

Systematic Telepresence Enabled Exploration





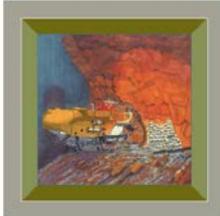
Craig Russell
Program Manager
Okeanos Explorer

Katy Croff Bell
Vice President
Ocean Exploration Trust

Drivers

DISCOVERING

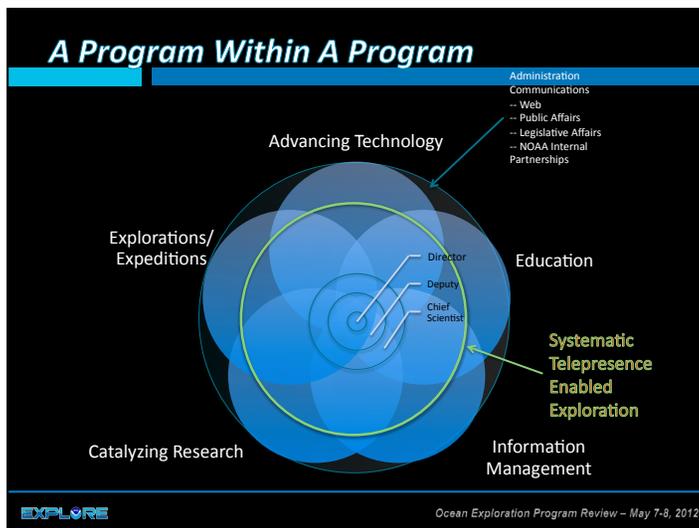
EARTH'S FINAL FRONTIER:
A U.S. STRATEGY FOR OCEAN EXPLORATION



The Report of the President's Panel for Ocean Exploration



Ocean Exploration Program Review – May 7-8, 2012



Agency Mission Alignment

“...in many instances, scientists have virtually no data.” (p. 19)



Climate
Adaptation and
Mitigation



Healthy Oceans



Resilient Coastal
Communities and
Economies





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Priority Setting

- Community Input: Workshops and white papers
- Agency mission drivers and priorities
- Existing Partnerships
- Available Budget
- Ship time allocations
- Opportunistic Partnerships

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Evolving a New Paradigm



Science Advisory Board



Ocean Exploration Advisory Working Group

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Development Partners

Joint Project Agreement

MYSTIC AQUARIUM RESEARCH

VISIT THE AQUARIUM | ANIMALS & EXHIBITS | FUN & LEARNING | INSTITUTE FOR EXPLORATION | AQUATIC RESEARCH

Institute for Exploration

The Institute for Exploration (IFE) is dedicated to research in the aquatic sciences, especially pertaining to human and natural history in the oceans. Under the direction of [Dr. Robert Ballard](#), IFE develops advanced [deep-sea vehicle systems](#) to conduct this research, as well as educate students and the general public about our work.

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Inner Space Center

The Inner Space Center at the University of Rhode Island Graduate School of Oceanography is a state of the art facility to support ocean exploration and education programs. It relies on "telepresence" technologies to transport scientists, educators, students, and worldwide audiences to remote expeditions in real-time, and provides instantaneous access to real oceanographic data and video content, both live and previously captured. The Center also supports exciting educational initiatives to promote ocean literacy.

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Center for Coastal and Ocean Mapping
Joint Hydrographic Center

About Us Research Education Outreach News & Events People Facilities

Where in the World?

During the 2011 field season, CCOM/JHC researchers and students participated in more than a dozen cruises around the world. Ten of these cruises are summarized in the new issue of the Center's newsletter, *The Anchor*.

[Learn More](#)

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Evolving a New Paradigm

Innovate, Incubate, Integrate
noaa research
NOAA'S OFFICE OF OCEANIC AND ATMOSPHERIC RESEARCH

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
Marine and Aviation Operations
NOAA's Office of Marine and Aviation Operations (OMAO)

NOAA FISHERIES SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

1
NOAA

NOAA SATELLITE AND INFORMATION SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

National Oceanic and Atmospheric Administration
National Weather Service

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Development Partners

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Development Partners

NOAA Ocean Exploration Advisory Working Group
Summary Workshop Report
Planning the Maiden Voyage of the Okeanos Explorer
May 10-11, 2007 Washington D.C.

NOAA Office of Ocean Exploration and Research
Workshop to Plan "Empire-to-Exhibit"
Expeditions for the Atlantic

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Traditional Expedition Science Team – On Board



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Traditional Expedition Science Team – On Shore

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New Expedition Science Team – On Board



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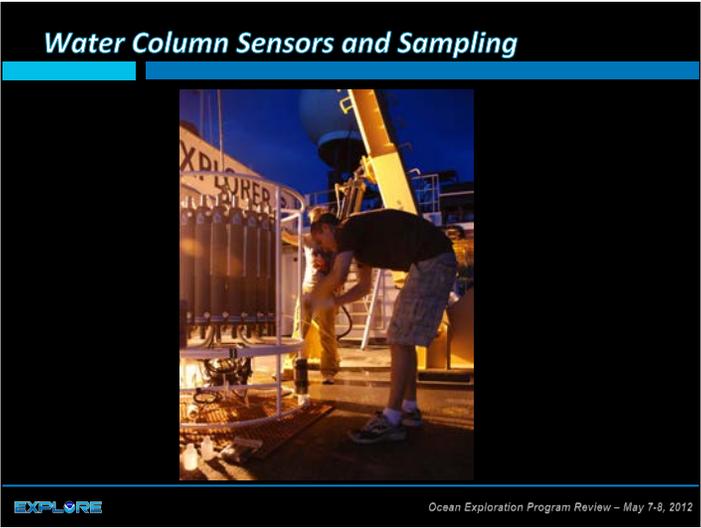
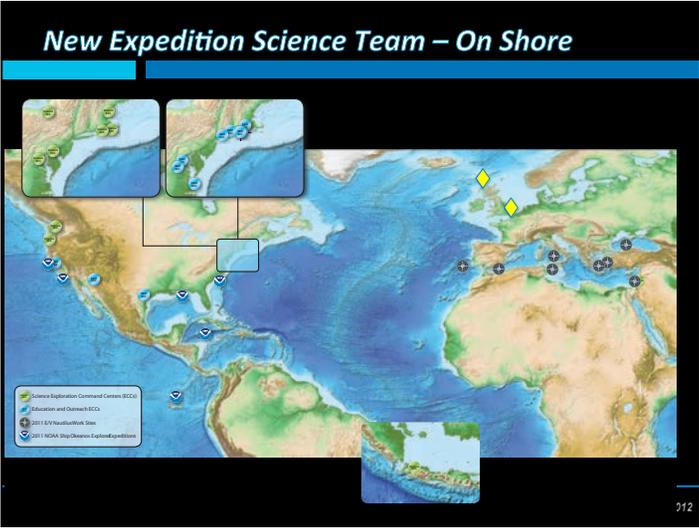
New Expedition Science Team – On Shore

“On Watch/Duty” and/or “On Call”

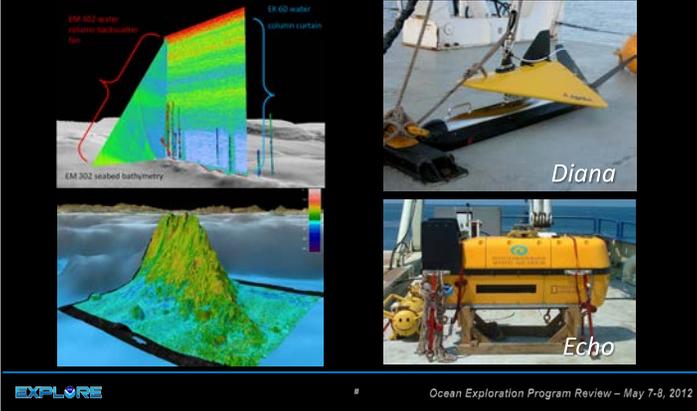


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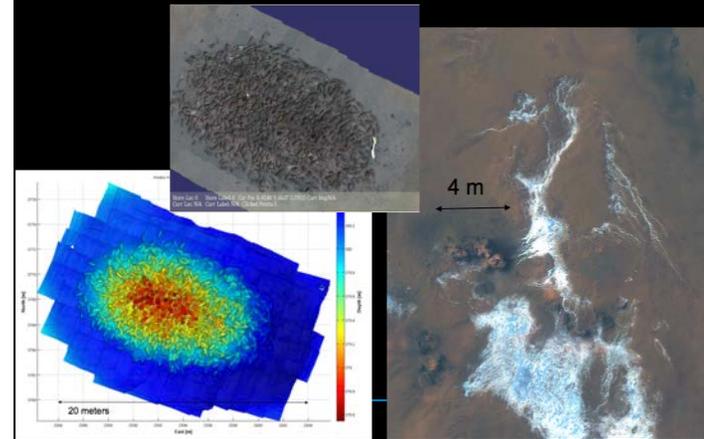
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Bottom and Water Column Mapping Systems



Tech Development: High-resolution seafloor mapping



Remotely Operated Vehicles



Towsled/Camera Platform HD Cameras



ROV HD Cameras

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Integrated Control Rooms

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High Speed VSAT Satellite Link

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Reaching Others In New Ways

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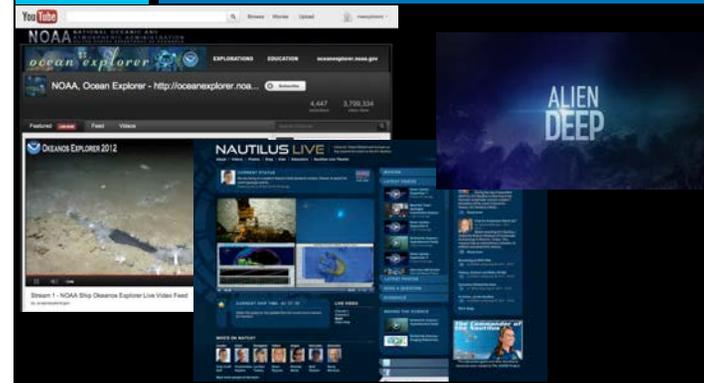
Training the Next Generation of Explorers



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Inspiring a global audience



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Leaving a Legacy of Standards-Based Data

- NGDC, NODC, NOAA Library
- Digital Atlas (NCDDC)
- Web sites



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Exploration Vessel Nautilus



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NAUTILUS 2011 Field Program



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Building partnerships and catalyzing others



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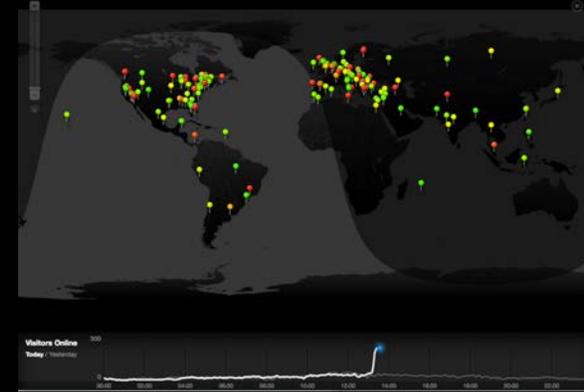
24-hour ROV Operations: High Efficiency



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24-hour ROV Operations: Global Reach



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24-hour ROV Operations: Shore Staffing Challenge



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24-hour ROV Operations: Video Challenge



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Opportunistic Exploration



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Cultural Discoveries



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Kolumbo Underwater Volcano



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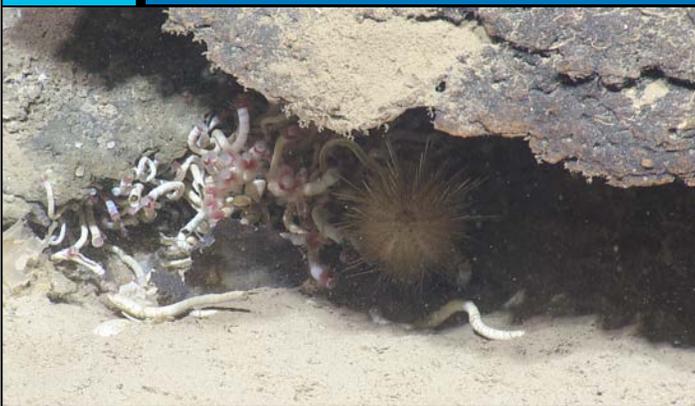
Aeolian Arc Hydrothermal Systems



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New gas deposits off Israel and Cyprus



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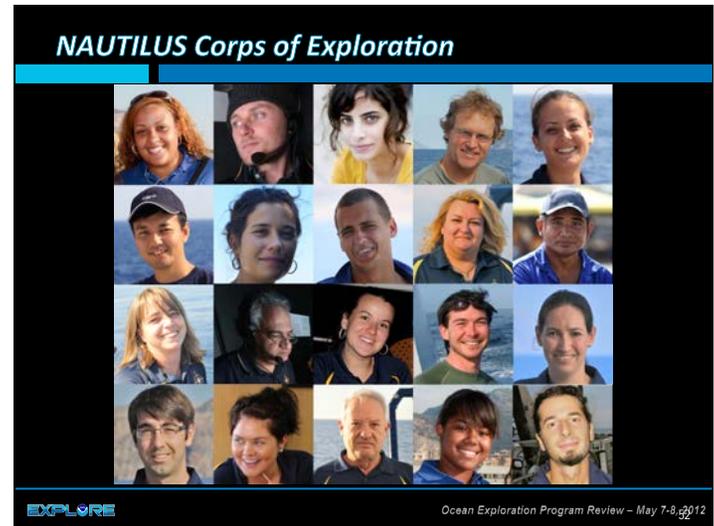
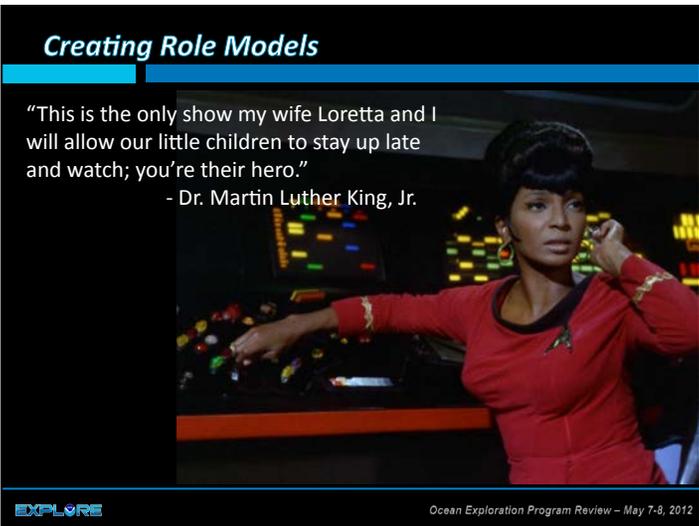
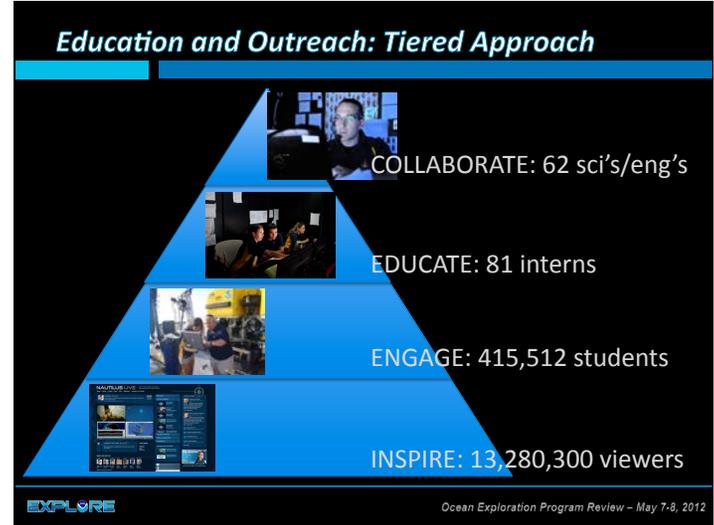
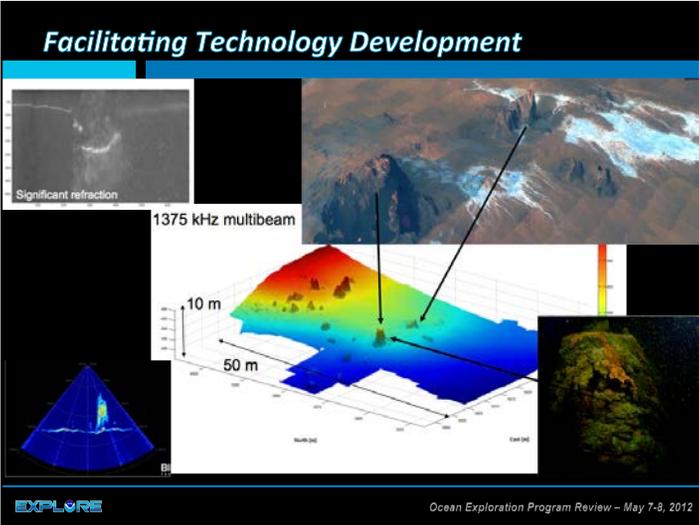
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Sample Collection, Archiving, and Access

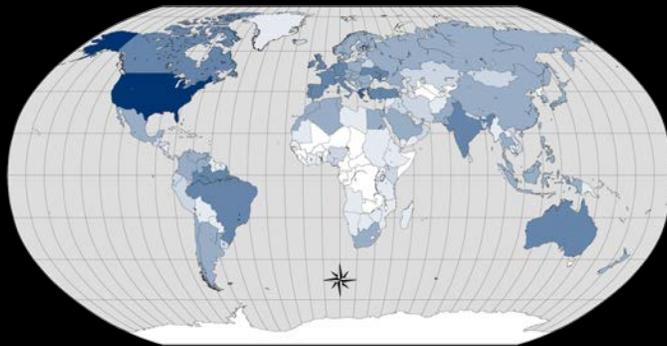


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Global Reach



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Scientists and Engineers are Cool!



"Working on Ms. Weavers science homework... Doing key terms for our science book... Reminds me of Nautilus SO much... We have words like Sonar, Mid-Ocean Ridge lol"

"How did you get this job? What school did you have to go to? PS I love your work!!!"

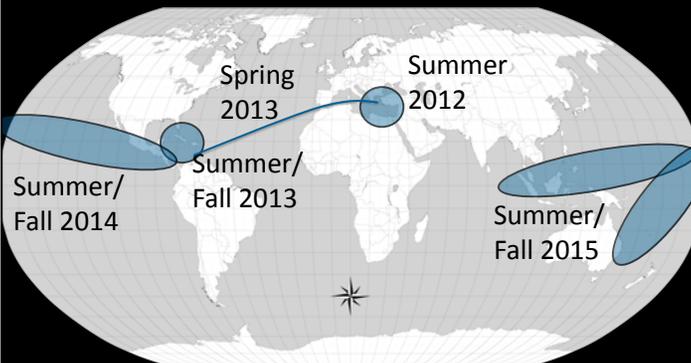
"I Like Hypack 2 because it shows under-sea elevation."

"You guys are soooooo interesting and cool. I want to meet you. What wildlife have you seen on your odyssey?"

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Future Plans



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Highlights

From June 18 to August 14 2010, NOAA and Indonesian partners jointly explored the deep Celebes Sea.

*Science
Operations
Diplomacy
Partnerships
Education
Outreach*

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President Obama Cairo Address



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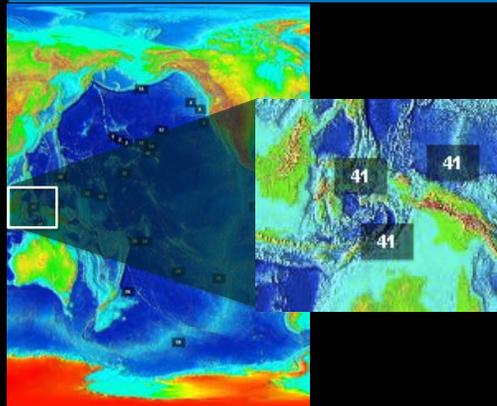
Embassy Jakarta Initiative



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Community Priority Target



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Implemented Telepresence Enabled Exploration



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Scientific Collaborations



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Building Relationships



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Joint Ship Operations



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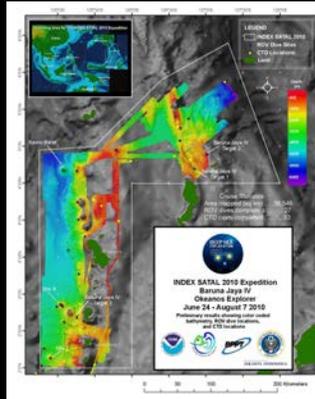
Joint Ship Operations



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Mapping on both ships



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ROV Exploration



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Revealing biodiversity runs deep



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Live Interactions with VIPs, Public and Media



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International, National, Local and Web Media

The collage features three main elements:

- The Economist:** An article titled "Ocean diversity: What lies beneath" with a sub-headline "A new expedition to the deep-ocean is revealing previously unknown living treasures." dated Aug 30, 2010.
- The Washington Post:** An article titled "Deep-sea images reveal colorful life off Indonesia" by Robin Muciwell, dated Thursday, August 26, 2010, 12:53 PM. The article mentions "Scientists using cutting-edge technology to explore waters off Indonesia were wowed by colorful and diverse images of marine life on the ocean floor - including plate-sized sea spiders and flower-like sponges that appear to be camouflaged." and notes "They predicted Thursday that as".
- Ocean Explorer Website:** A screenshot of the "OCEANOS" website with a "DEEP SEA EXPLORATION" banner.

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From collection to archives in 6 weeks

The screenshot shows the NOAA National Geophysical Data Center website. The main content is a table titled "EK1004 Data File List" with columns for "File Name", "File Size", and "Description". The table lists 13 files in "Binnet multibeam format". To the right, there is a map of the Pacific Ocean with a "Data Explorer" window overlaid, showing a ship's track and a data point.

File Name	File Size	Description
0001_20100808_000000_01_01_010808_00	2.0 MB	Binnet multibeam format
0001_20100808_000000_02_01_010808_00	20A.0	Binnet multibeam format
0001_20100808_000000_03_01_010808_00	22.1	Binnet multibeam format
0001_20100808_000000_04_01_010808_00	121.4	Binnet multibeam format
0001_20100808_000000_05_01_010808_00	47.8	Binnet multibeam format
0001_20100808_000000_06_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_07_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_08_01_010808_00	6.7 MB	Binnet multibeam format
0001_20100808_000000_09_01_010808_00	14.8	Binnet multibeam format
0001_20100808_000000_10_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_11_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_12_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_13_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_14_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_15_01_010808_00	10.0	Binnet multibeam format
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0001_20100808_000000_17_01_010808_00	10.0	Binnet multibeam format
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0001_20100808_000000_19_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_20_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_21_01_010808_00	10.0	Binnet multibeam format
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0001_20100808_000000_23_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_24_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_25_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_26_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_27_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_28_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_29_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_30_01_010808_00	10.0	Binnet multibeam format
0001_20100808_000000_31_01_010808_00	10.0	Binnet multibeam format

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NOAA-Google CRADA Activities

A satellite view of the Pacific Ocean region, showing the western coast of North America, the Hawaiian Islands, and the eastern coast of Asia. The Google Earth logo and copyright information are visible in the bottom right corner.

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The Result...

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The Result

1

Hard Fought Success for
NOAA , US and Republic of
Indonesia

- ✓ Telepresence
- ✓ Science
- ✓ Diplomacy
- ✓ Partnership
- ✓ Education
- ✓ Outreach

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Catalyzing Partnerships

"I cannot find a better example of how the 'Indonesia-US Comprehensive Partnership' is being executed in terms of the soft power relationship than the present scientific cooperation of INDEX-SATAL 2010...."



-Amb. Dino Djalal, Indonesia
Ambassador to the U.S and former
spokesperson for President
Yudhoyono

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Looking Ahead - How can we...

- Move forward with "advancing technology"
- Change or overcome increasingly constraining business process with increasing transaction costs
- Build a national ocean video infrastructure for easy archive and public access

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Looking Ahead - How can we...

- Best expand the new model
- Overcome challenges to developing and sustaining partnerships
- Best demonstrate return on investment
- Tap into "crowdsourcing" and the knowledge commons under outdated "policies" and "practices"

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Systematic Telepresence Enabled
Exploration

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Thank you!

	
Craig Russell Program Manager <i>Okeanos Explorer</i>	Katy Croff Bell Vice President Ocean Exploration Trust