Seamless Online Distribution of Amundsen Multibeam Data

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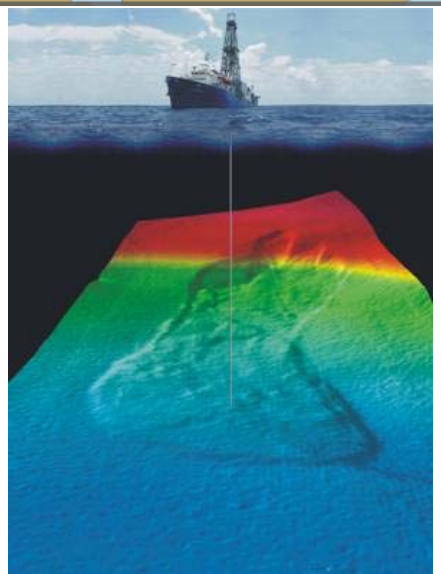
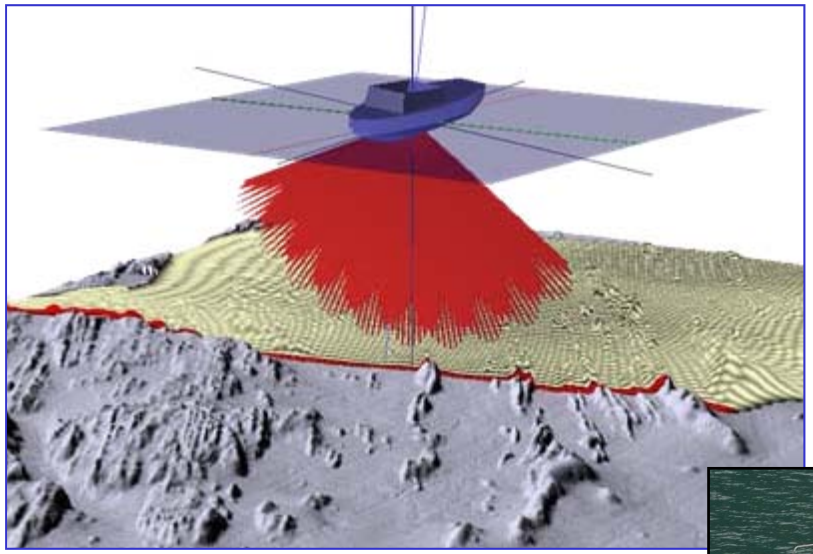
The Ocean Mapping Group's role in ArcticNet

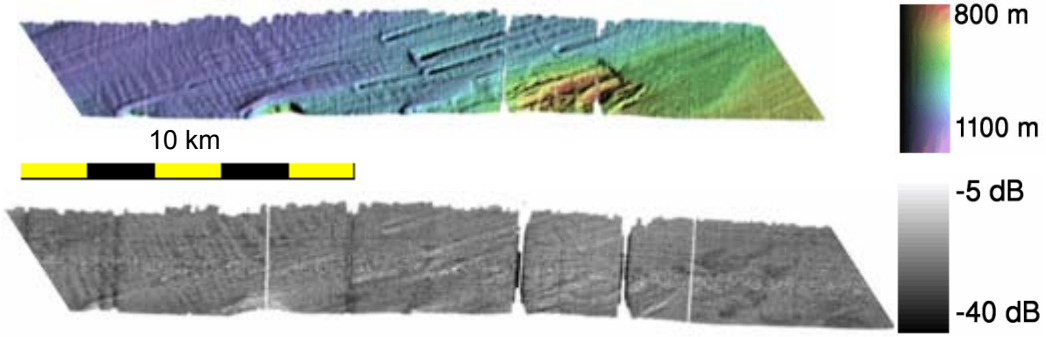
- Shipping
- Safety of Navigation
- Ice Escort
- Geohazards
- Resource Exploration



(above) Photo by Edouard

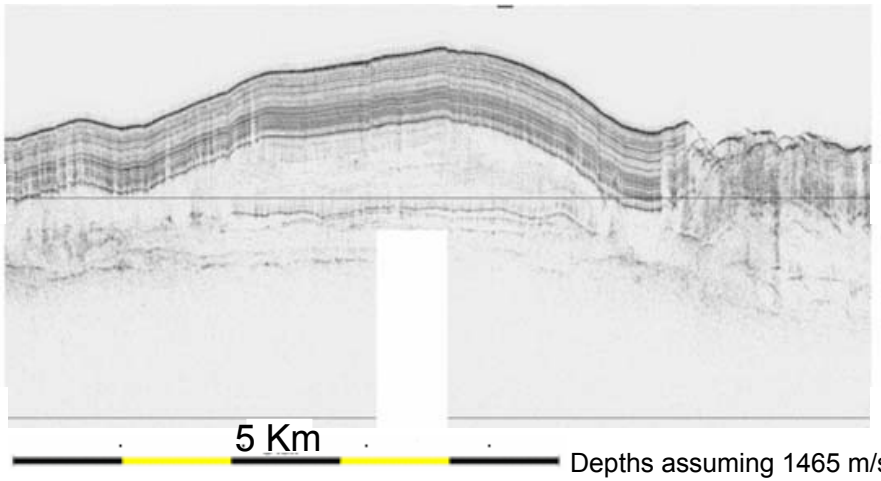
Kongsberg EM302 Multibeam Echosounder



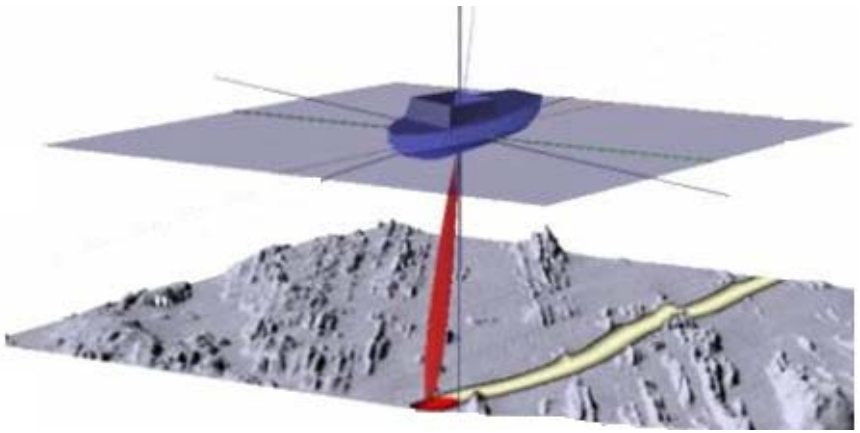


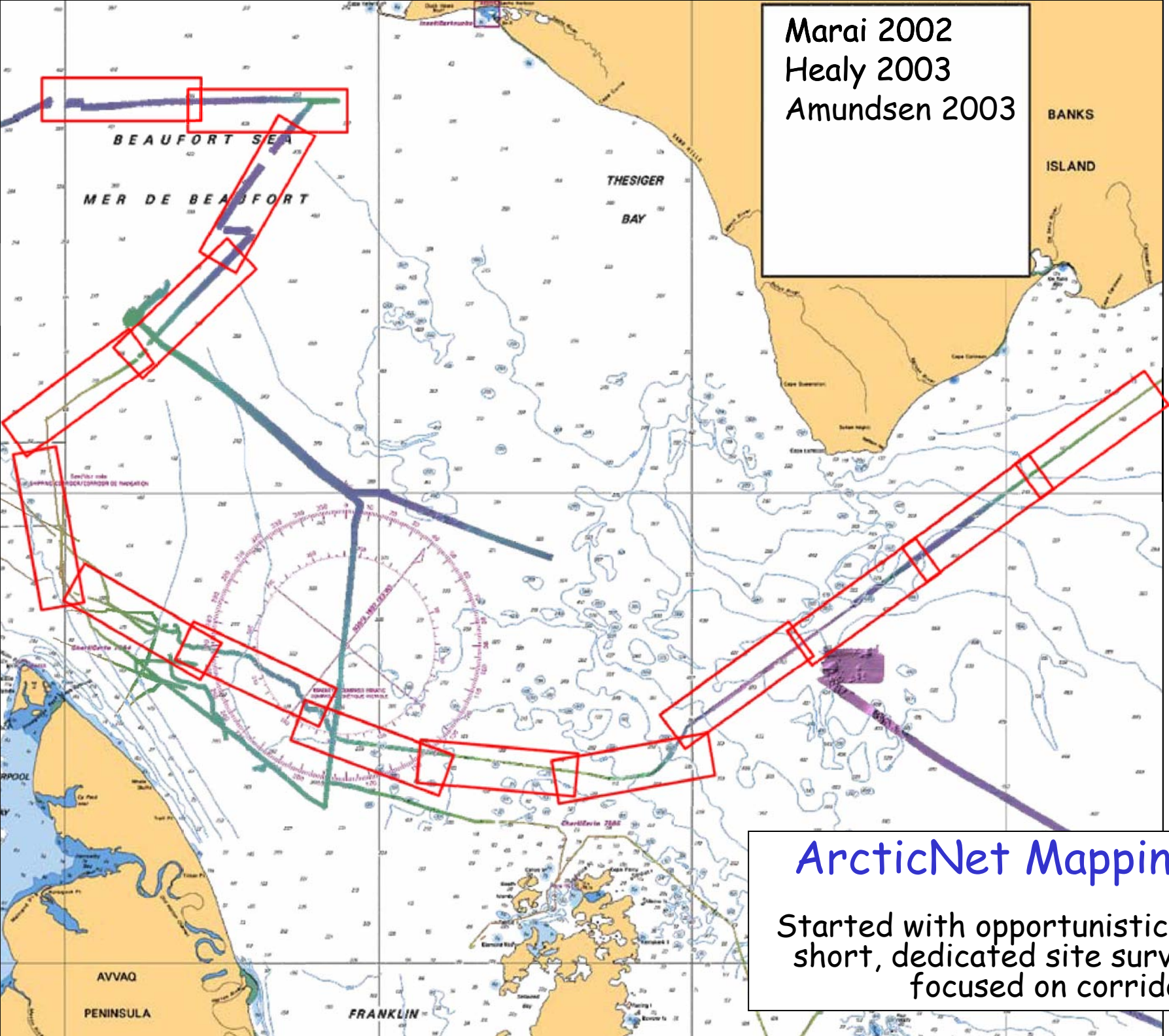
(above) Photo by Edouard

Knudsen 320R Sub-bottom Profiler



Depths assuming 1465 m/s and 7 m draft

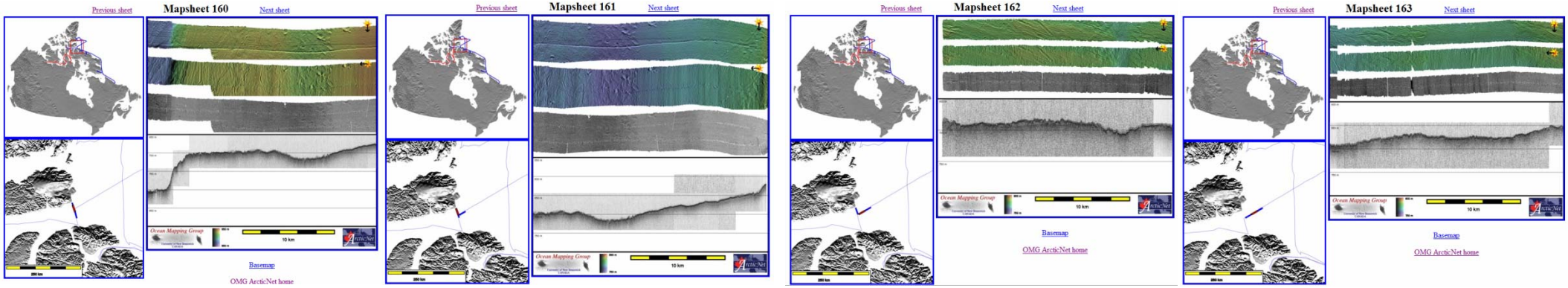




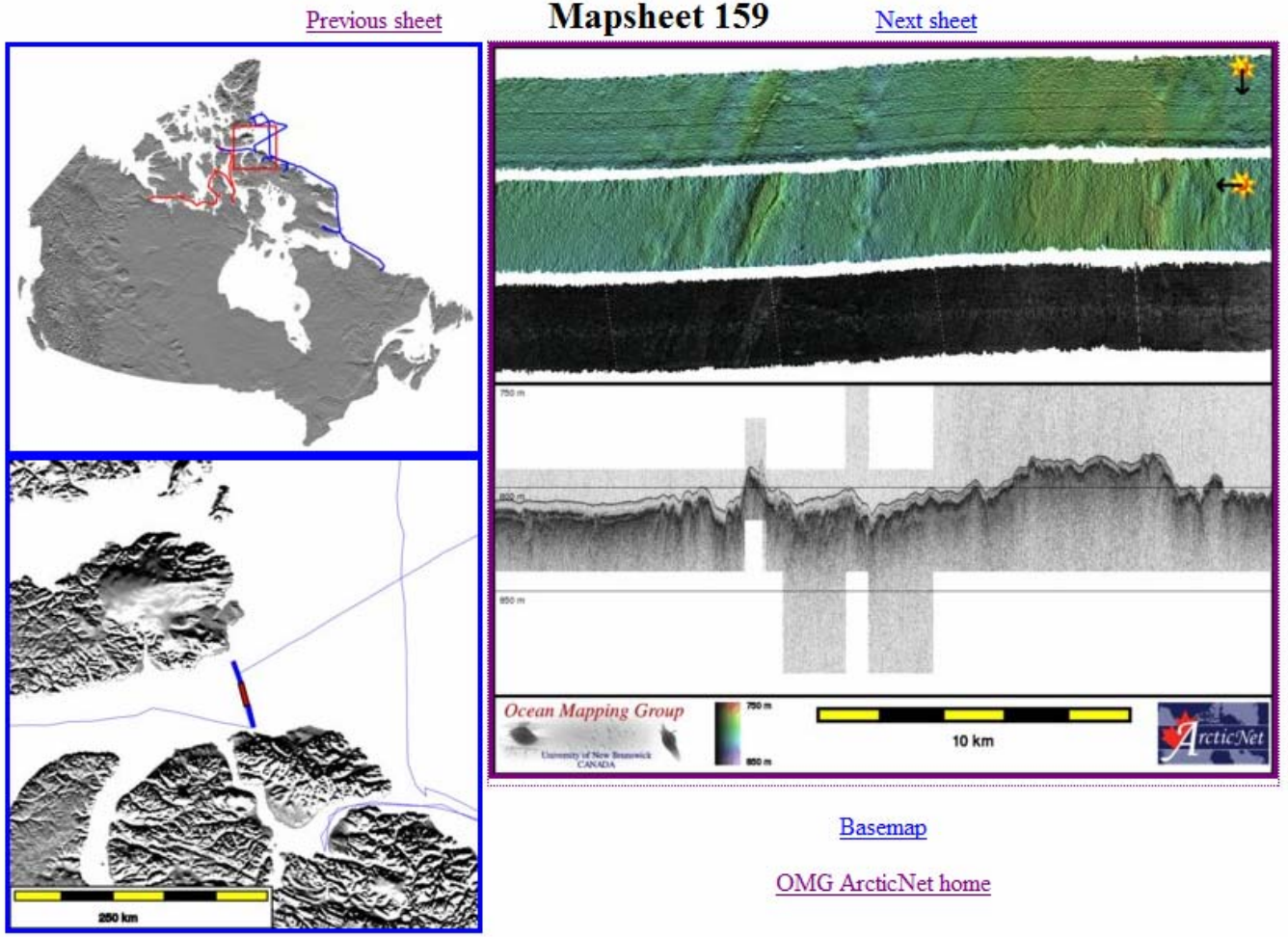
ArcticNet Mapping Model

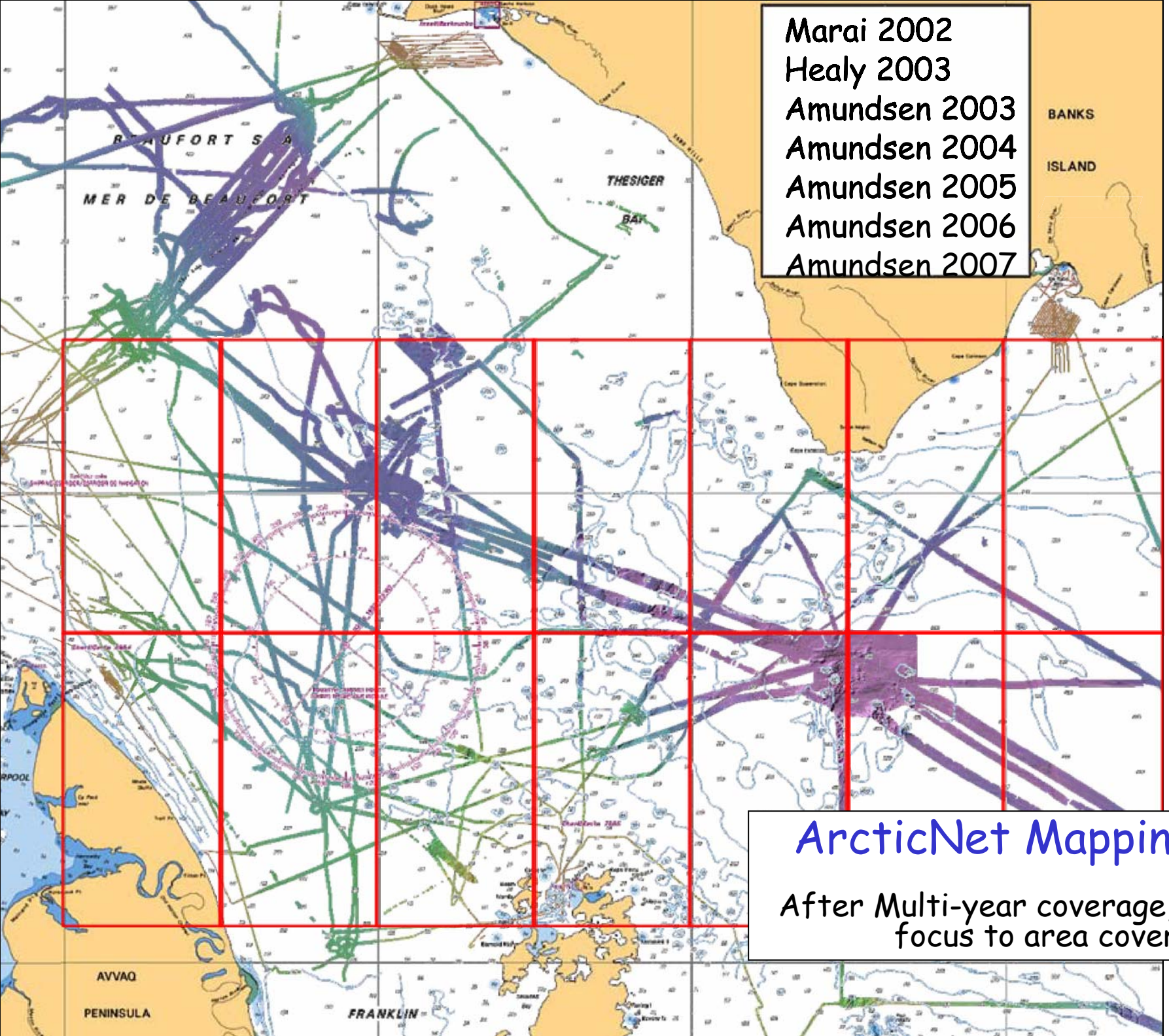
Started with opportunistic transits and short, dedicated site surveys. Model focused on corridors.

Current Online Distribution Method



Strip Maps





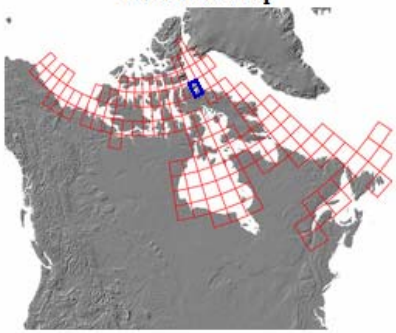
ArcticNet Mapping Model

After Multi-year coverage, shift model focus to area coverage.

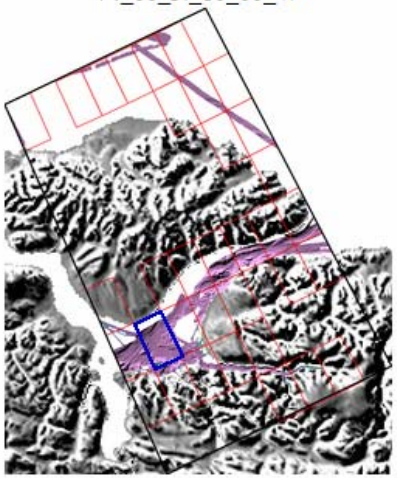
Current Online Distribution Method

ArcticNet Basemap Series: 72_45_N_79_30_W

Overview Map

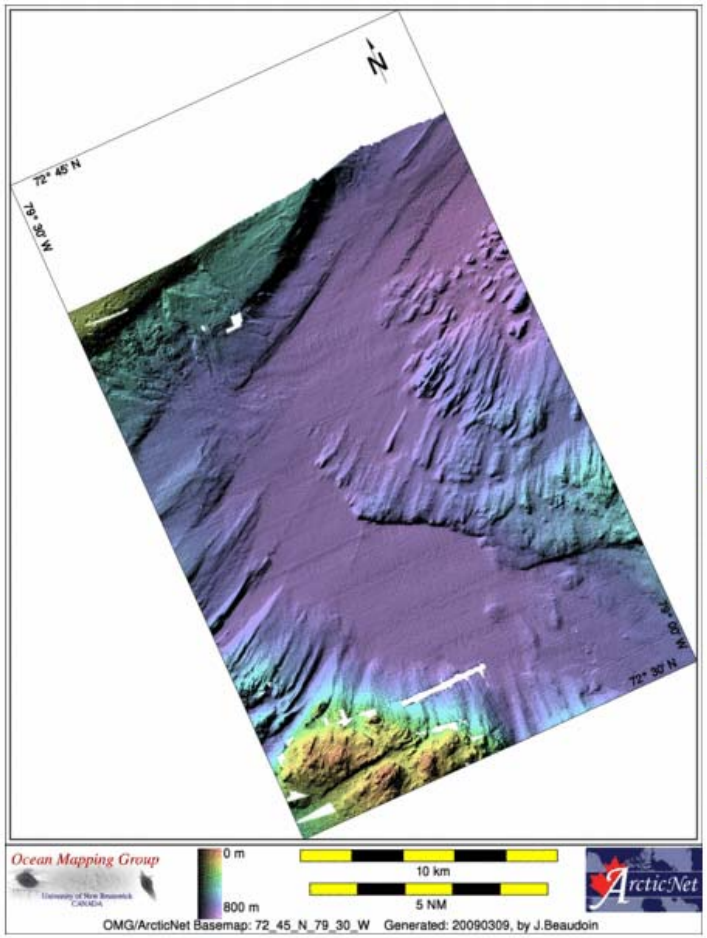


Index Map
74_00_N_80_00_W



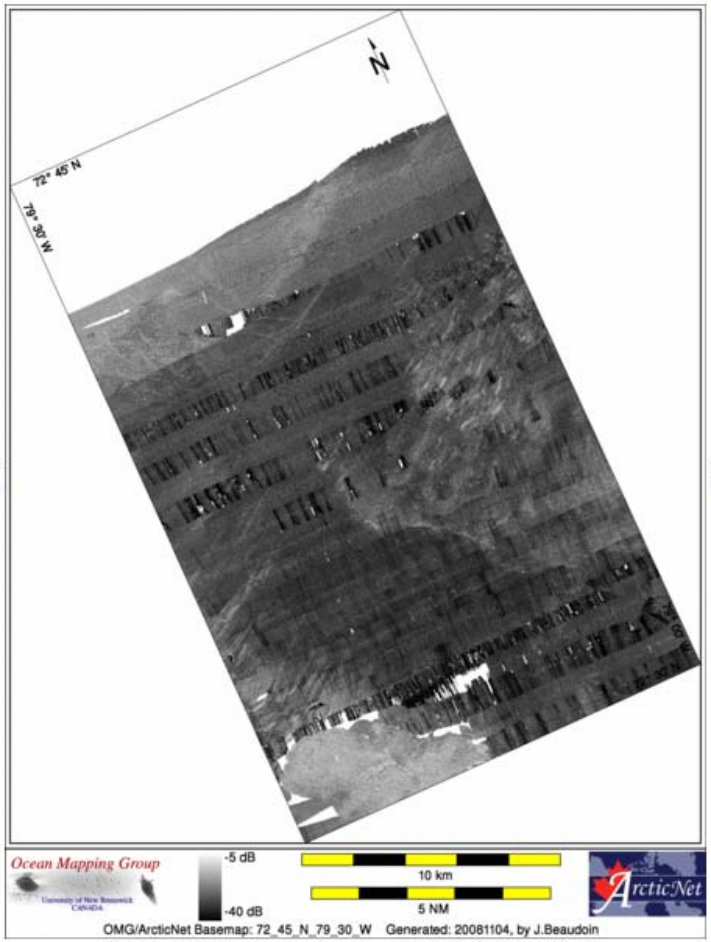
Downloads
ESRI grid files for:
This basemap

NW N NE
W E
SW S SE



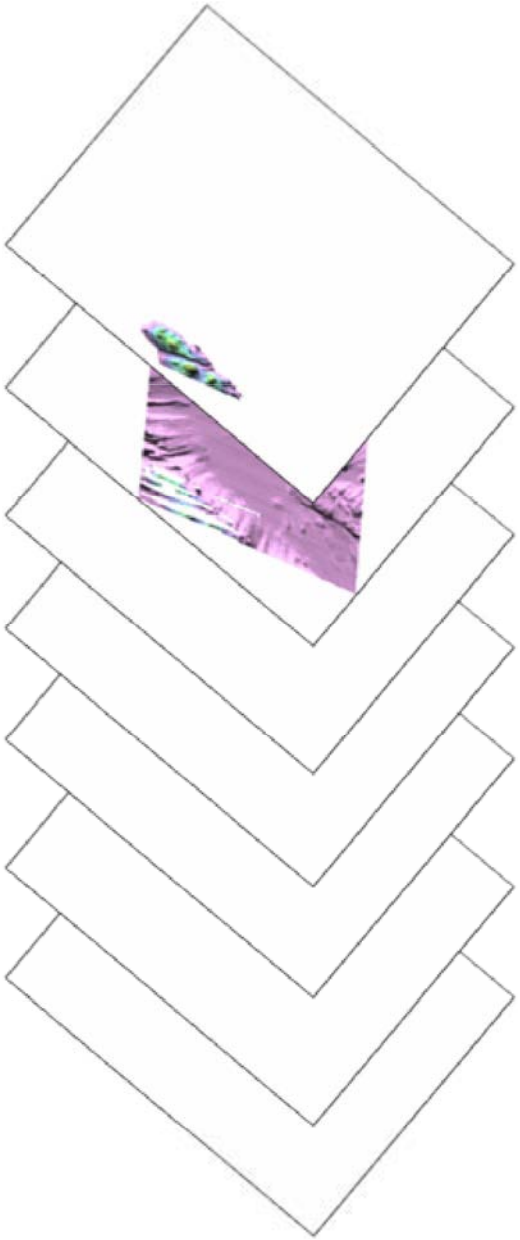
BATHYMETRY BACKSCATTER

NW N NE
W E
SW S SE



About these basemaps...

Source data for each mapsheet



2008 - Heron

2008 - Amundsen

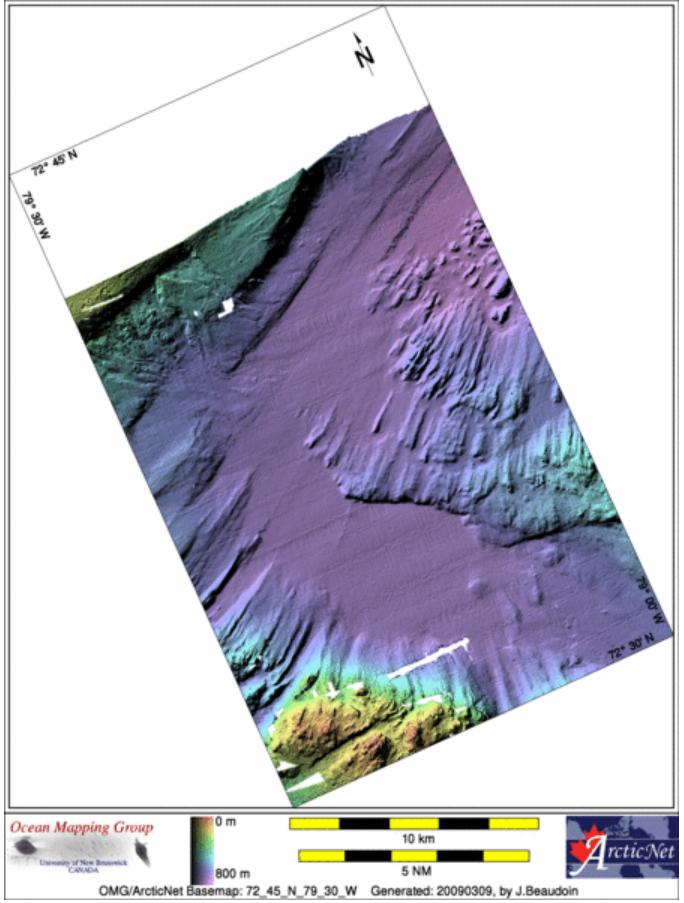
2007 - Amundsen

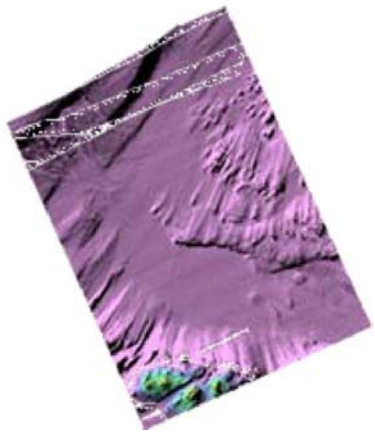
2006 - Amundsen

2005 - Amundsen

2004 - Amundsen

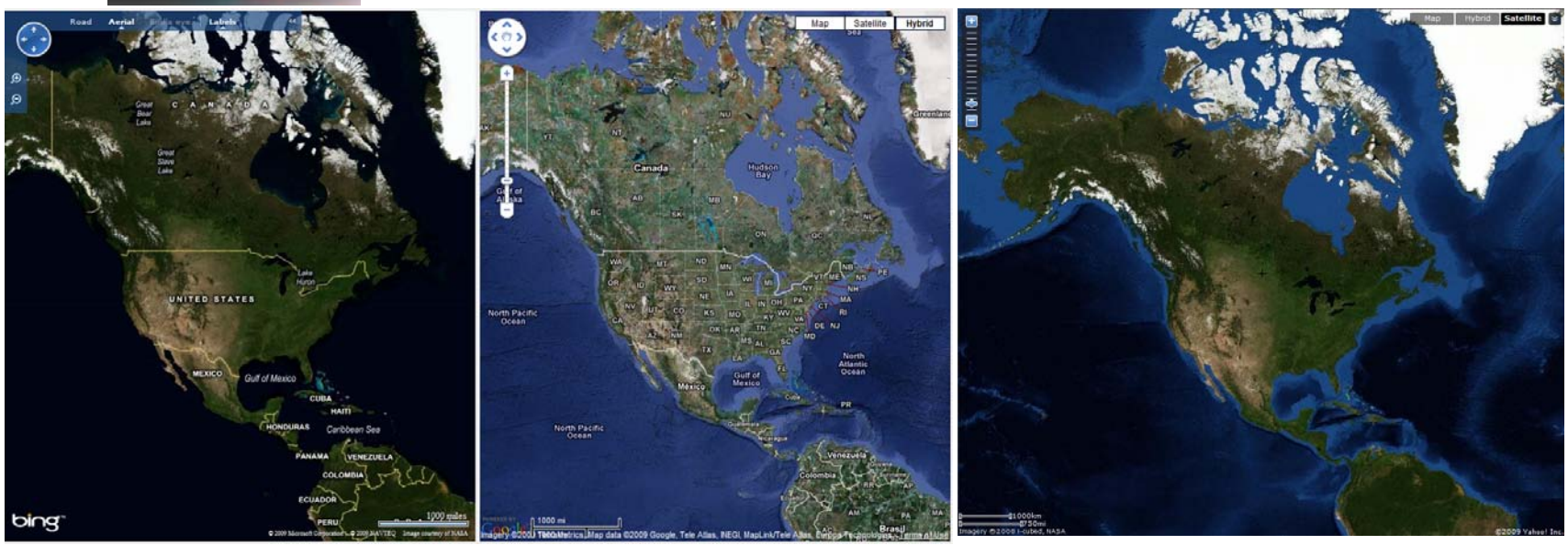
2003 - Amundsen





New Online Distribution Method

- In the past few years there has been big developments in web-based Geographic Information Systems.



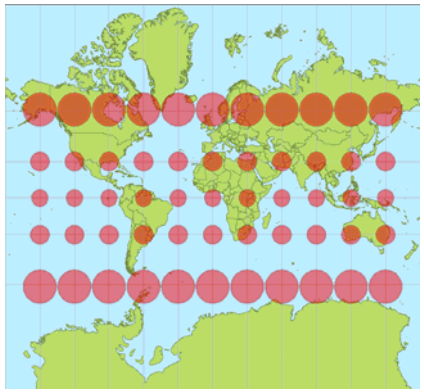
Why Google Maps?

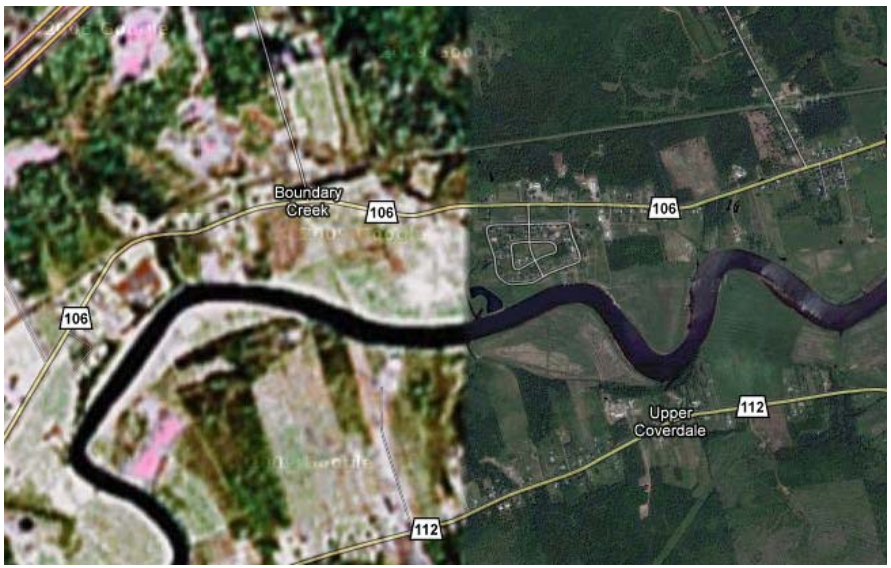
- Free software.
- Google Maps has a great API and online help.
- Many developers use Google Maps.
- Well known user interface.
- Possibility to display maps in almost real-time.
- Can be displayed on any supported web browser.

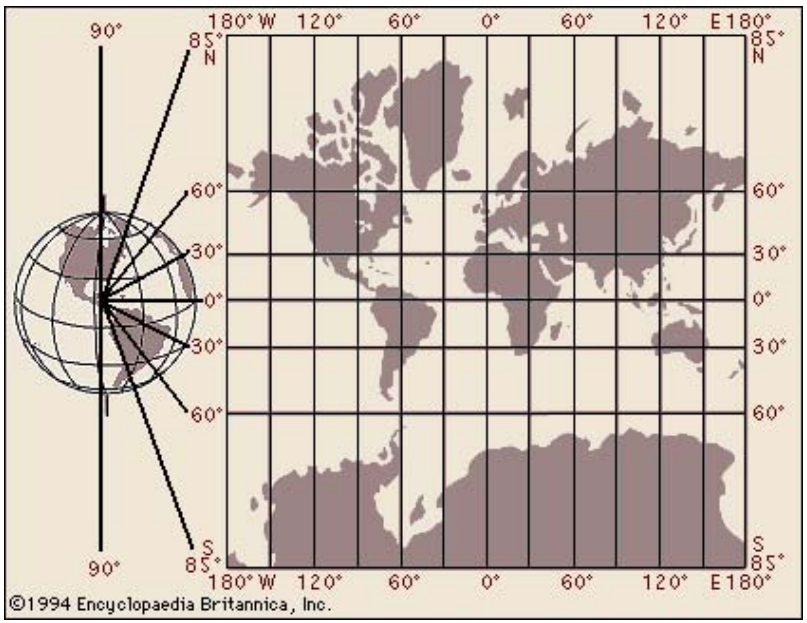
Google maps Canada

Disadvantages

- High resolution satellite imagery and aerial photography covers mostly urban areas.
- World ocean imagery only at low zoom levels.
- Mercator projection does not show the poles.
- Complex to develop multi-resolution images and maps.
- Less tools than proprietary GIS systems.

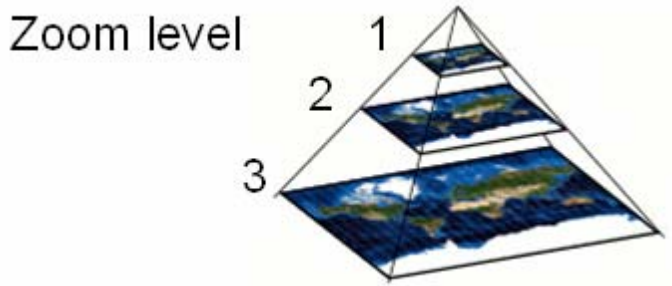






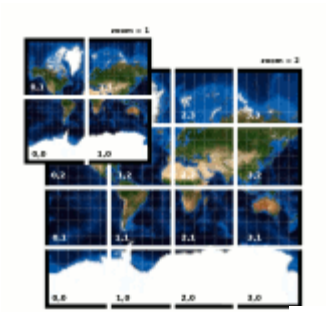
How to handle large datasets?

- Create a pyramid structure that changes the resolution of the overlays according to the zoom level and latitude.



zoom level	Map Resolution (metres / pixel) 0	30	60	80	Latitude
1	78271.5	67785.1	39135.8	13591.7	
2	39135.8	33892.6	19567.9	6795.9	
3	19567.9	16946.3	9783.9	3397.9	
4	9783.9	8473.1	4892.0	1699.0	
5	4892.0	4236.6	2446.0	849.5	
6	2446.0	2118.3	1223.0	424.7	
7	1223.0	1059.1	611.5	212.4	
8	611.5	529.6	305.7	106.2	
9	305.7	264.8	152.9	53.1	
10	152.9	132.4	76.4	26.5	
11	76.4	66.2	38.2	13.3	
12	38.2	33.1	19.1	6.6	
13	19.1	16.5	9.6	3.3	
14	9.6	8.3	4.8	1.7	
15	4.8	4.1	2.4	0.8	
16	2.4	2.1	1.2	0.4	
17	1.2	1.0	0.6	0.2	
18	0.6	0.5	0.3	0.1	

- Tile the data in the map to speed up the application.



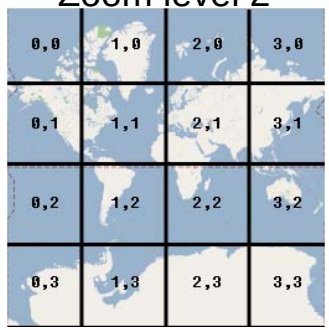
# of Tiles = 4^n
(where n = zoom level)

Zoom level 13 = 67,108,864 images

Zoom level 0

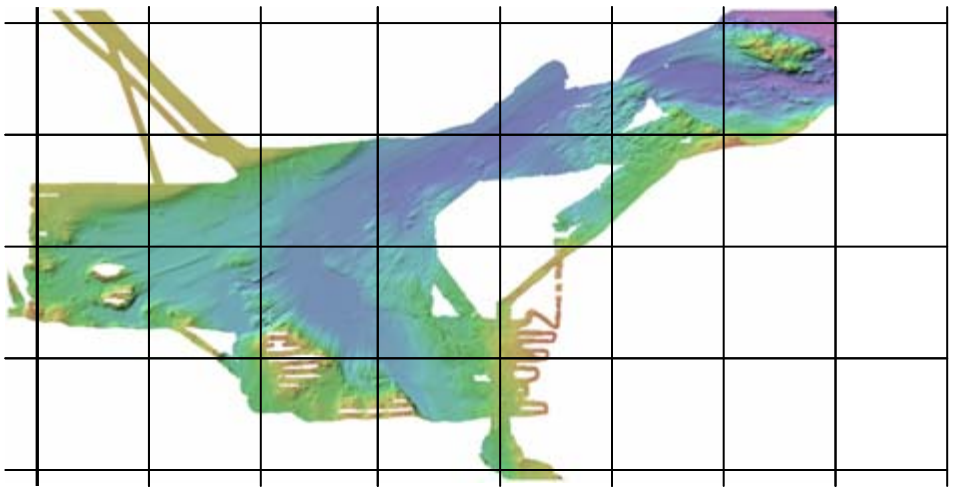
Zoom level 1

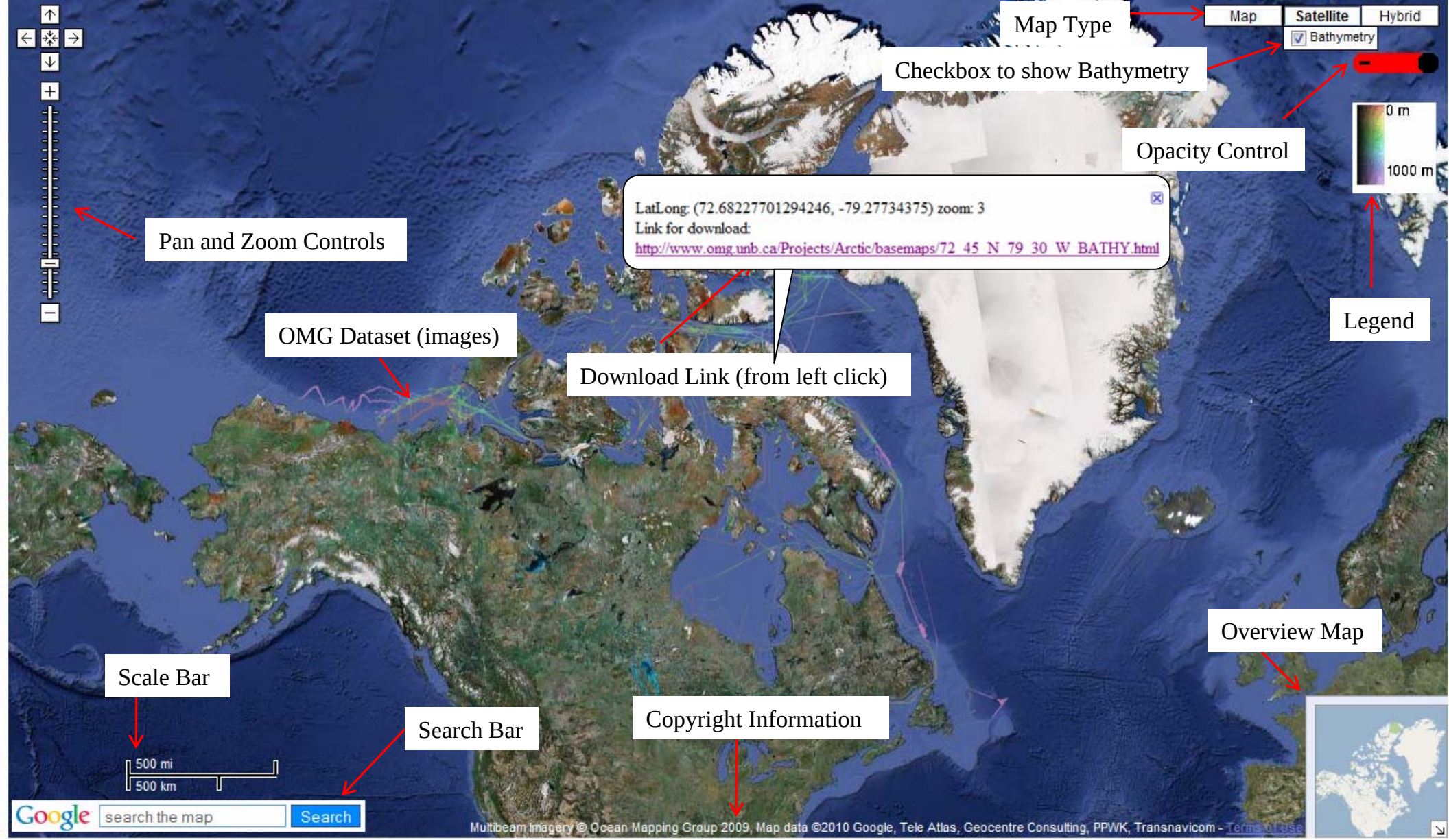
Zoom level 2



Tile Overlay

- A custom Ocean Mapping Group software program was developed to created the tiles
- Grid highest resolution and collapse 4 sheets into a new tile at lower zoom level.





Map center: (70.728979,-86.308594) - zoom: 3
SW: 37.300275, 166.289063
NE: 83.359511, 21.093750

Map Properties

Mouse LatLng: 71.497037, 20.566406
Mouse Px: 1141, 432
Tile: 4, 1
Resolution (m/px): 6355.97

Mouse Position

Show/Hide Subbottom Markers

2008

Toggle Strip Maps

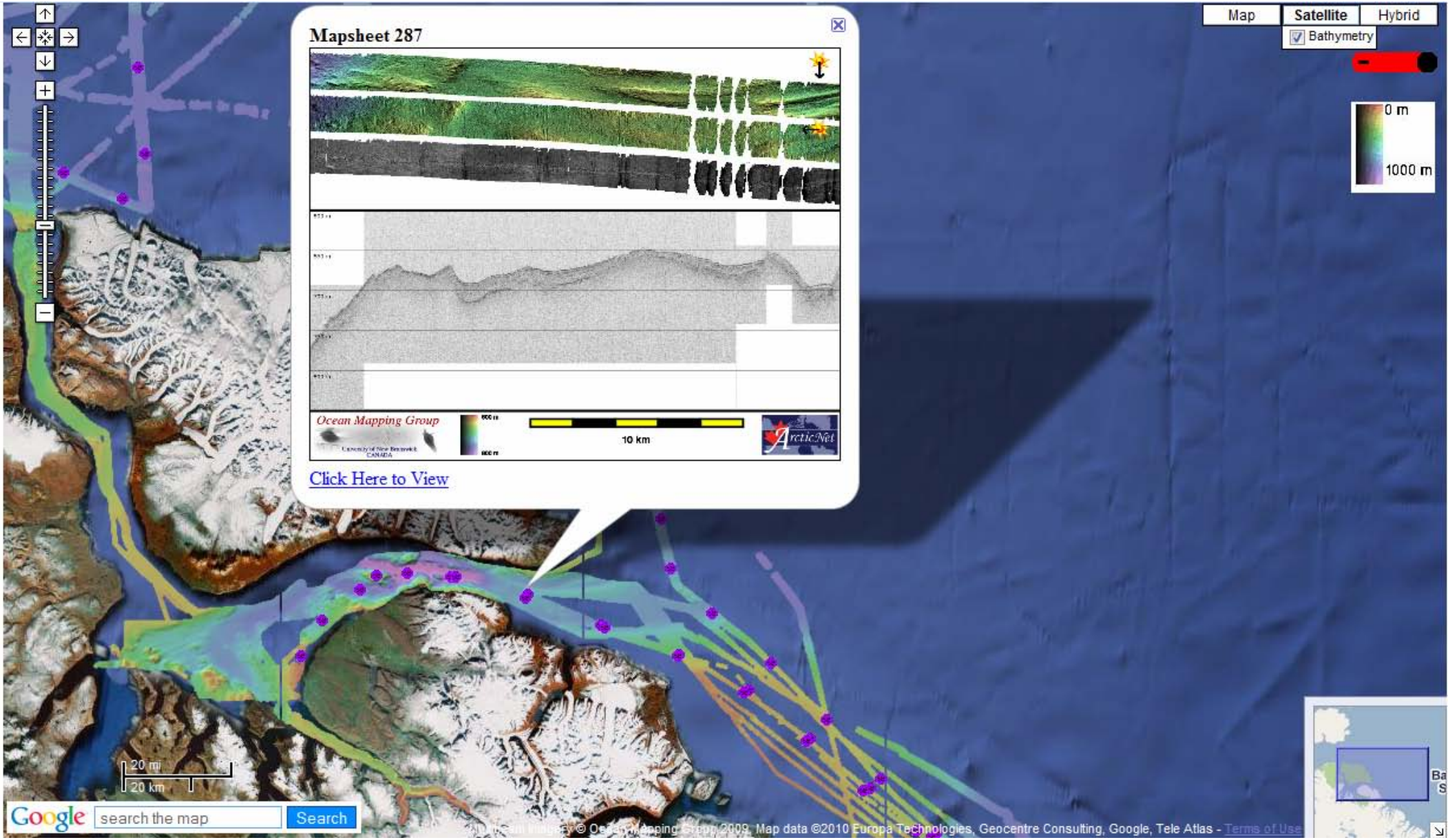
Strip Maps

- Point overlays
- Created from an XML file

```
<markers>
  <marker name="Mapsheet 0" address="http://www.omg.unb.ca/Projects/Arctic/stripmaps/nwp2008/img/strip_0.gif" lat="67.925121" lng="-114.973642" year="2008" icon="purple"/>
  <marker name="Mapsheet 1" address="http://www.omg.unb.ca/Projects/Arctic/stripmaps/nwp2008/img/strip_1.gif" lat="68.020356" lng="-114.569748" year="2008" icon="purple"/>
  <marker name="Mapsheet 10" address="http://www.omg.unb.ca/Projects/Arctic/stripmaps/nwp2008/img/strip_10.gif" lat="68.546710" lng="-109.808829" year="2008" icon="purple"/>
</markers>
```

- Website parses the XML file
- Points are added to the map
- Colour code the Strip Map by year

Strip Maps



Map
Satellite
Hybrid
Bathymetry
0 m
1000 m
Mapsheet 287
Ocean Mapping Group
10 km
ArcticNet
Click Here to View
20 mi
20 km
Google
search the map
Search

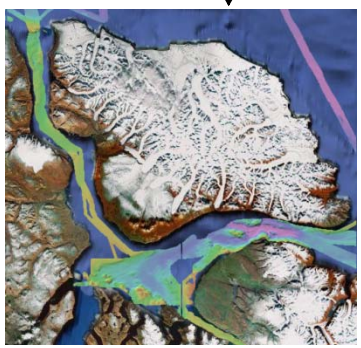
How Does the Website Work?

OMG Data (Strip Maps..)

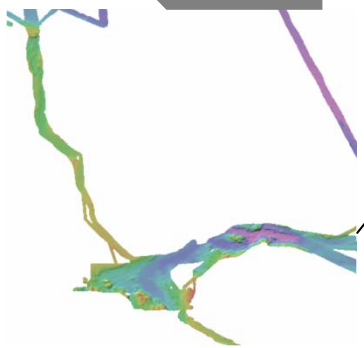
Custom Tools

Website code

Website

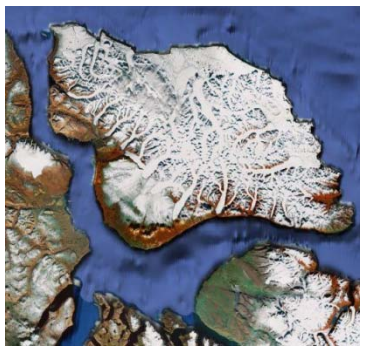


User

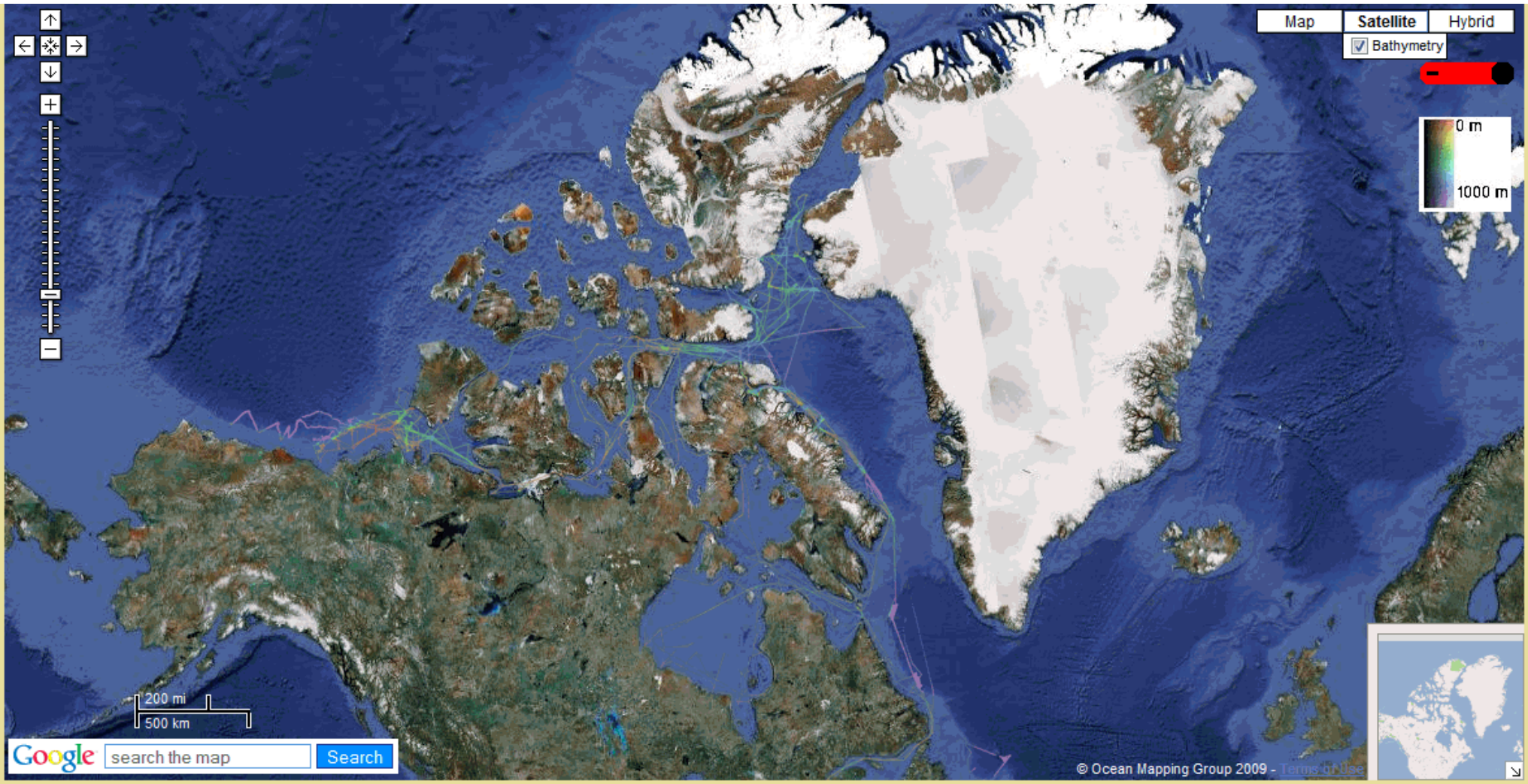


OMG Server

Google Server



Access to webpage



Future Work

- Create Backscatter tiles
- Develop software to update the tiles after each field season
- Maintain and update website as new versions and features become available in Google Maps

- Google Maps provides a platform to link and display all sources of data the Ocean Mapping Group collects to anyone who is interested.

Acknowledgements

- The Ocean Mapping Group & Their Sponsors
  - U.S. Geological Survey
  - Kongsberg Maritime
  - Route Survey, Canadian Navy
  - Rijkswaterstaat
- Imperial Oil Limited

Geological Survey of Canada
NRCan

Canadian Hydrographic Service
DFO

Officers and Crew of the:
CCGS Amundsen
CCGS Henry Larsen
CCGS Nahidik