Crowd Source Bathymetry and its potential for Merchant Mariners

Paul Canham
United Kingdom Hydrographic Office

Objectives

- What is Crowd Source Bathymetry (CSB)?
- What does the Hardware look like?
- What were the results of the trial?
- What does this activity / data support?
- What do you get?
- What will the UKHO use CSB data for?
- Why should passage sounding evolve now?
- What is the next step of the trial?
- Conclusion

What is Crowd Source Bathymetry (CSB)?

Definitions

Definition

- “Crowdsourcing is a distributed problem-solving and production model”.
- The problem here is lack of survey data
- John Udell – the heavy metal umlaut

Method

- Brings data gathering and crowd sourcing together
- Uses vessels of opportunity to log depth and position data
- Data uploaded to the web for processing.

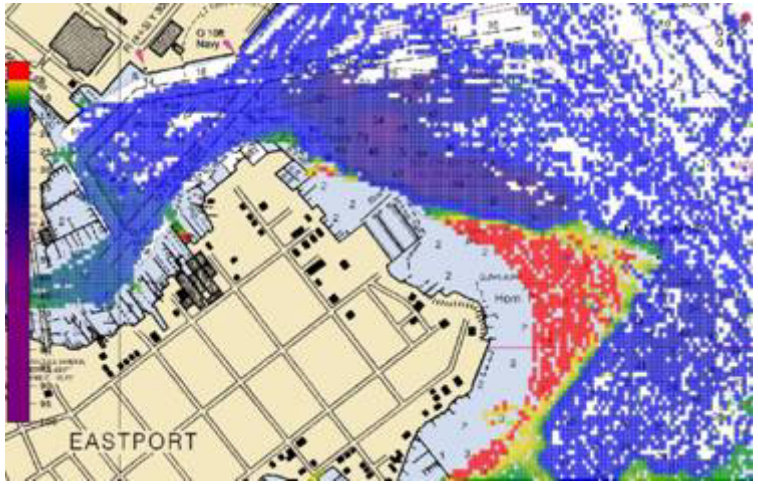
Objective

- More effective data gathering.
- Better navigational situational awareness (eg in areas that are off the normal sea lanes)

What does the hardware look like?

ARGUS™ Overview

- Onboard ARGUS unit connects to vessel GPS and Depth systems
- Autonomous, continuous processing of routine vessel activity – stationary (pier-side) and moving
- Automatically offloads using extended-range marine WiFi , cellular, or satellite broadband
- Collective processing provides bathymetry profiles



~ Vessel operators never have to touch ARGUS ~
Completely autonomous throughput of data products to vessel fleets

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Results of the Trial

Trial Summary

Ships trial initiated 2012

- Lindblad Expeditions
  R/V NG Explorer
  January 2012
  12.5 million soundings
- *M/V Carnival Pride*
  June 2012
  2.5 million soundings

US coastal testing initiated 2010

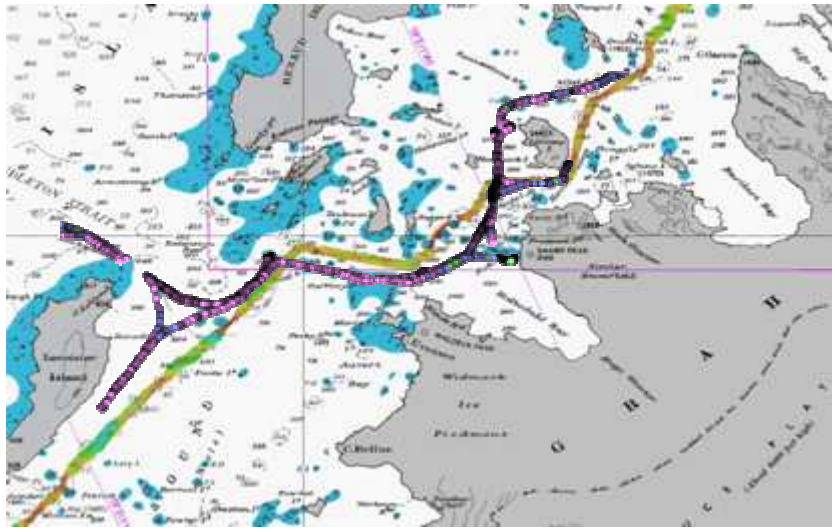
- 30 commercial tow boats and recreational trawlers
- 35 million soundings

Trial Results

National Geographic Explorer

•SURVICE ARGUS equipment installed onboard – Completed by ship's staff.

- Data transmitted to CARIS for processing – Achieved by INMARSAT.



- Accuracy of CSB data compared with data held by UKHO……

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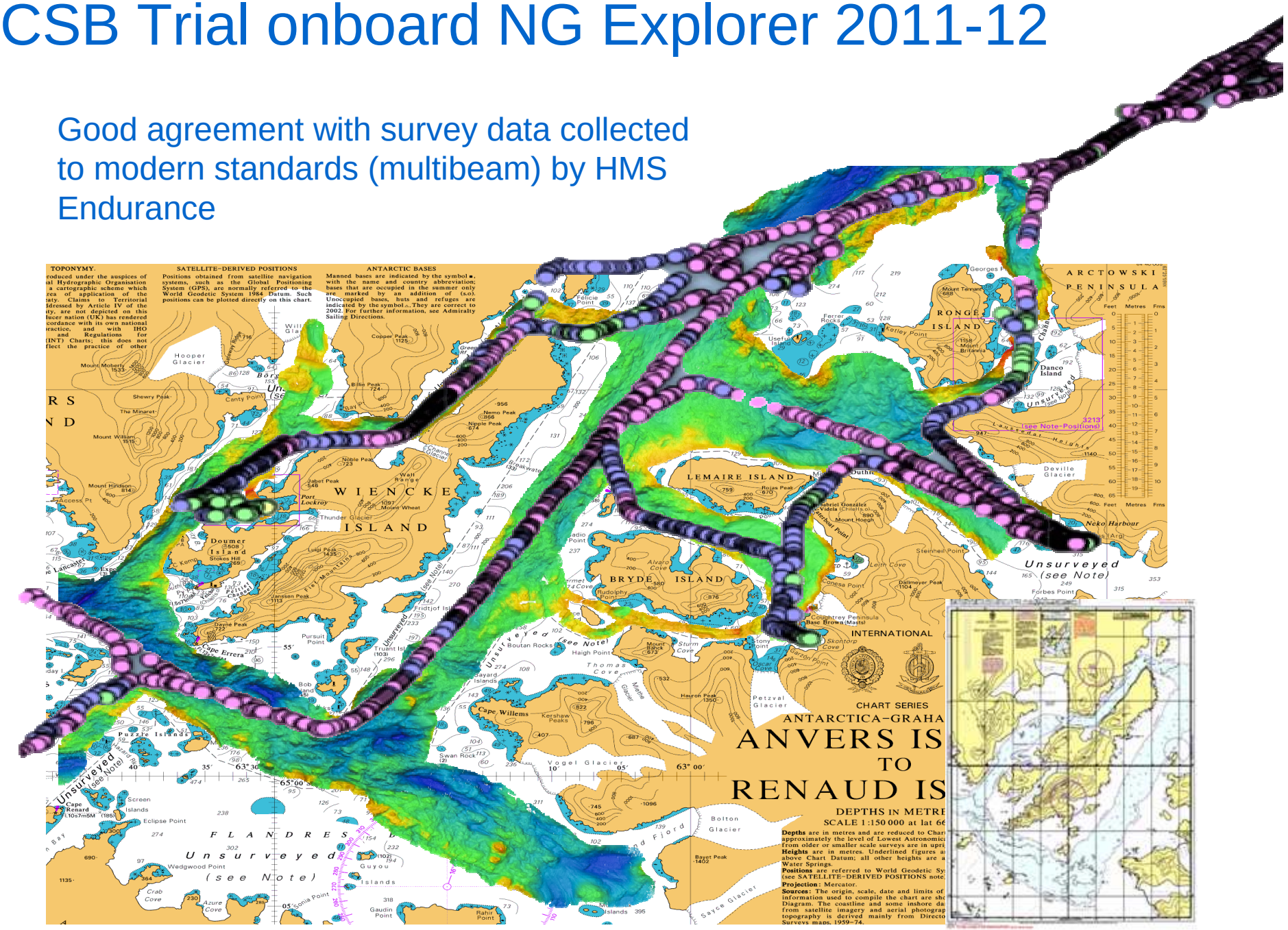
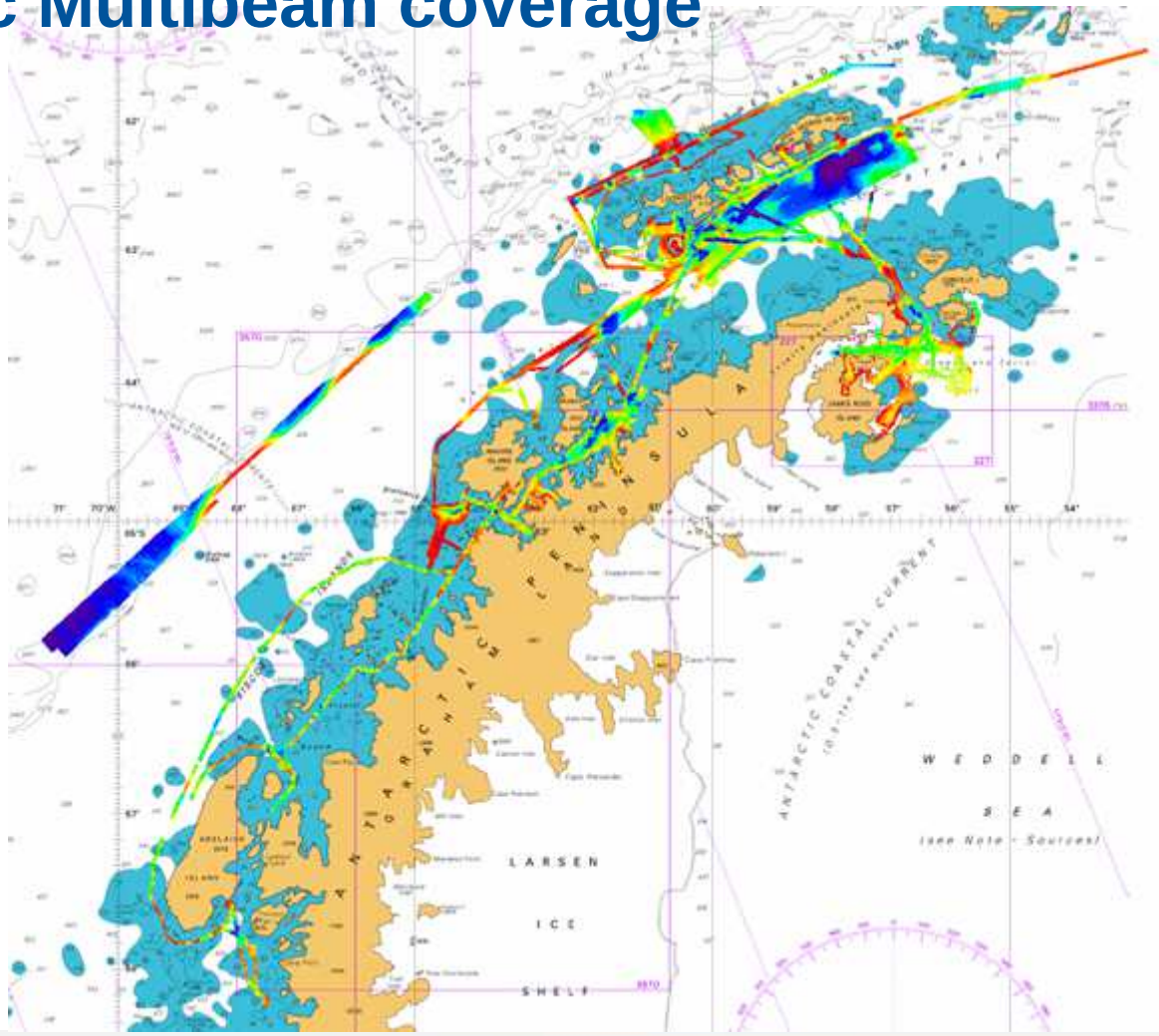
CSB Trial onboard NG Explorer 2011-12

Good agreement with survey data collected to modern standards (multibeam) by HMS Endurance



What does this activity / data support?

Antarctic Multibeam coverage



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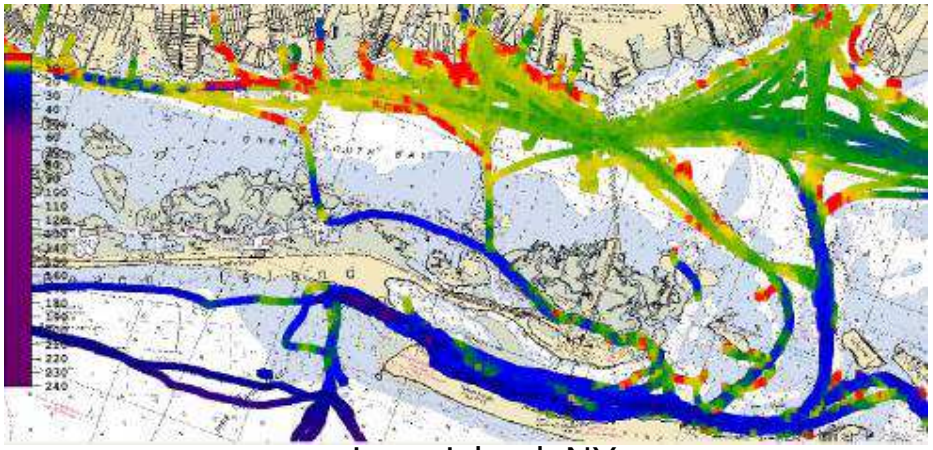
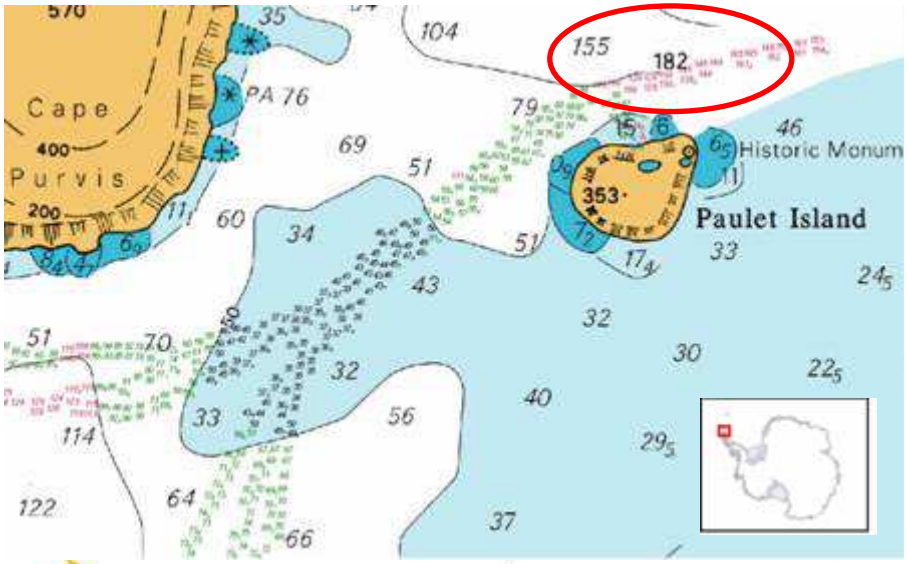
Charting and Navigation Awareness

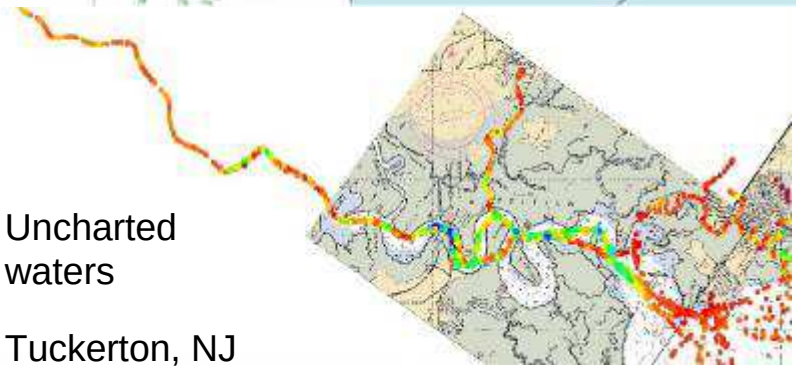


Long Island, NY

"Shoreline surveys not keeping pace with rate of shoreline change" - HSRP

Chart Comparison Paulet Island, Graham Land Antarctica.





Uncharted waters

Tuckerton, NJ

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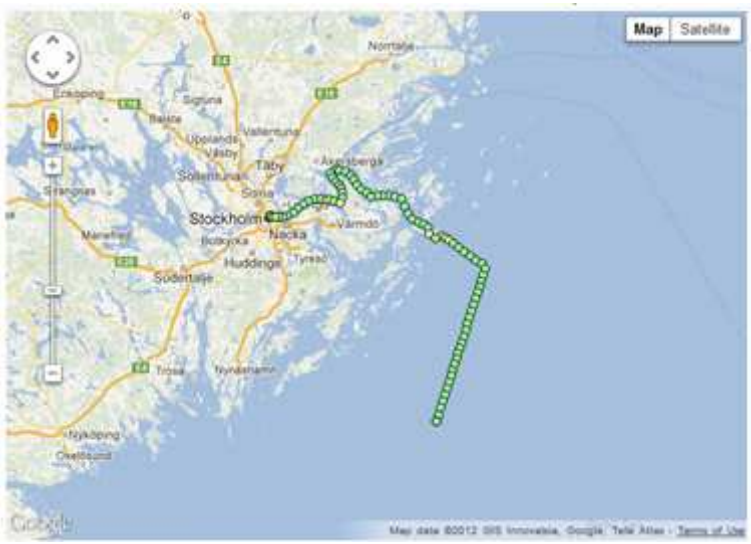
Standard Trial Outputs

- Real-time position and depth reporting
- Historical vessel tracklines
- Fleet/crowd solution sets for areas/ports of interest
- Web-based outputs, with no additional hardware or software to install



NG Explorer Position Report - Stockholm

Crowd Solution Set – Baltimore Harbor

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What do you get?

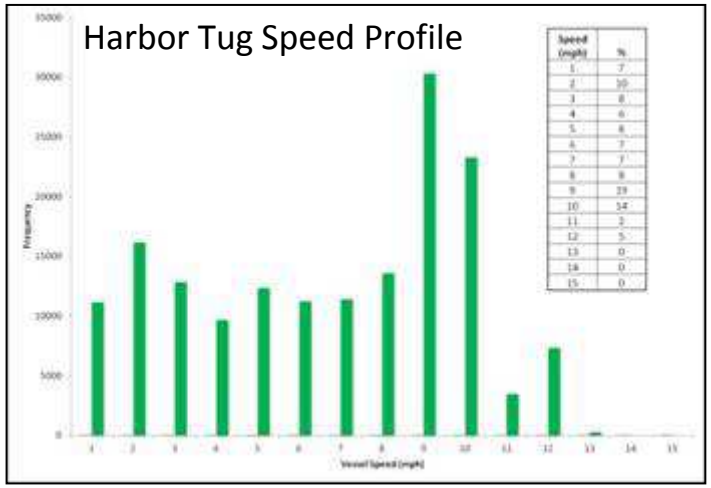
Fleet Services

- Autonomous logging/permanent cloud storage for all vessel activity
- No operator interaction required
- No hardware or software to buy, maintain, or upgrade
- No operating system restrictions or additional module requirements
- Full bathymetric solution sets from an international hydrographic industry leader using state-of-the-art systems, tools, and processes – and skilled staff

- "Monthly" service provides:
  - Hardware lease (includes lifetime maintenance, repair, upgrades)
  - Real-time vessel tracking (self and other vessels)
  - Vessel trackline histories
  - Area solution sets including data from all vessel traffic (crowd solutions)
  - Web browser product delivery

- In development
  - Continuous, real-time updates
  - Solution layers for ECDIS units and nautical charts
  - 3D visualizations through CARIS software
  - Data qualification for HO use

Vessel Diagnostics, Environmental Sensing

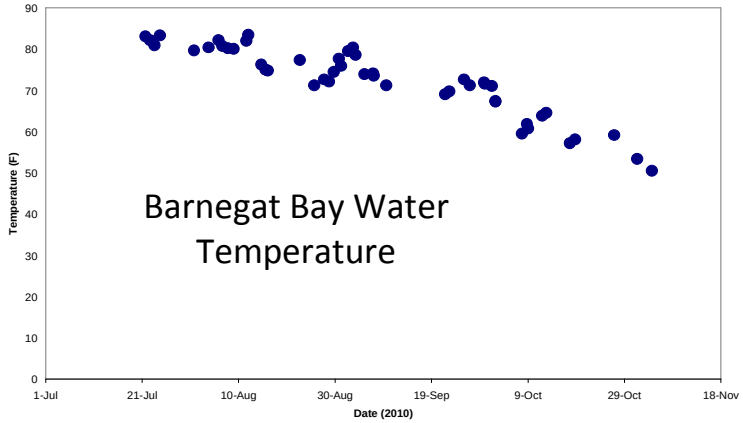


Time- and geo-referenced sampling

Weather Data
- True and apparent wind speed and direction
- Barometric pressure
- Relative humidity
- Air and wind chill temperatures

Water Quality
- Water temperature
- Salinity, pH, Conductivity, Dissolved oxygen

Vessel Systems
- Diagnostics
- Usage profiles
- Consumables tracking



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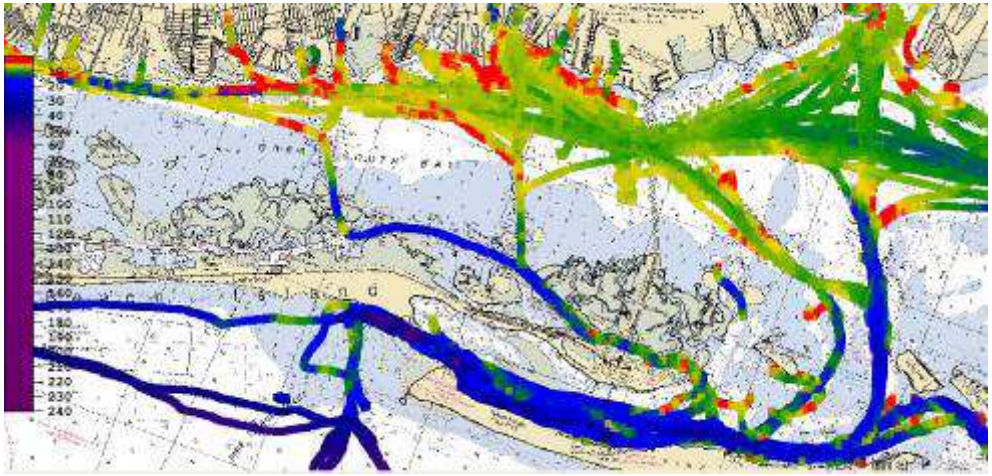
What will the UKHO use CSB data for?

CSB contribution to Navigational Safety

- To confirm the quality of existing charts
- Information to inform chart scheming (limits and scales)
- Buoyage scheme analysis.
- Tidal analysis…..



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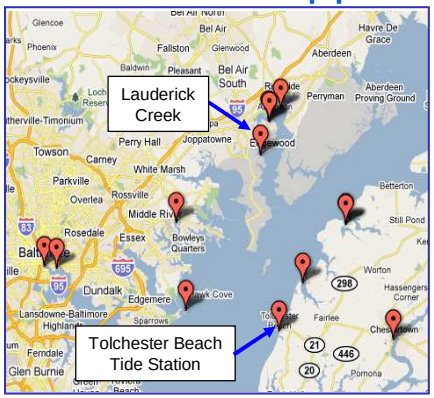
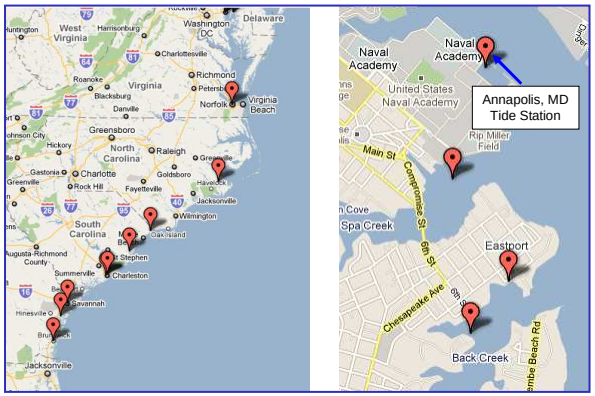
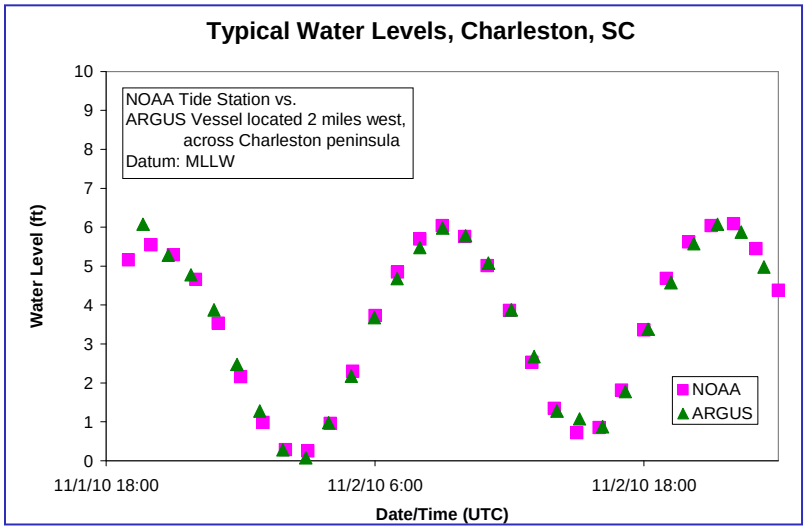
Tidal Prediction Analysis

Soundings from stationary vessels contribute to tide corrections

Float data snippets range from minutes to consecutive days, weeks







Potential to extend and enhance current fixed-tide-station networks

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Why should passage sounding evolve now?

Some Facts

Based on the US but a common thread world wide….

- U.S. coastal waters have ***never been completely surveyed.***
- 50% of the sounding data shown on NOAA nautical charts is ***pre-1940***.
- it is expected to take ***over 100 years*** to survey the 500,000 square nautical miles of navigationally significant waters.
  - In 2008 alone, there were 322 recreational vessel groundings, resulting in 13 deaths, 241 injuries, and $3.4 million in property damage.
  - In 2004, the *Athos I* oil tanker struck a submerged object in the Delaware River, spilling 265,000 gallons of oil, costing $165 million, affecting 115 miles of shoreline, with disastrous effects on marine life.

[US Hydrographic Services Review Panel Report]

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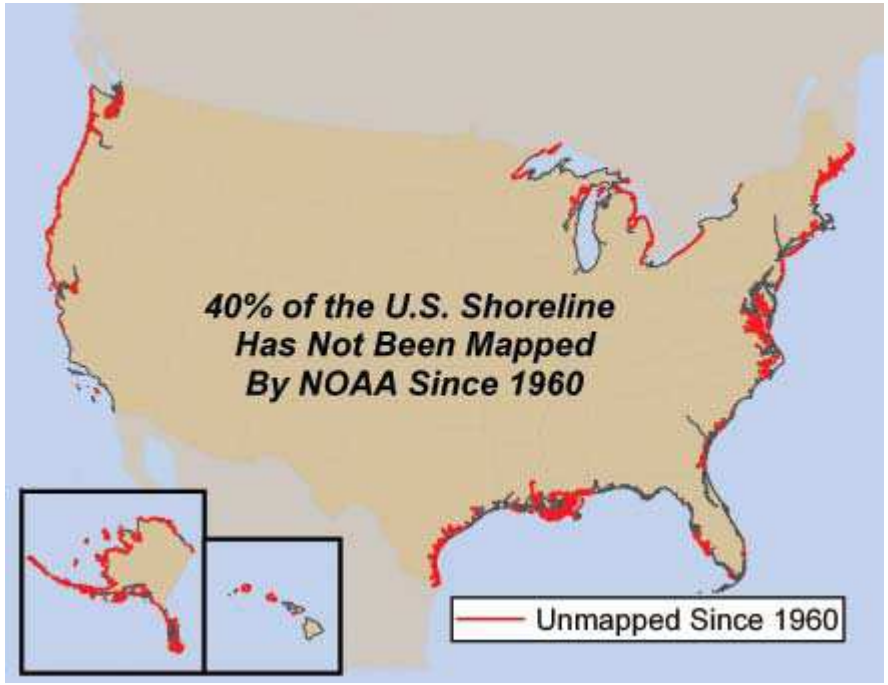
Current State of Surveying (United States – An Example)

What one vessel passes over, without knowing, or caring for that matter, is potentially of significance to any vessel with a deeper draft.



- NOAA finds new hazardous obstructions at an average rate of about 2.5 per day, but **only within the areas that NOAA surveys**.
- ARGUS-equipped vessels **routinely transit areas that have not been surveyed in over 70 years**, and for which there are no foreseeable plans to survey.

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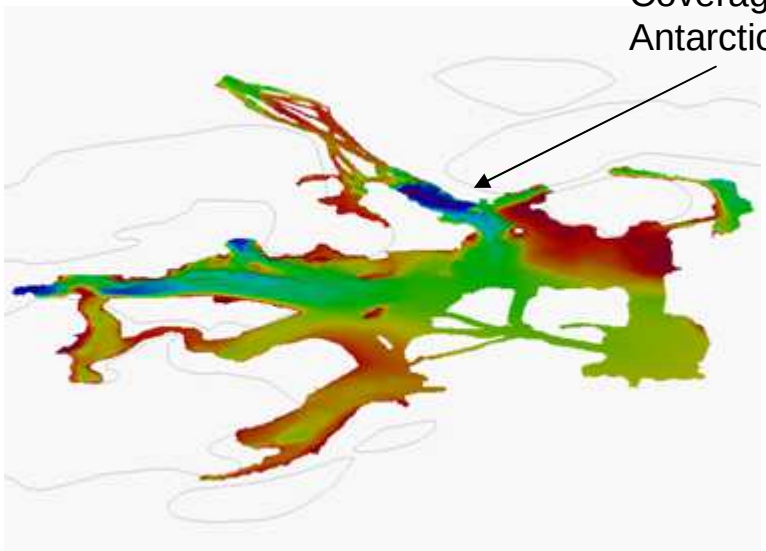
More Facts

- ARGUS provides cooperative hydrographic surveying of coastal and inland waterways… the potential for this capability has been proven in the Antarctic Peninsula.
- Resources for data gathering are generally reducing whilst the need is expanding.
- More innovation is required to support data gathering.

What is the next step for the trial?

Developing Navigational Situation Awareness Products

- Rapid turn around of CSB data to the crowd.
- Baseline for new products…..



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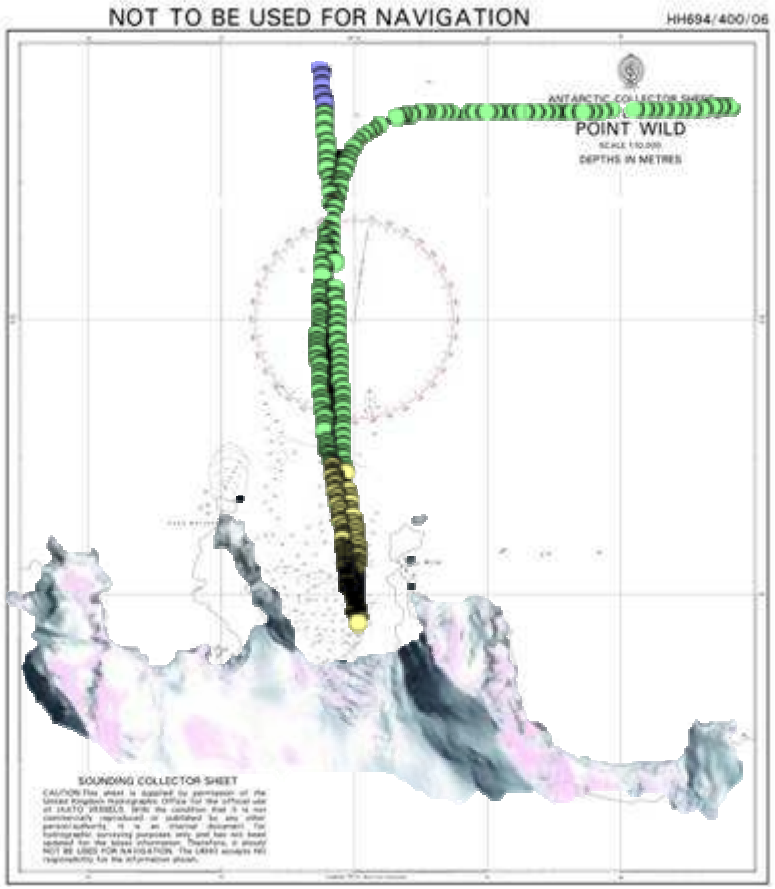
Proposed Point Wild Graphic

PROPOSED NEW CSB SHEET

EXISTING COVERAGE



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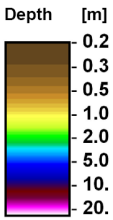
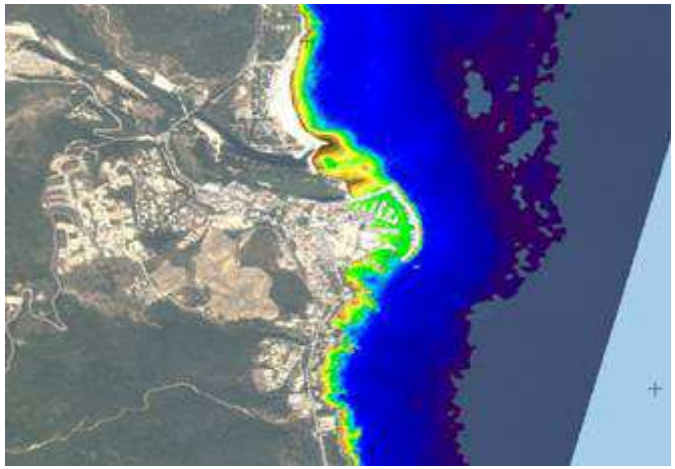
CSB in association with other emergent data gathering technology

- Satellite Derived Bathymetry – ground truth data





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Conclusions

Conclusions

- Low cost
- Low impact on host vessel operations
- Contributes to:
  - Safety of Navigation:
    - New situational awareness products and services
    - Validation of existing products.
    - Ground truthing for other survey methods
    - Information for chart schemes.
  - Local economies:

    Improved charting enabling greater port access.
  - Greater understanding of the Marine Environment

Thank You


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