



Autonomous Remote Global Underwater Surveillance

**Continuous and Ubiquitous
Coastal and Ocean Mapping**

John Hersey
SURVICE Engineering

Chesapeake Area Professional Captains Association (CAPCA)

February 27, 2011



SURVICE Engineering is a small business with a core focus on applying systems engineering to support the design, development, testing, and fielding of US combat systems that are safe, survivable, and effective.

SURVICE currently employs 300 personnel in 10 offices across the United States which includes recognized experts in a wide range of engineering disciplines.

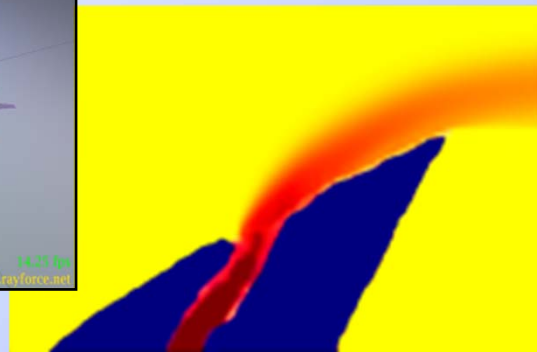
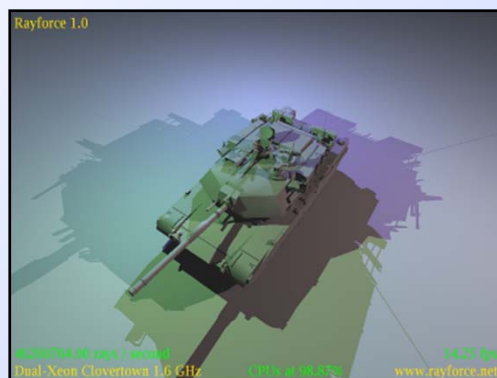
Applied Technology Operation

**SURVICE Metrology Center
Research and Development
Group
Belcamp, MD**





3D Modeling/Reverse Engineering



High Performance Raytracing and CFD Engines

The SURVICE Metrology Division was established to support our core business, providing precision measurement services required for survivability modeling.

The Applied Technology Operation (ATO) is focused on the development of custom applications:

- High performance computing in support of survivability modeling
- Custom 3D measurement solutions

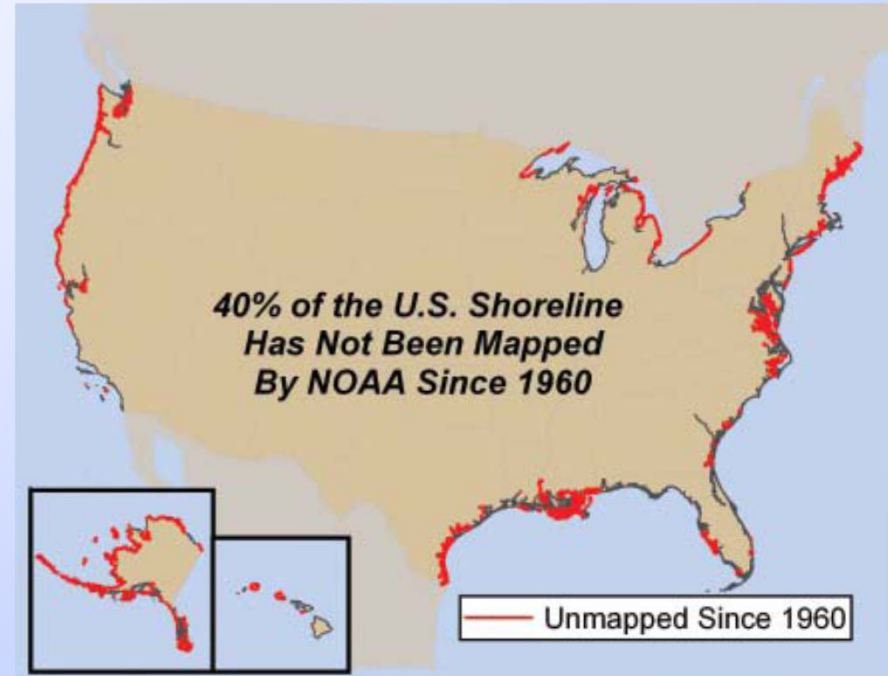
ARGUS is a custom solution developed in response to a NOAA RFP.



- Onboard ARGUS unit plugs into vessel chartplotter
- Autonomously records GPS position and water depth
- Continuous recording of routine vessel activity – stationary (pier-side) and moving vessels
- Automatically offloads using extended-range marine WiFi
- Provides vessels with WiFi connectivity
- Collective processing provides bathymetry profiles
- Readily expandable for environmental and met sensing

~ Vessel operators never have to touch ARGUS ~
Completely autonomous recording and reporting of data

- U.S. coastal waters have never been completely surveyed, and for the areas that have been surveyed, approximately **50% of the sounding data is pre-1940**, collected by antiquated leadline soundings and wire drags.
- At the current pace, it is **expected to take NOAA 166 years to survey the 500,000 square nautical miles (SNM) of navigationally significant waters** using in-house and contract surveying vessels, with a budget of \$100M per year – (taken from NOAA HSRP Report 2007).



Obvious need for supplemental charting using a cost-effective approach



265,000 gallons of oil into the Delaware River

115 miles of shoreline affected

The Athos I collided with three **uncharted and undetected** submerged obstructions in the channel and anchorage.

The Athos I incident alone has cost the ship owner and his insurer over \$165 million.

The true value of wildlife lost and port commerce delayed or deferred cannot be calculated.

How many vessels passed over these before the Athos I did?





Costa Concordia off Italy's Tuscan Coast, 2012
Dozens killed or missing
"The rocks weren't on the map"

\$500 million lawsuit
on top of vessel loss and recovery costs

- In 2008 alone, there were 322 recreational vessel groundings, resulting in 13 deaths, 241 injuries, and \$3.4 million in property damage.
- The cleanup from the *Exxon Valdez* accident has cost \$3 billion, and litigation costs continue to mount.
- 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 those same remote areas that have not been surveyed in over 70 years, and for which there are no foreseeable plans or resources to survey.

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

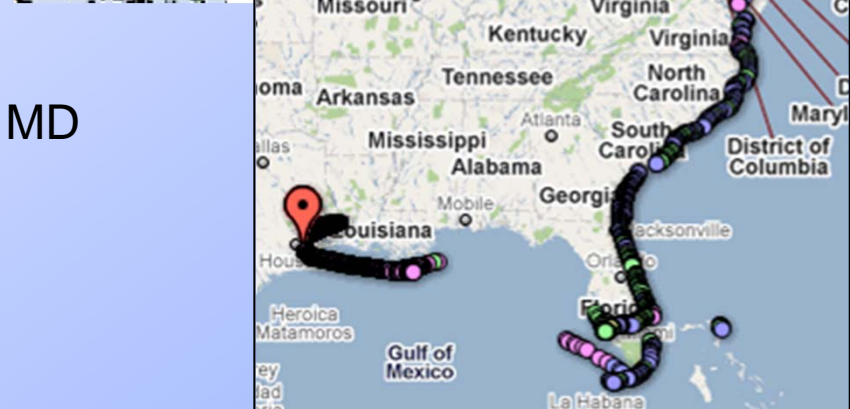
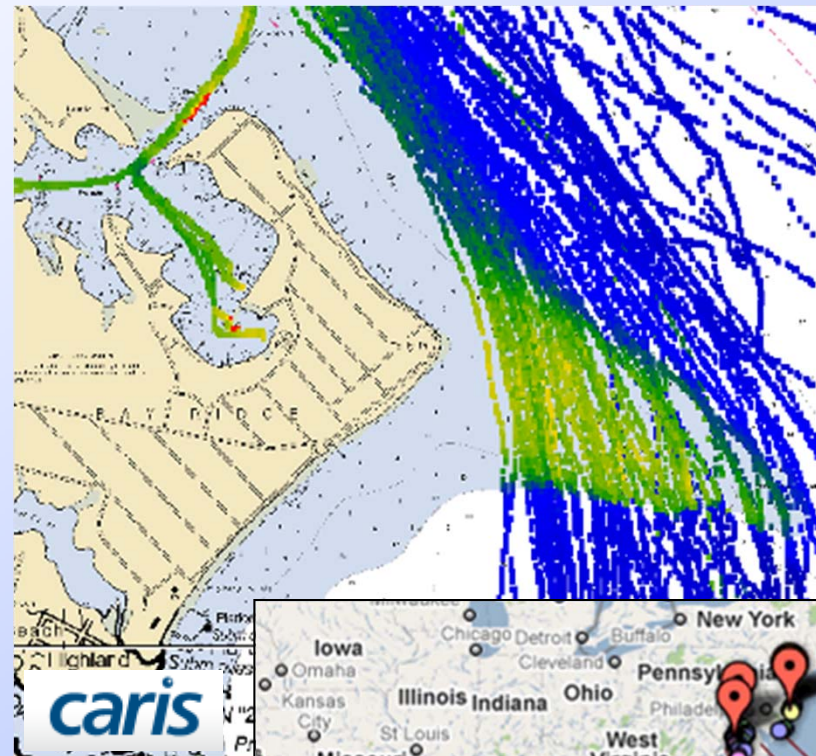
- Interfaces with combined or separate displays for GPS/Depth
- Autonomous data acquisition
- Robust memory management
- Automatic data offloading in real time or near-real time
- On-the-fly data processing and compression
- Wireless – control, Internet, and server connectivity
- Controllable, repeatable – *even assignable* – transits over selected areas or shipping channels



4 ○
3 ●
2 ●
1 ○



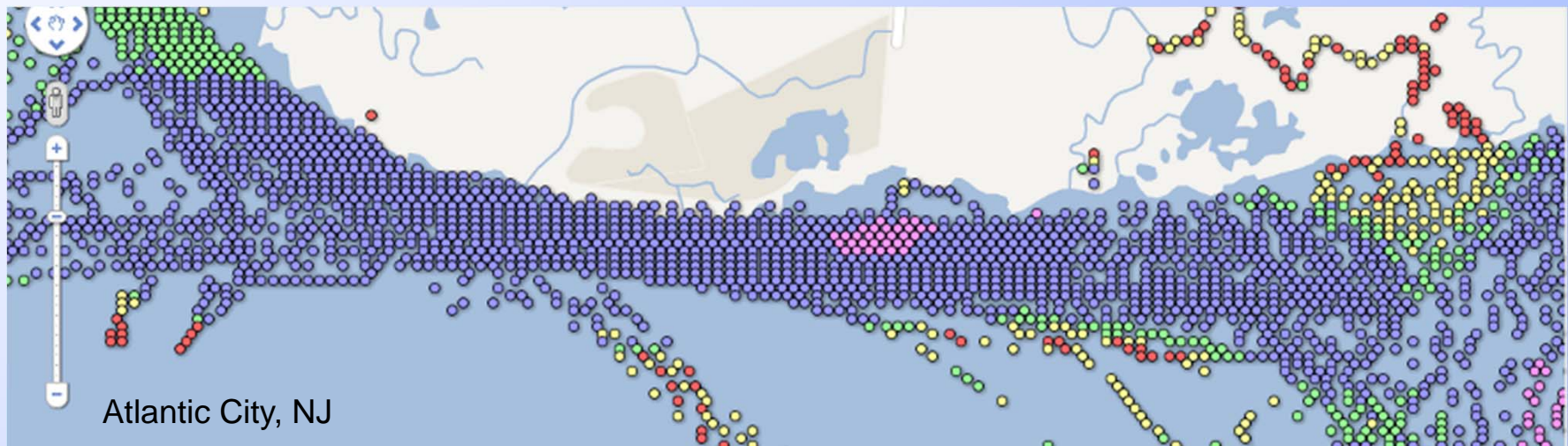
- Eastern seaboard to Gulf of Mexico
- 22M soundings
- **Sea Tow** vessels deployed:
 - Atlantic City, NJ
 - Barnegat Bay, NJ
 - Annapolis, MD
 - Brooklyn and Long Island, NY
- **M/V Chez Nous, Altair, Elixir**
 - Intracoastal Waterway trawlers
 - 8M soundings
- **Reality Check Sailing**
 - Sailing vessel transport captain
 - Texas, Louisiana, GoM, Florida, ICW, Bahamas
- **Washington College** - Chestertown, MD
- **USCG Auxiliary**
- **UNH CCOM** – Portsmouth, NH
- **Florida DEP** – St. Augustine, FL



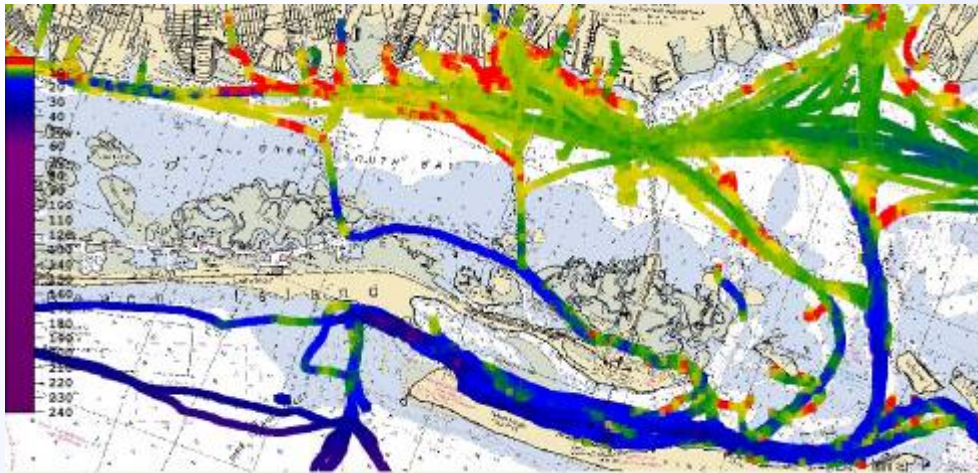
- Over 200 square km – 60 SNM

Long Island, NY – 27 sq km	Atlantic City, NJ – 23 sq km
Barnegat Bay, NJ – 10 sq km	Chesapeake Bay – 45 sq km
Virginia – 1 sq km	North Carolina – 14 sq km
South Carolina – 12 sq km	Georgia – 9 sq km
Florida – 47 sq km	Gulf Coast – 29 sq km

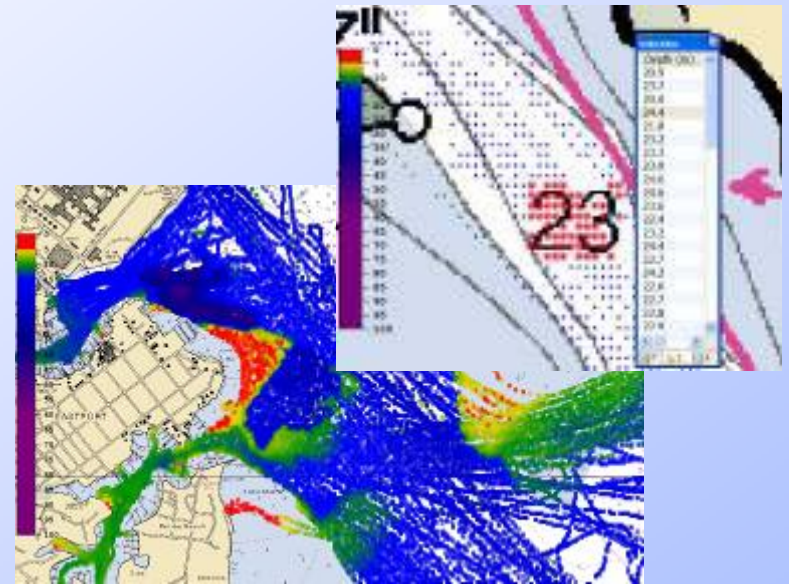
- Soundings counts range from 1 to 1000's per grid
- Speeds range from 0 to 40 knots
- Average rate = 15 soundings/minute



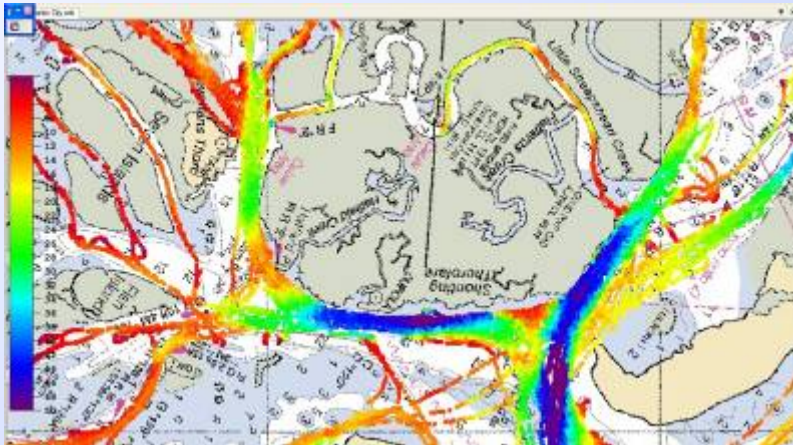
Redirect multibeam resources to where better resolution is most required



Long Island, NY



Annapolis, MD

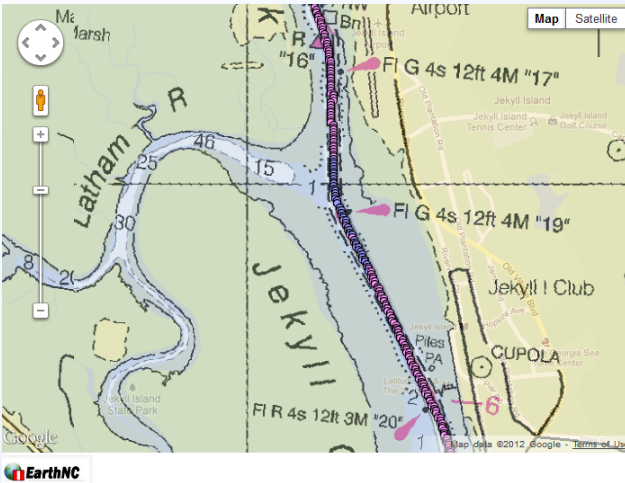


Atlantic City, NJ



Tuckerton, NJ

Georgia ICW – Jekyll Island



Vessel Transit – WL Observations

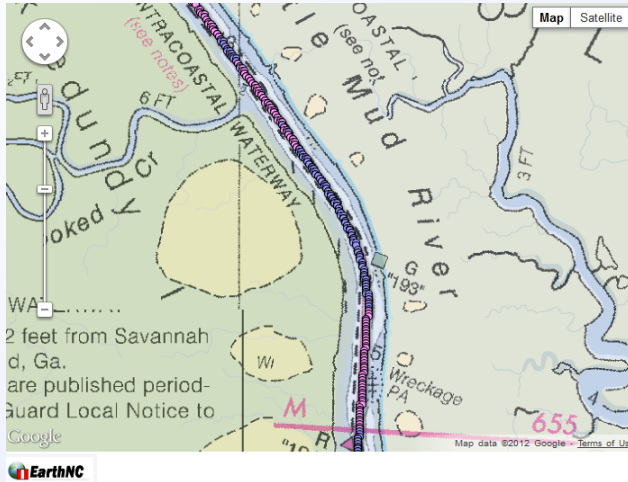


Vessel Transit – Corrected to MLLW

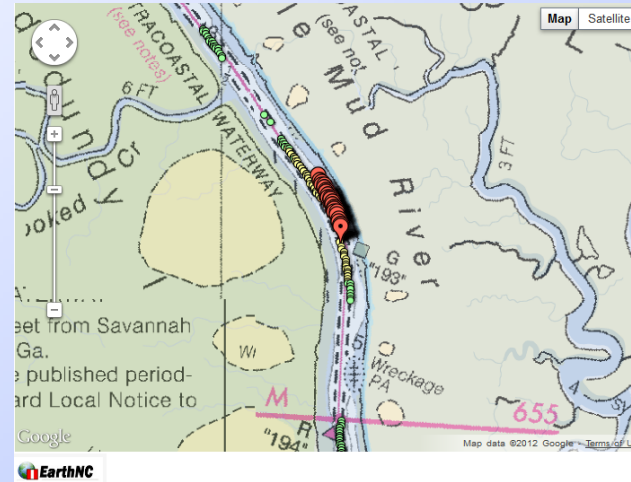


Solution Set – MLLW Corrected

Georgia ICW – Little Mud River



Vessel Transit – WL Observations



Vessel Transit – Corrected to MLLW



Solution Set – MLLW Corrected

- Beta progress
- Sample data
- Solution set downloads
- Vessel tracking

SURVICE ARGUS™

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Recent News

Improving Navigation with Social Media

Motor Boating, April 2011:
Peter Swanson discusses ARGUS and the role of the boating community in updating and sharing nautical data.

READ MORE >

Sailing with a Purpose

Cruising World, Feb 2011:
Mark Fitzhery's lead editorial regarding the origins of the ARGUS System and the current direction of the project.

READ MORE >

What is ARGUS?



ARGUS Partners

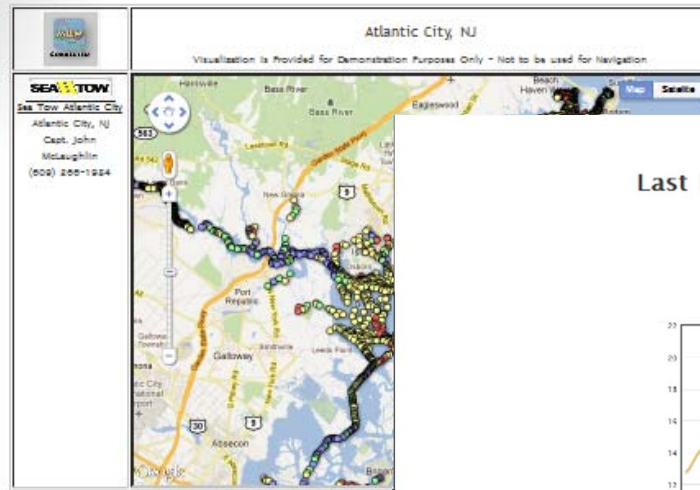


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Sample Data Sublinks: Location Maps Boating Washington College SeDINC PARIS Shipping Channels In Development

Sounding Locations

- ANNAPOLIS, MD
- ATLANTIC CITY, NJ
- BARBOURSVILLE, WV
- BROOKLYN, NY
- BUSH RIVER, MD
- CHESAPEAKE, VA
- CHRISTCHURCH, NZ
- NORTH CHESHIRE, MS
- SOUTH CHESHIRE, MS
- NORTH FLORIDA
- SOUTH FLORIDA
- SALUSTIUM, TX
- SEASIDE, CA
- WASHINGTON, DC



Vessel ID: C7C
 Last Report : Sun Sep 11 20:27:08 2011
 Depth : 6.2 ft
 Latitude : 40.369053 N
 Longitude : 74.030651 W

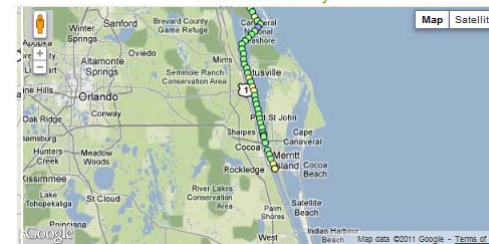
Unit status

ARGUS Depth vs. Time Chart



Stationary Vessel - Tide Data

Location History

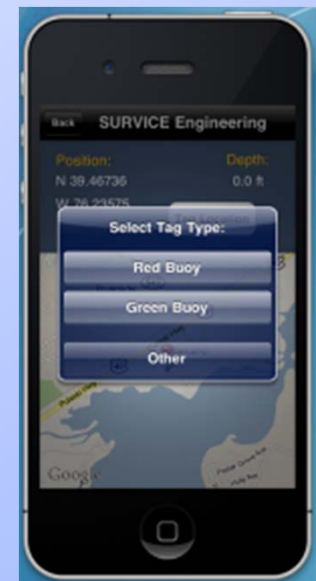


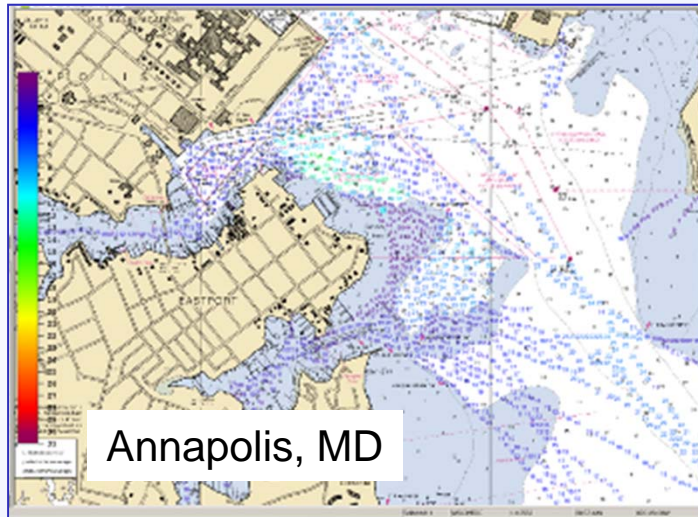
Moving Vessel - Position Reporting

<http://argus.survice.com>

- Cruise ship pilot tests – ongoing
- Florida Department of Environmental Protection (DEP) – current beta tester
- US Coast Guard Auxiliary – current beta tester
- Port of Pittsburgh Rivernet Test Bed
- 2012 Ocean Sciences Meeting – SURVICE, CARIS, University of Washington joint presentation

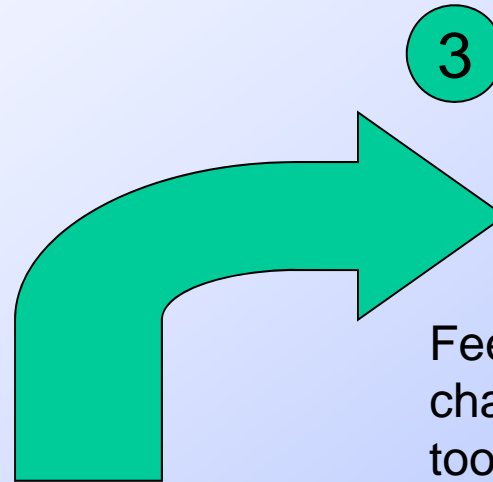
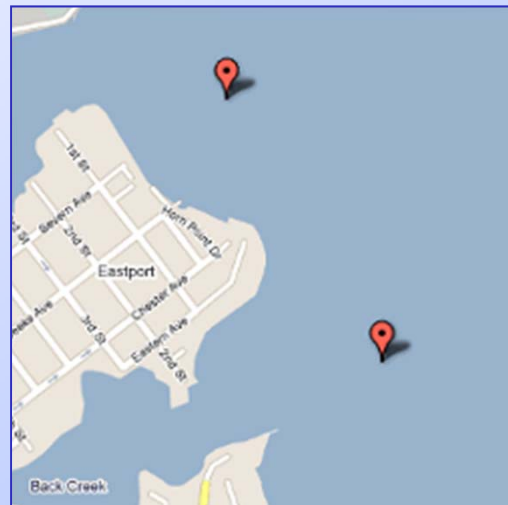
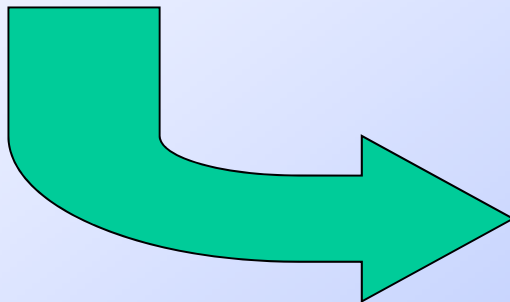
- Manual data tagging for special report generation
- ARGUS-Lite in development
 - ARGUS functionality for smartphones
 - Low-cost alternative to current commercial-duty onboard unit
 - Same backend processing as for all ARGUS data
 - Two-way utility applications
 - Hazard reports
 - Shoaling reports
 - Follow me – see the chartplotter on the boat in front of you
 - Beta testing launch Spring 2012





Process
collective
soundings

1



3



Feedback to ARGUS-equipped
chartplotters and PC navigation
tools:

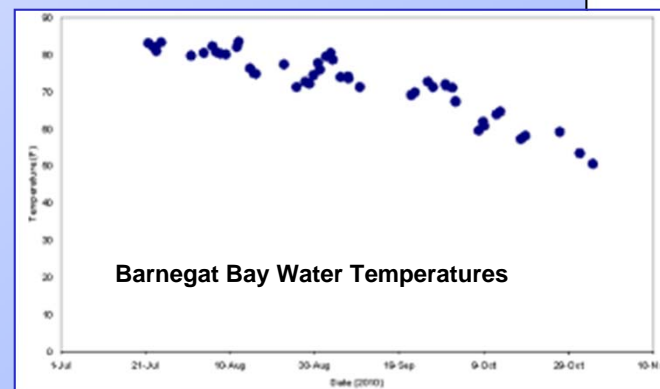
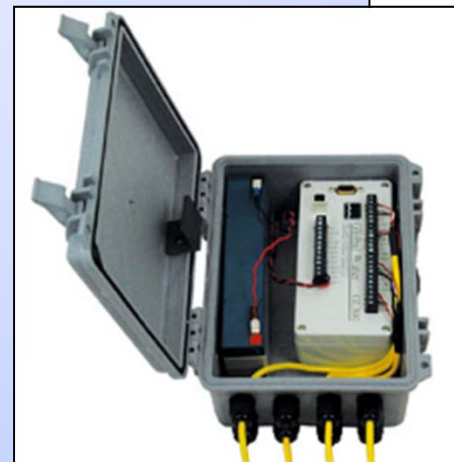
- Via ARGUS-user web portal
- Display of high-value targets

Identify:

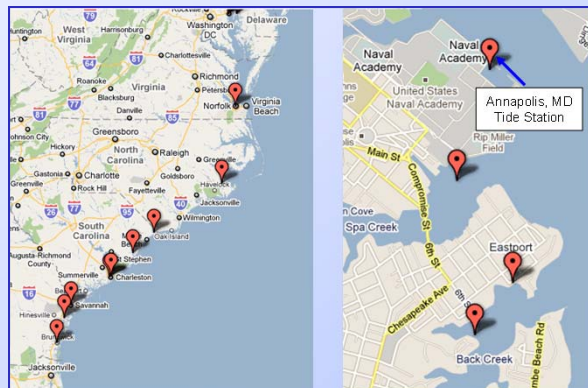
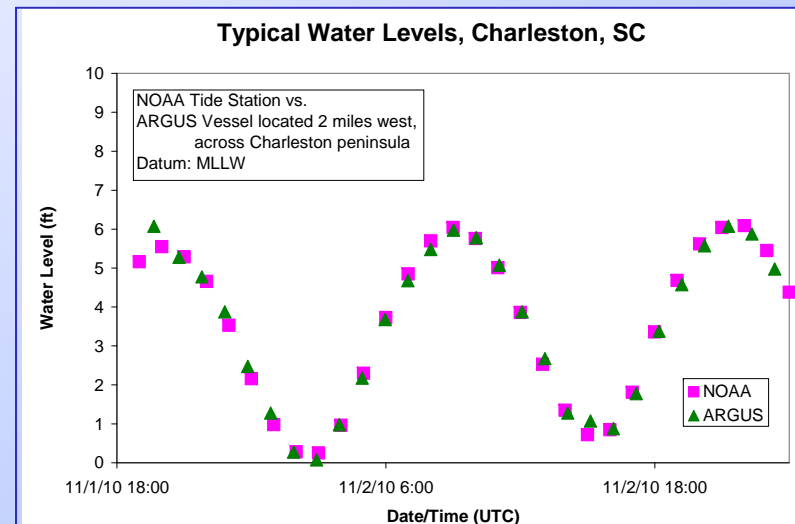
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- Potential new shoaling
- Latest dredging
- Changing inlet conditions

- Weather Data
 - True and apparent wind speed and direction
 - Barometric pressure
 - Relative humidity
 - Air and wind chill temperatures
- Water Quality
 - Water temperature
 - pH
 - Conductivity
 - Dissolved oxygen
 - Other possible metrics include: turbidity, oxidation-reduction potential (ORP)
- Pollution/oil spill applications

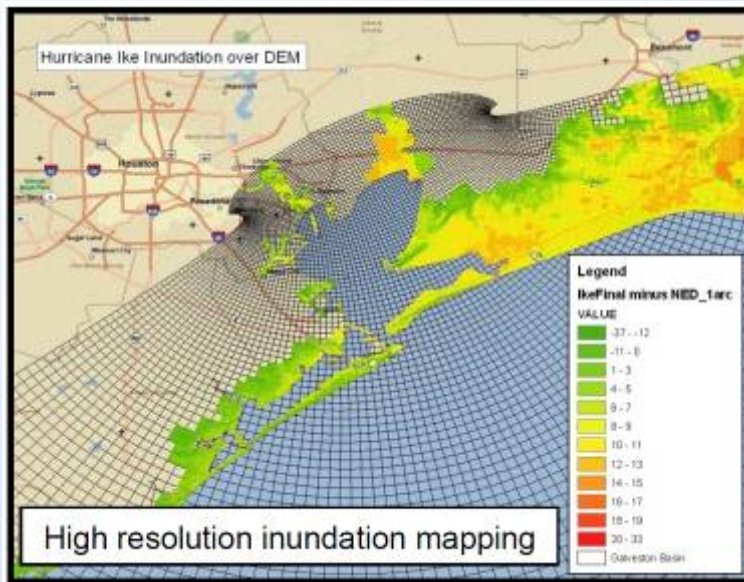


- Over 50% of soundings are from stationary vessels
- “Float” data not only provides depth measurements, but also contributes to tide corrections
- Float data snippets range from minutes to consecutive days, weeks

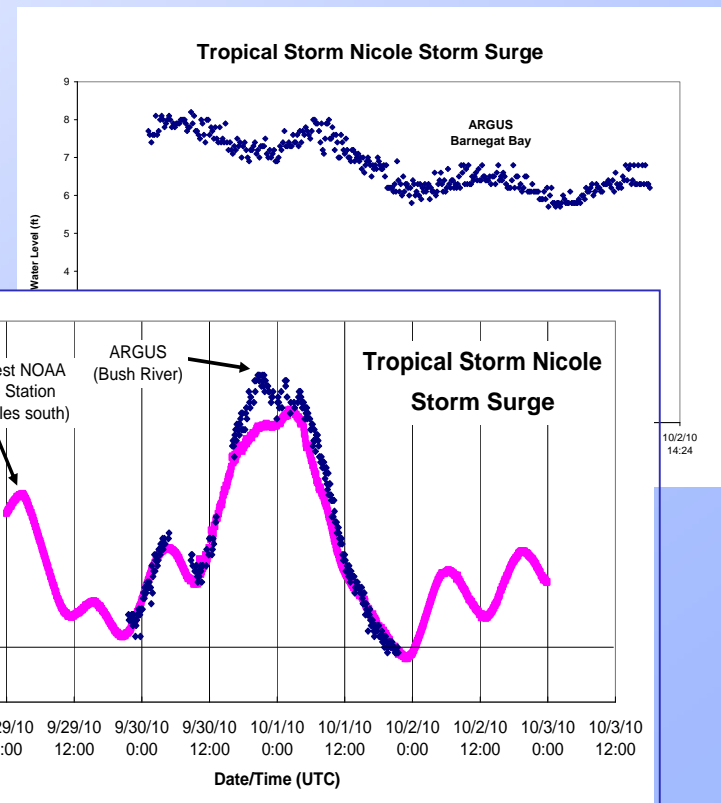


Potential to extend and enhance NOAA's current fixed-tide-station network

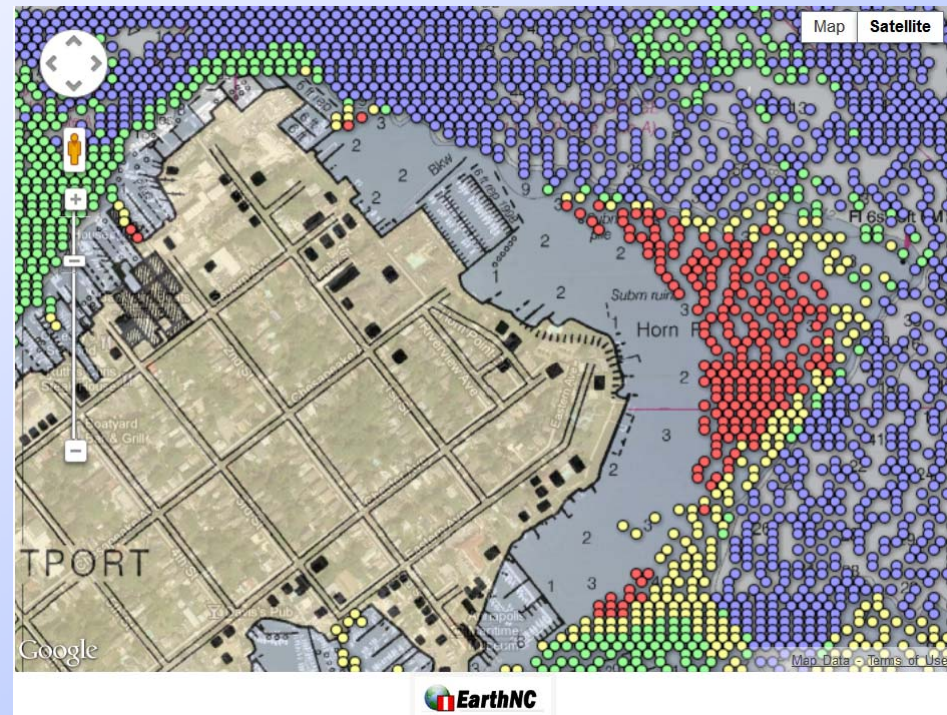
- Application: Obtain highly localized (space, time), very-fine-scale storm surge and met data – before, during, and after tropical storms
- Utility: *Selectable*-location data for cell-by-cell NOAA model validation
- Current partners: Earth Networks, CARIS, Teledyne Benthos, Sea Tow Services International



Source: NOAA Storm Surge Roadmap (21 JUL 2010)



- Handful of loaner units available
- Dedicated high-use vessels and unit sharing opportunities are being sought
- Unit sharing through CAPCA?



Upper Chesapeake
Capt. Dave Duvall