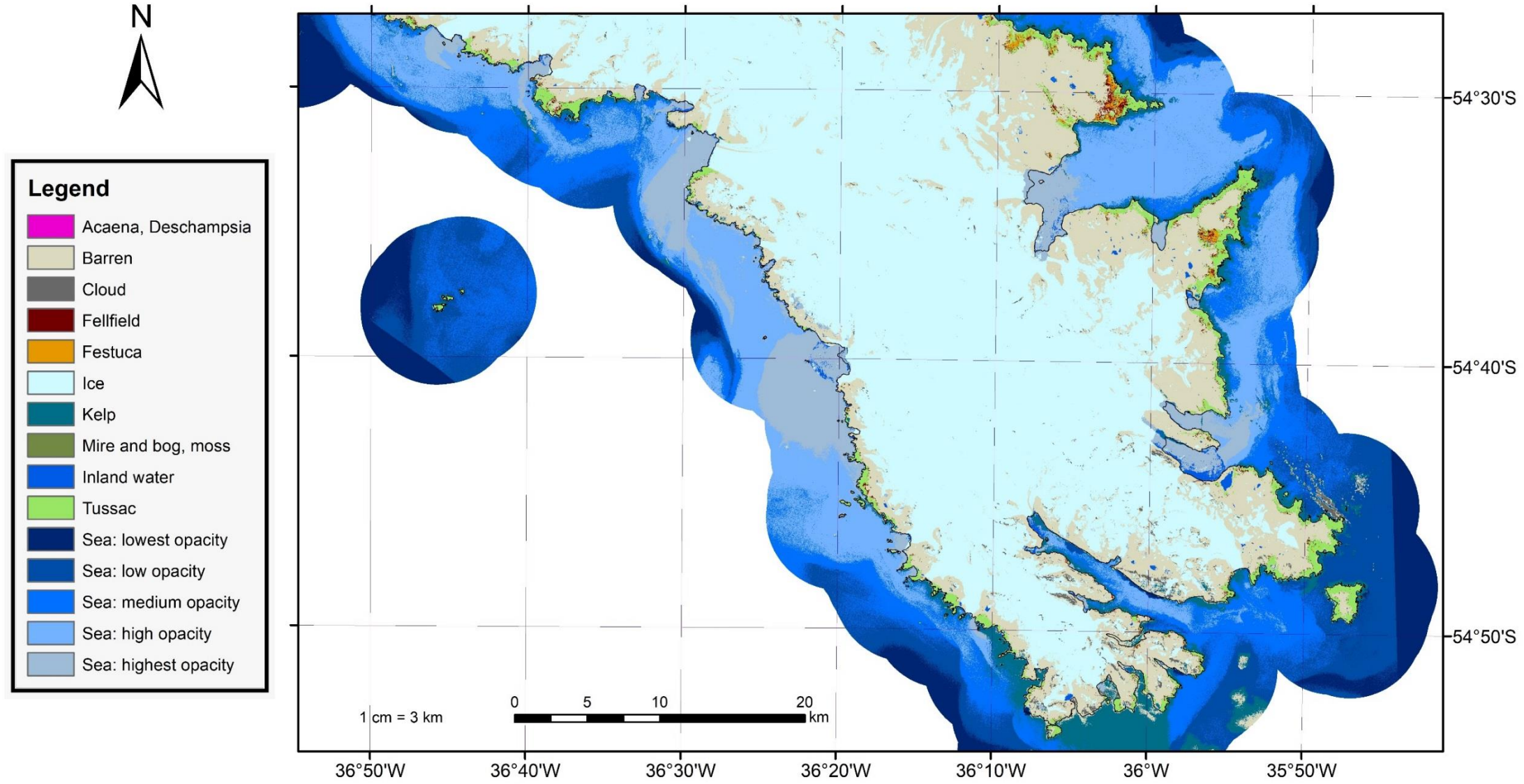
South Georgia Landcover Classification: South



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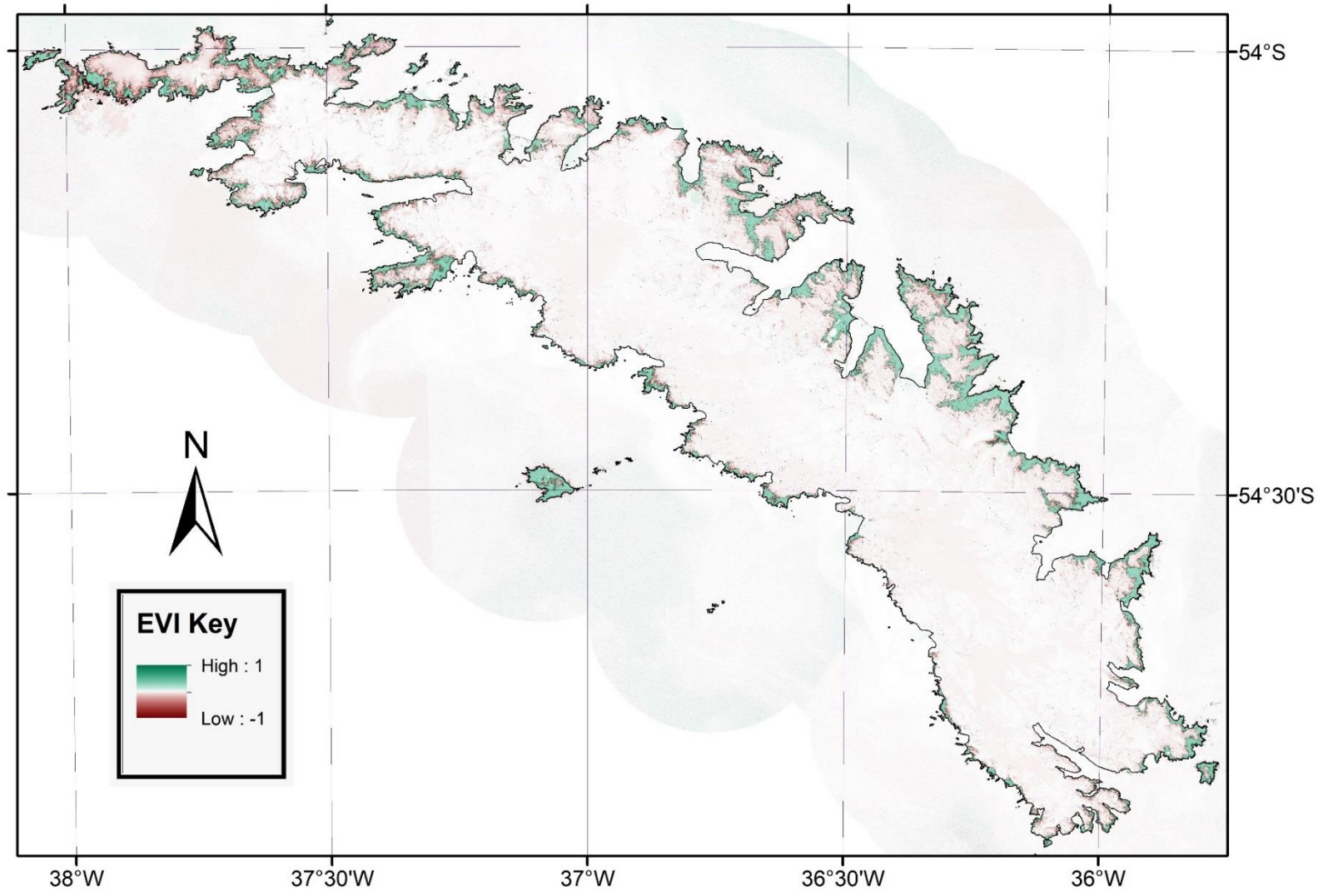
South Georgia Sentinel 2 Imagery EVI: February 22nd, 2018



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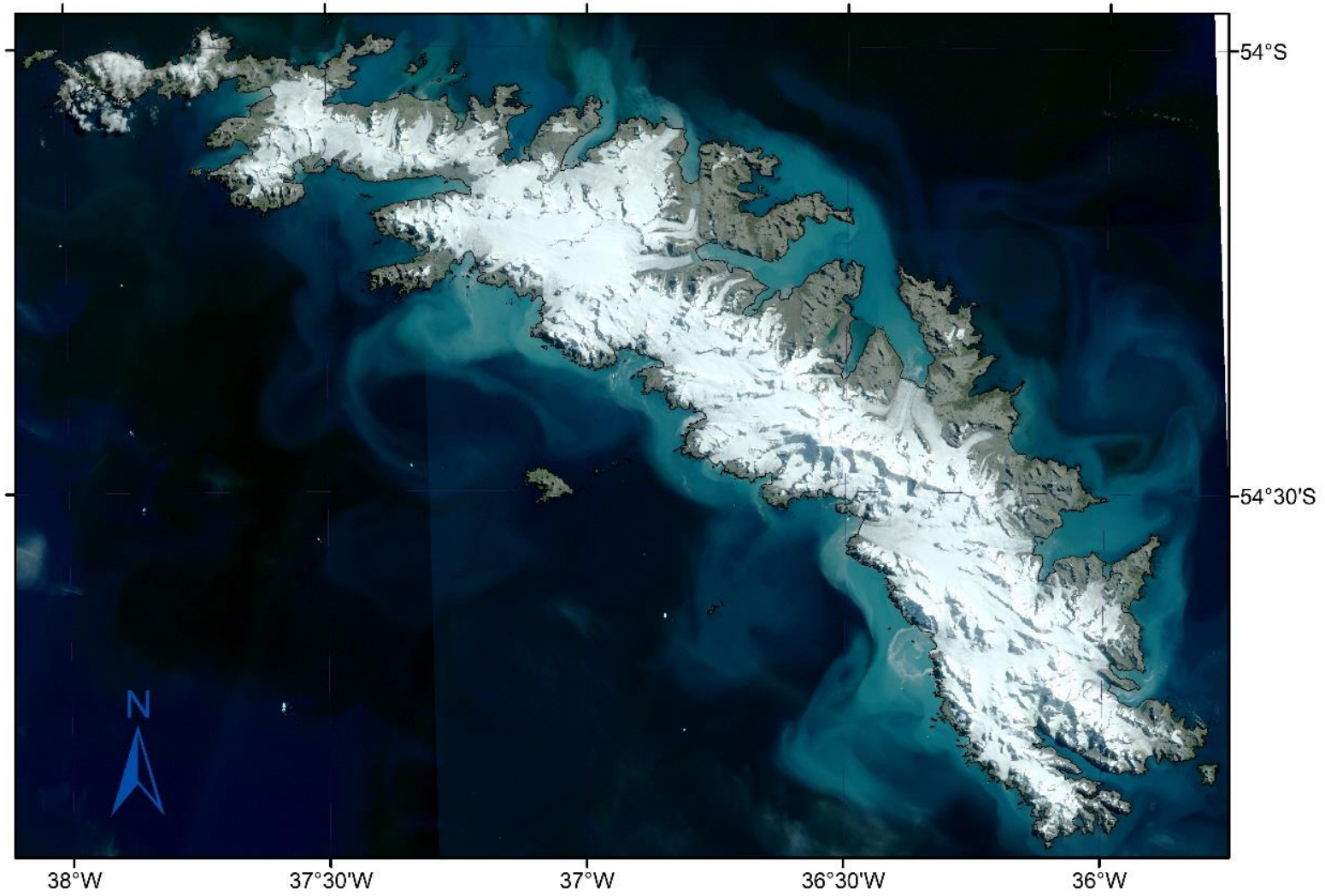

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Classified/Predicted habitat classes	Ground Validation (Observed/Reference) points															Total number of classified/predicted points	User Accuracy (reliability)	Errors of Commission
	Acaena, Deschampsia	Barren	Cloud	Fellfield	Festuca	Ice	Kelp	Mire and Bog, Moss	Inland Water	Tussac	Op1	Op2	Op3	Op4	Op5			
Acaena, Deschampsia	5	1	0	0	2	0	0	0	0	20	0	0	0	0	0	28	18%	82%
Barren	0	153	3	0	0	4	1	0	0	7	1	0	0	0	0	169	91%	9%
Cloud	0	3	39	0	0	1	0	0	0	0	1	0	0	0	0	44	89%	11%
Fellfield	2	4	0	53	7	0	0	0	0	35	0	0	0	0	0	101	52%	48%
Festuca	1	1	0	4	51	0	0	0	0	18	0	0	0	0	0	75	68%	32%
Ice	0	1	0	0	0	79	0	0	0	0	0	0	0	0	0	80	99%	1%
Kelp	0	0	0	0	0	0	152	0	0	1	0	1	2	0	0	156	97%	3%
Mire and Bog, Moss	1	1	0	4	5	0	0	10	0	16	0	0	0	0	0	37	27%	73%
Inland Water	0	3	0	0	0	0	0	0	20	0	0	0	0	0	0	23	87%	13%
Tussac	0	4	0	5	4	1	0	0	0	1380	0	0	0	0	0	1394	99%	1%
Op1	0	1	0	0	0	1	0	0	0	0	42	3	0	0	0	47	89%	11%
Op2	0	2	0	0	0	0	0	0	0	0	3	29	6	0	0	40	73%	28%
Op3	0	0	0	0	0	0	1	0	0	0	0	4	24	5	0	34	71%	29%
Op4	0	0	0	0	0	0	0	0	0	0	0	0	6	24	0	30	80%	20%
Op5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51	51	100%	0%
Total number of ground validation points	9	174	42	66	69	84	156	10	20	1477	47	37	38	29	51			
Producer's Accuracy	56%	88%	93%	80%	74%	94%	97%	100%	100%	93%	89%	78%	63%	83%	100%			
Errors of Omission	44%	12%	7%	20%	26%	6%	3%	0%	0%	7%	11%	22%	37%	17%	0%			

Overall accuracy: 91%

Satellite images courtesy of Digital Globe Foundation

Project update: Work Package 3

- Fine scale (Stage 2) coastal habitat mapping
  - To identify/address significant areas of uncertainty in the maps **OR**
  - To address issues/areas highlighted by stakeholders (YOU) as a priority

- Access to very high resolution satellite imagery (up to 50cm resolution) - Digital Globe Foundation grant.

- Acquisition of ultra high resolution (2cm) imagery using Phantom 4 Pro drones.

Satellite images courtesy of Digital Globe Foundation

Impact of Resolution

- Why not just use Google Earth?
- The type of features you can map relies directly upon the resolution of your input imagery.
- To know what you can map, you need to know what features your data is capable of capturing.

Satellite images courtesy of Digital Globe Foundation

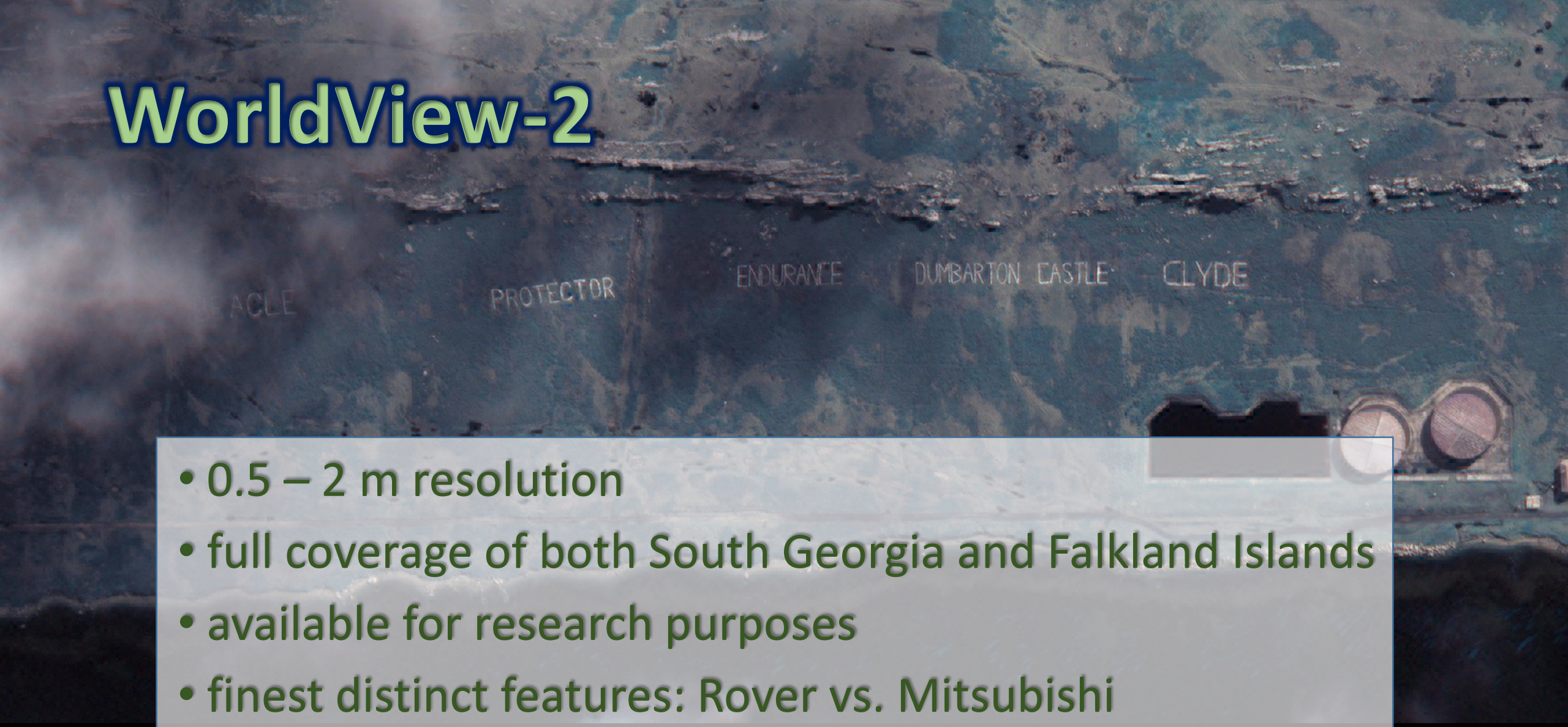
Sentinel 1 and 2

- free to the public
  - additional processing
- finest distinct features: large buildings, roads, ponds

- mostly 10 m resolution
- regularly updated

Satellite images courtesy of Digital Globe Foundation

WorldView-2



- 0.5 – 2 m resolution
- full coverage of both South Georgia and Falkland Islands
- available for research purposes
- finest distinct features: Rover vs. Mitsubishi

Satellite images courtesy of Digital Globe Foundation

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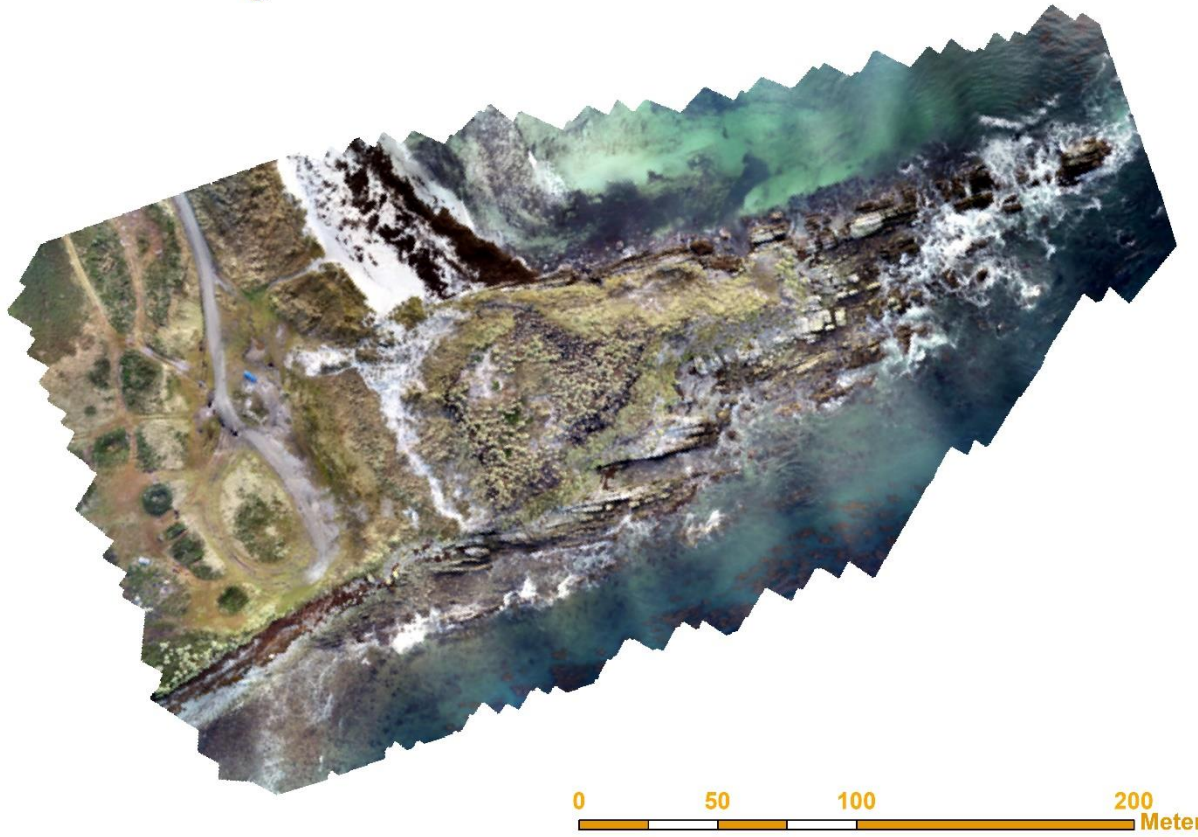
gital Globe Foundation

Drone

- ~ 2 cm resolution (50 m altitude)
- future: multispectral capability
- surveys conducted by SAERI
- finest distinct features: blades of tussac, tire tracks, fences, teaberry patches

Drone Survey Hooker's Point



Satellite images courtesy of Digital Globe Foundation

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Resolution and scale of our imagery:

"Coarsest" to "finest" resolution:

- **regional** Sentinel 1 and 2 satellite imagery (about 10 m)
- **regional** WorldView-2 satellite imagery (0.5 - 2 m)
- **local** drone surveys (~ 2 cm)

Satellite images courtesy of Digital Globe Foundation

Next steps ..

- Stakeholder workshop report
  - Draft circulated to attendees
  - Published on project website
- Planned fieldwork in summer 18/19
  - Undertaking aerial surveys with drone
  - Gathering ground validation information
  - Vessels of opportunity to be discussed
- Project deliverables:
  - Fine scale regional/local habitat maps – end June 2019

Satellite images courtesy of Digital Globe Foundation

Thank you for listening

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