Underwater Robots Observing the Ocean: The U.S. IOOS® National Glider Network

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Input from: D. Rudnick, S.Glenn

Overview

I. IOOS Background

II. Why a National Glider Network

III. Network Plan

IV. Questions

IOOS® the Integrating Force for Good

WHO

WHAT
Observation
Data Management
Modeling & Analysis
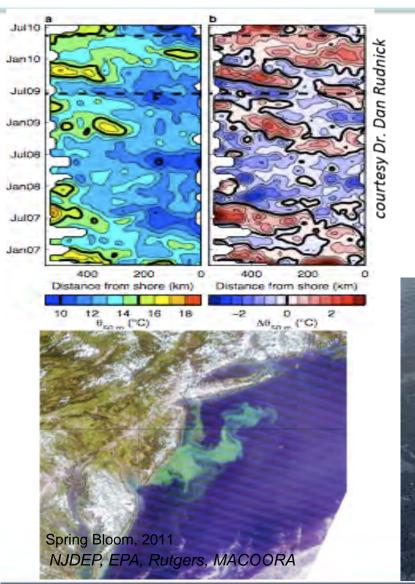Research & Development
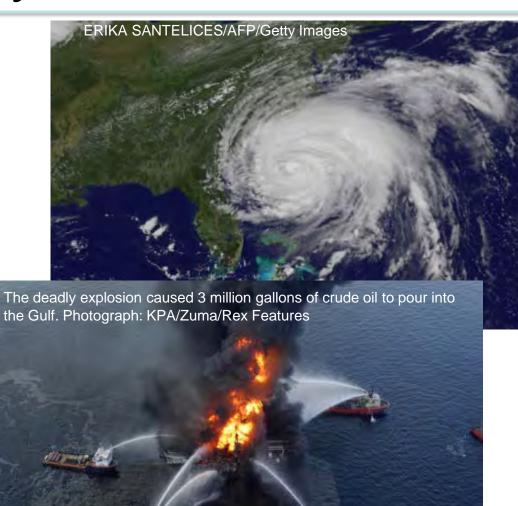tion

WHERE
Global
Coastal (EEZ to tida

tal Goals, 1 System
ate change and weather
cy of **maritime operations**
al hazards
security
alth risks
healthy coastal ecosystems
ne **resources**

Regional Associations Across the United S

ODAS

Why Gliders

courtesy Dr. Dan Rudnick

ERIKA SANTELICES/AFP/Getty Images

The deadly explosion caused 3 million gallons of crude oil to pour into the Gulf. Photograph: KPA/Zuma/Rex Features

Spring Bloom, 2011
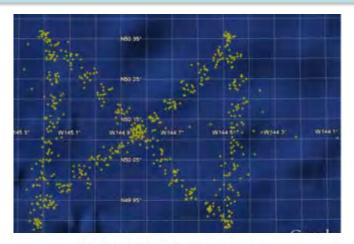*NJDEP, EPA, Rutgers, MACOORA*
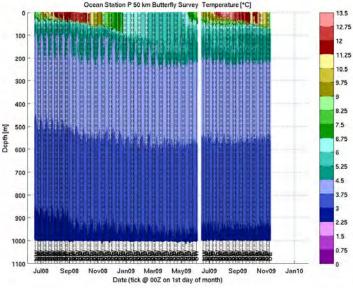
IOOS®

Provide Decision Support

Ocean State Data for:

Sub-surface Tracking

Model Refinement

Critical Mission Support

Instrument Testing/Validation

Extreme Environment Surveys

HABs and Water Quality

Ocean Acidification

Other Uses:

Map/Quantify Coastal Dynamics

Education and Outreach

Monitoring of Global Events

Biological Monitoring

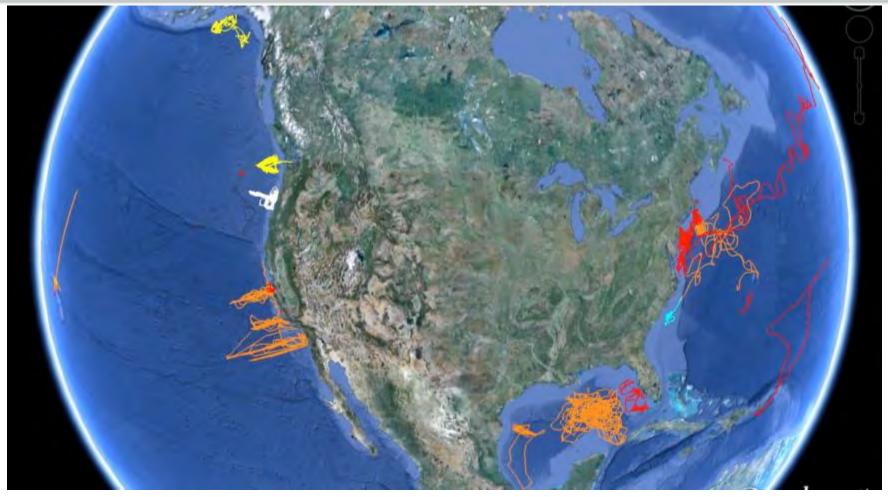Craig Lee, University of Washington

Why a Network

- Coordinated Approach
- Shared/leveraged resources
- Enable sustained monitoring

Glider observations on the US coast

- Gliders' role in ocean observing system is to patrol the boundaries, connecting the coastal and open ocean

Why IOOS: A Growing Enterprise

Summary of Glider Days for 2008-2012			
Year	Glider-days of data collected annually by glider operators. (Glider-day = 1 glider in the water collecting data for 1 day)	Glider-days completed outside of the EEZ	Glider-days supported by IOOS
2008	4007	890	349
2009	4739	1132	337
2010	4944	1329	990
2011	5740	1663	772
2012	6292	1793	715
2008 – 2012 Totals	**25722**	**6807**	**3163**

* Glider Days provided with support from Federal Agencies including NSF, ONR, NOAA, EPA, state and local governments and private foundations.

National Glider Network

Data Management

- National standards to ease exchange of data from regional glider operators
- Real-time distribution
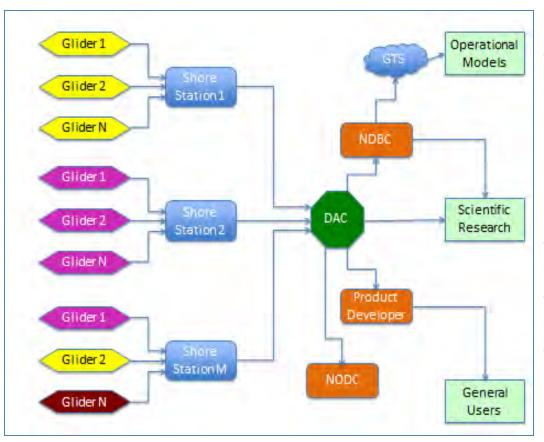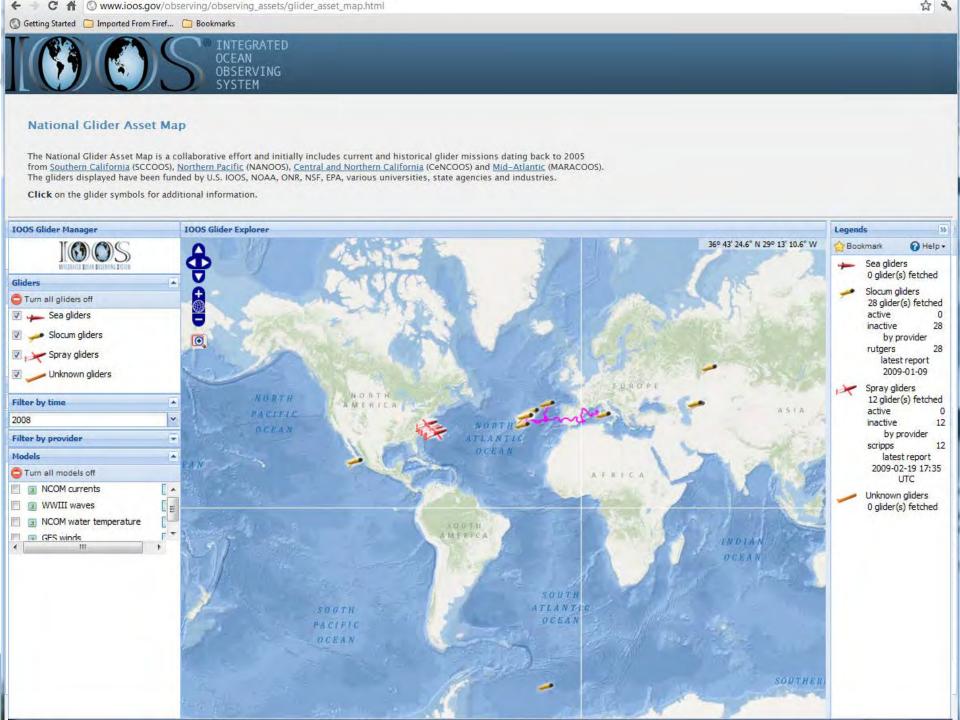- Quality control
- Archiving

IOOS @ INTEGRATED OCEAN OBSERVING SYSTEM

National Glider Asset Map

The National Glider Asset Map is a collaborative effort and initially includes current and historical glider missions dating back to 2005 from Southern California (SCCOOS), Northern Pacific (NANOOS), Central and Northern California (CeNCOOS) and Mid-Atlantic (MARACOOS). The gliders displayed have been funded by U.S. IOOS, NOAA, ONR, NSF, EPA, various universities, state agencies and industries.

Click on the glider symbols for additional information.

| IOOS Glider Manager | IOOS Glider Explorer | Legends ⟩⟩ |

IOOS INTEGRATED OCEAN OBSERVING SYSTEM

Gliders ▲

🔴 Turn all gliders off

☑ ✈ Sea gliders

☑ 〜 Slocum gliders

☑ ✕ Spray gliders

☑ ╱ Unknown gliders

Filter by time ▲

2008 ▾

Filter by provider ▾

Models ▲

🔴 Turn all models off

☐ 🔲 NCOM currents

☐ 🔲 WWIII waves

☐ 🔲 NCOM water temperature

☐ 🔲 GFS winds

36° 43' 24.6" N 29° 13' 10.6" W

☆ Bookmark   ❓ Help ▾

✈ Sea gliders
0 glider(s) fetched

〜 Slocum gliders
28 glider(s) fetched
active   0
inactive   28
by provider
rutgers   28
latest report
2009-01-09

✕ Spray gliders
12 glider(s) fetched
active   0
inactive   12
by provider
scripps   12
latest report
2009-02-19 17:35 UTC

╱ Unknown gliders
0 glider(s) fetched
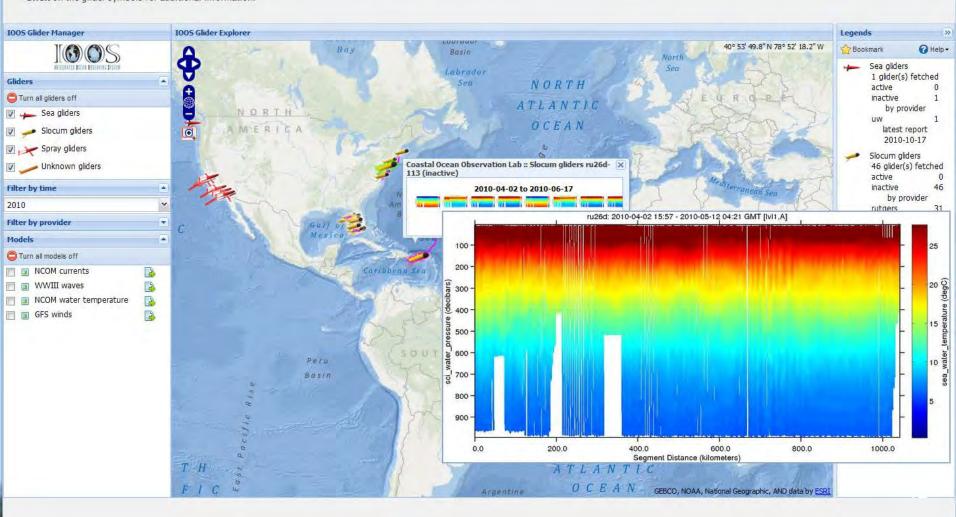
IOOS ® INTEGRATED OCEAN OBSERVING SYSTEM

National Glider Asset Map

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IOOS Glider Manager

IOOS INTEGRATED OCEAN OBSERVING SYSTEM

Gliders
- 🚫 Turn all gliders off
- ☑ ↦ Sea gliders
- ☑ ↦ Slocum gliders
- ☑ ↦ Spray gliders
- ☑ ↦ Unknown gliders

Filter by time
2010

Filter by provider

Models
- 🚫 Turn all models off
- ☐ 🖾 NCOM currents
- ☐ 🖾 WWIII waves
- ☐ 🖾 NCOM water temperature
- ☐ 🖾 GFS winds

IOOS Glider Explorer

40° 53' 49.8" N 78° 52' 18.2" W

Coastal Ocean Observation Lab :: Slocum gliders ru26d-113 (inactive) ✕

2010-04-02 to 2010-06-17

ru26d: 2010-04-02 15:57 - 2010-05-12 04:21 GMT [lvl1,A]

sci_water_pressure (decibars)
100 / 200 / 300 / 400 / 500 / 600 / 700 / 800 / 900

Segment Distance (kilometers)
0.0 / 200.0 / 400.0 / 600.0 / 800.0 / 1000.0

sea_water_temperature (degC)
25 / 20 / 15 / 10 / 5

GEBCO, NOAA, National Geographic, AND data by ESRI

Legends ≫

⭐ Bookmark ❓ Help▾

↦ Sea gliders
   1 glider(s) fetched
   active   0
   inactive   1
      by provider
   uw   1
      latest report
      2010-10-17

↦ Slocum gliders
   46 glider(s) fetched
   active   0
   inactive   46
      by provider
   rutgers   31

Future

- FY13: Finalize the National Glider Network Plan
- Develop Version 1 of Data Assembly Center
- Develop Version 2 of Glider Asset Map
- Deliver Glider data on GTS through NDBC
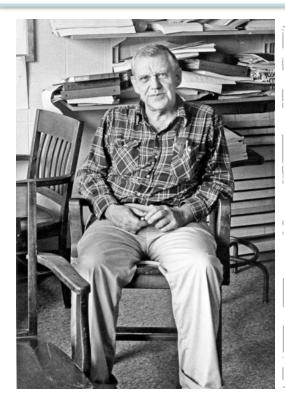- Establish implementation group to initiate NGN plan

Contact: Becky Baltes, NGN PM,
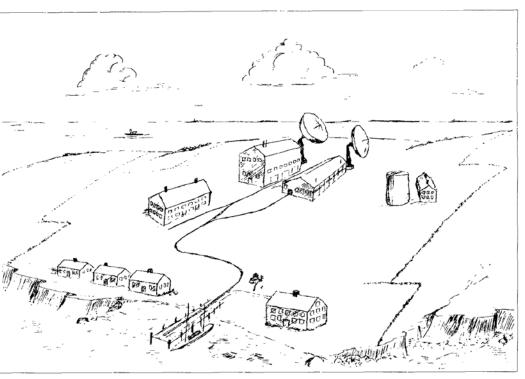becky.baltes@noaa.gov
301-427-2427
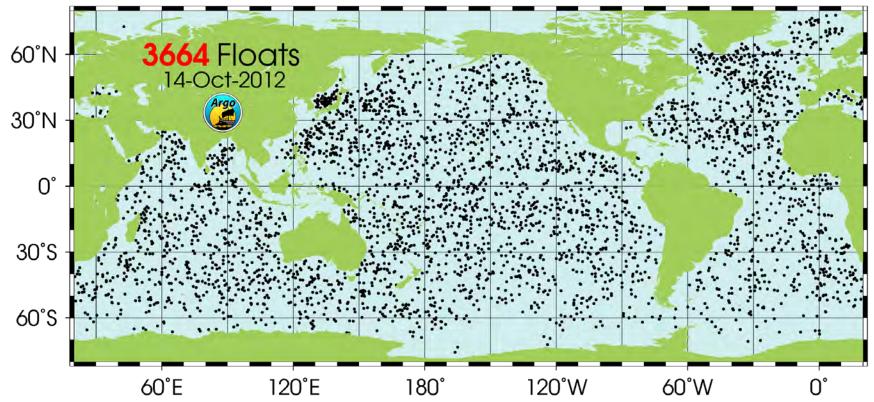http://www.ioos.noaa.gov/glider/strategy/welcome.html

Stommel's Vision

1989

The Slocum Mission Control Center on Nonamesset Island.

Each Slocum reports into Mission Control via satellite about six times a day.

- "They migrate vertically through the ocean by changing ballast, and they can be steered horizontally by gliding on wings at about a 35 degree angle. They generally broach the surface six times a day to contact Mission Control via satellite. During brief moments at the surface, they transmit their accumulated data and receive instructions telling them how to steer through the ocean while submerged. Their speed is generally about half a knot."
- "the backbone of our climate monitoring capability is our permanent fleet of 480 [gliders]"

Argo

- The ocean's role in climate
- Global system for sustained observation of ocean temperature, salinity, velocity

courtesy Dr. Dan Rudnick
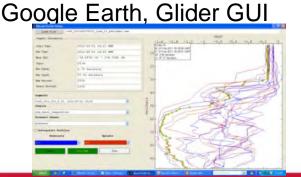
Trans-Atlantic Education

Social networking tools developed to enable collaboration between scientists and students in the U.S., Canada, Spain and Portugal.

Interactive Data Interface
Google Earth, Glider GUI

Web Portal

Briefing Blog

JERSEY ROOTS, GLOBAL REACH

Coastal Ocean
Observation Lab