

NDSF Operator's Report

DESSC Meeting
Dec. 12, 2004



Personnel Changes

NDSF Operator's Report

- **Bob Detrick replaced Dick Pittenger as *WHOI's Vice President for Marine Facilities and Operations.***
- **Liz Caporelli replaced Jon Alberts as *Marine Operations Coordinator.***
- **Dan Fornari stepped down as *Chief Scientist of Deep Submergence;* now Director of *WHOI's Deep Ocean Exploration Institute.***

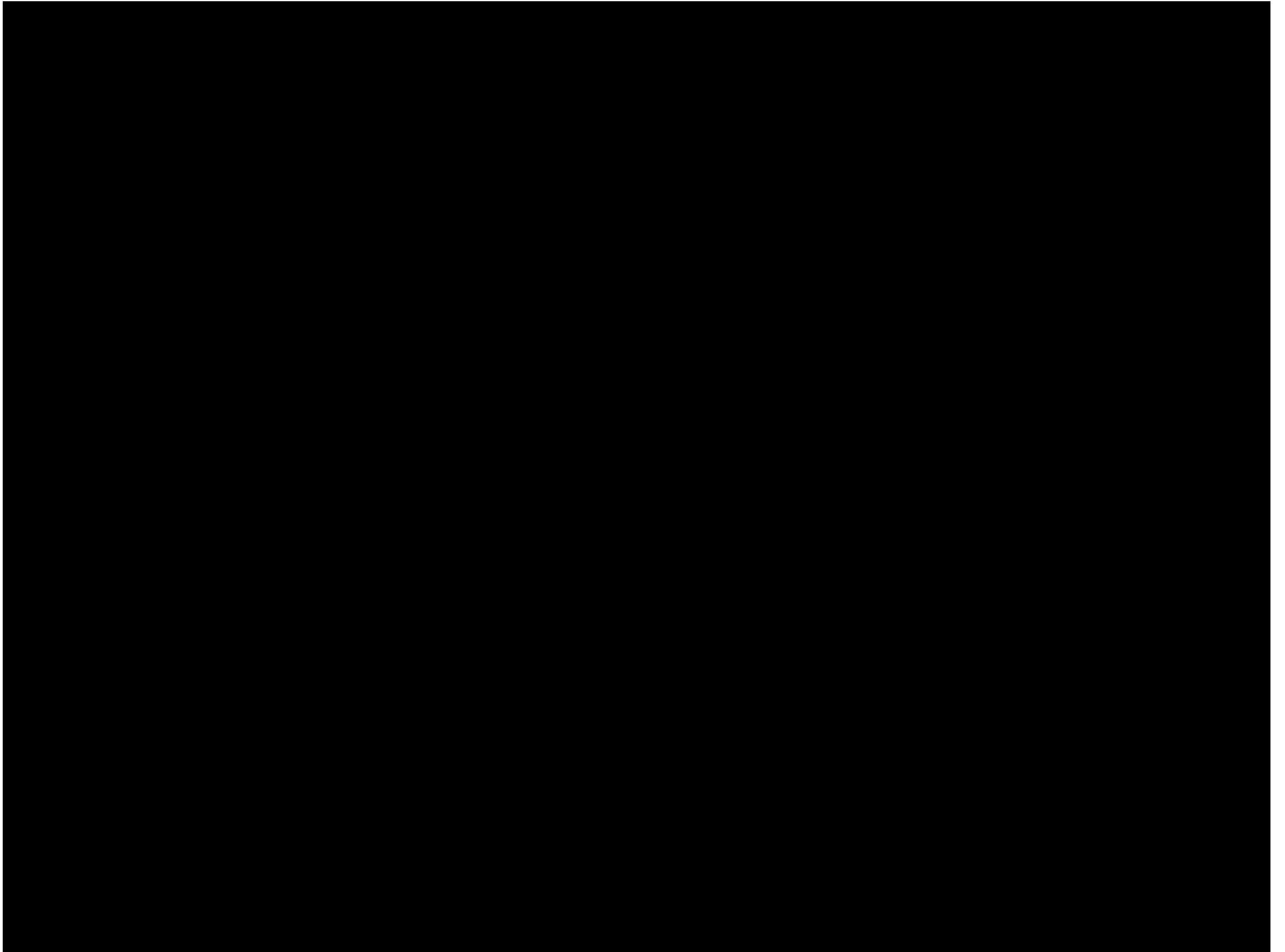


Chief Scientist of Deep Submergence (CSDS) Search

NDSF Operator's Report

- **Search committee formed and position nationally advertised in Spring 2004.**
- **Candidates interviewed in Summer 2004.**
- **Maurice Tivey offered and accepted CSDS position through end of 2005; pending his appointment to the WHOI senior scientific staff, Chris German will assume CSDS position in 2006.**





2004 NDSF Operations Summary

NDSF Operator's Report



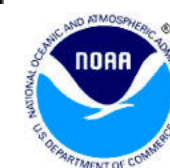
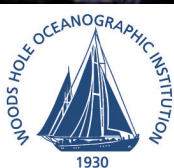
DSV-2

ALVIN

1964-2004



40 years
4,000 dives



2004 ALVIN Operations Summary

NDSF Operator's Report

(as of 12/1/04)

- **213 operating days**
- **9 science cruises**
- **113 days on station**
- **102 dives**
- **766 hrs submerged (*32 days*)**
- **7.5 hrs avg/dive**
- **474 hrs on bottom (*20 days*)**
- **4.7 hrs avg bottom time/dive**
- **2,473 m average depth**
- **\$2.4M budget**

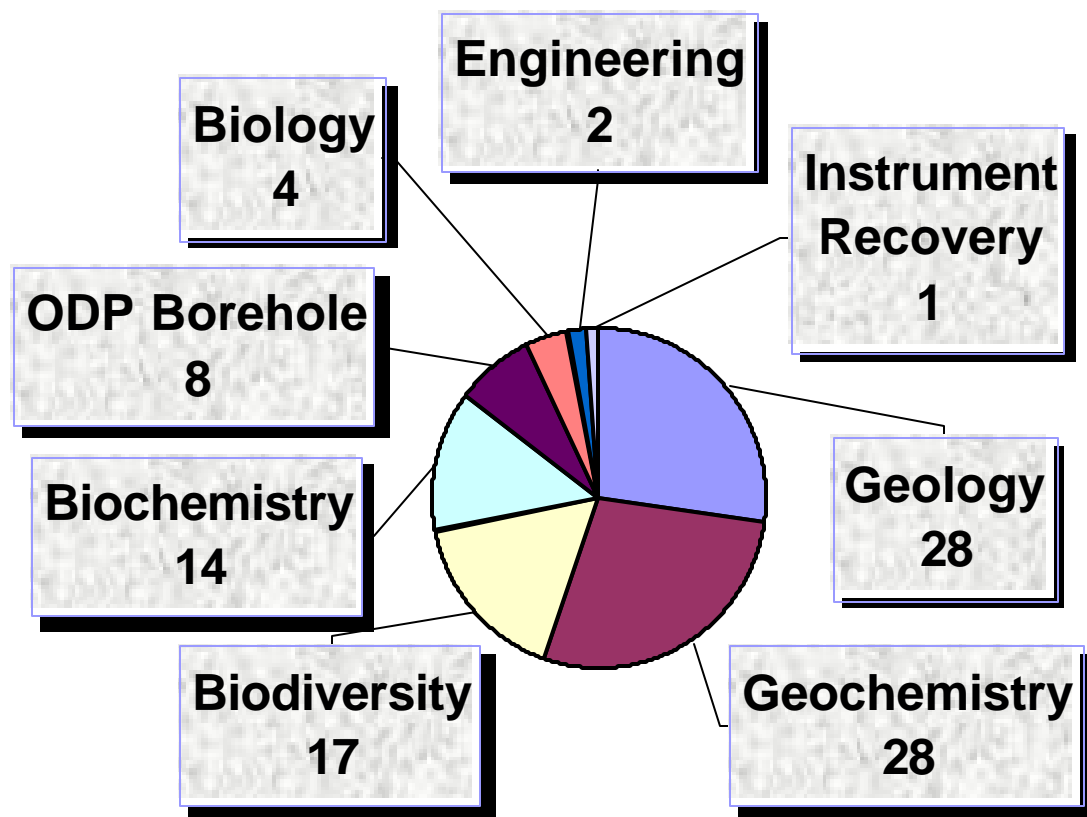


Current Ops Group:
3 pilots
6 technicians



ALVIN Dive Discipline Breakout

NDSF Operator's Report



All 2004 dives were in the Pacific, including the Gulf of Alaska



NDSF Support Ships in 2004

NDSF Operator's Report

UNOLS vessels used in support of NDSF 2004 operations:

- *R/V Atlantis* (8 *Alvin* legs)
- *R/V Knorr* (2 *Jason II* legs)
- *R/V Revelle* (2 *Jason II* legs)
- *R/V Thompson* (*Jason II DSL-120* leg)
- *R/V Kilo Moana* (*DSL-120* leg)



2004 ROV Operations Summary

NDSF Operator's Report

- **193 operating days**
- **7 science cruises**
 - *4 different ships*
 - *operations from 32S to 53N*
- **46 lowerings**
 - 39 Jason, 7 DSL-120a
- **1,224 hrs on bottom (51 days)**
- **328,000 framegrabs from video**
- **100th Jason dive**
- **Longest Jason lowering to date (71 hrs on bottom)**
- **First combined Jason/ABE ops**
- **\$3.3M budget**



Tethered Vehicle Activities '04

NDSF Operator's Report

- Replacement control vans (planning underway for swap 12/05)
- Designing new shop area (Blake Lab renovations)
- *New Medea*
- Surface location beacon (GPS/Iridium)
- SM2000/DSL120a test/evaluation
- Science pan & tilt (with camera)
- First use of slack-tensioner
- Homer probes
- New corers
- Fall WHOI dock trial/maintenance period
- Auto altitude (DVL or Simrad altimeter as input)
- Initial evaluation of *Jason* to *Medea* navigation
- New DVD duplication station

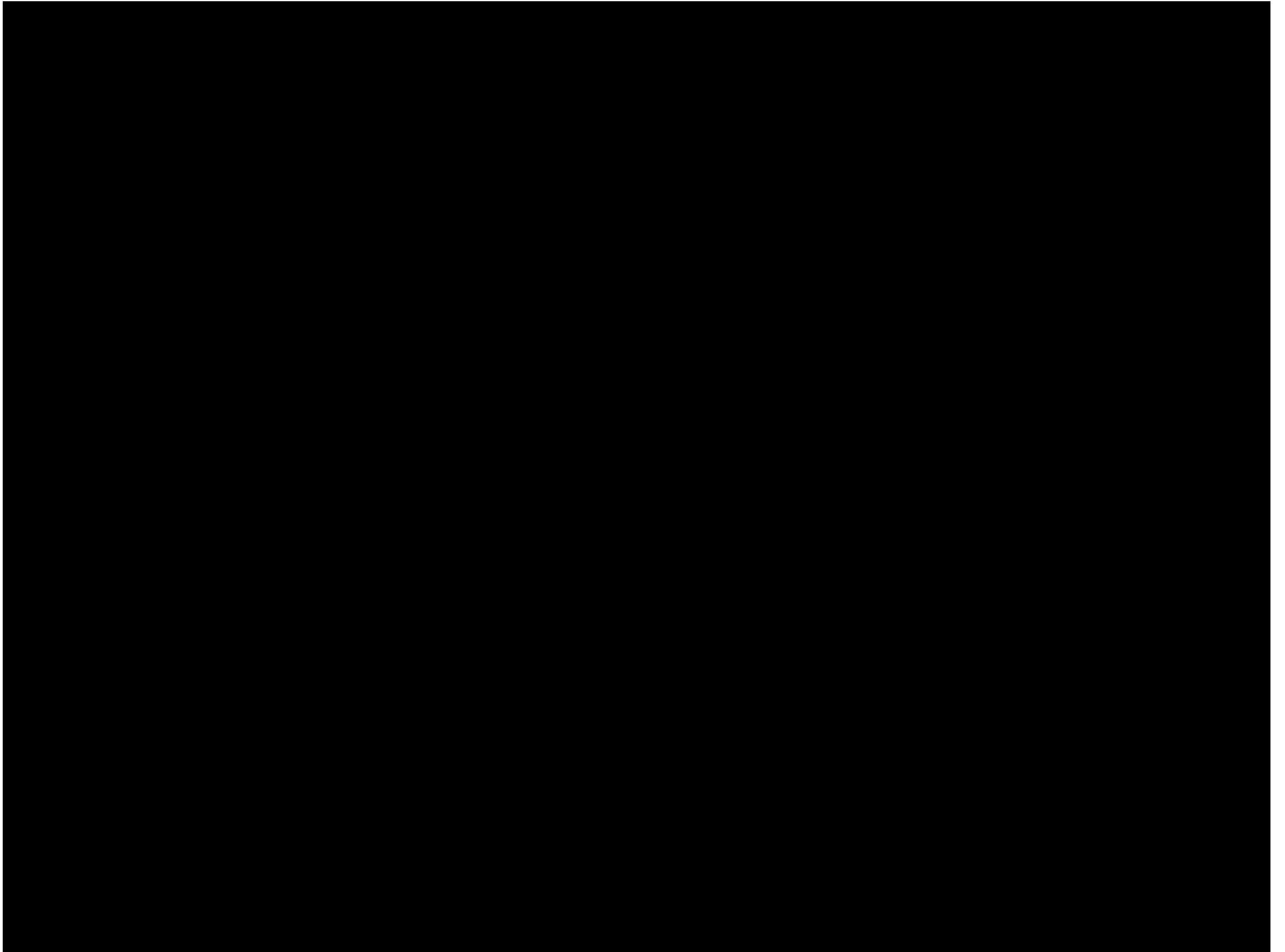


Support Ship Issues

NDSF Operator's Report

- **Variability in DP operations from vessel to vessel (possible problems with ship propulsion; especially AGOR-23 bow thrusters)**
- **Lack of consistent crew training/experience in use of DP systems**
- **Operators moving cruises without discussing ramifications on ROV ops**
- **Lack of consistency among ship operators with respect to mob/demob and shipboard crew/tech expectations; billing procedures; definition of an in-port day**
- **Security for vessels in port**
- **U.S. Customs require original signed 4455 Certification of Registration; (URL for the form on the WHOI web site below)**
http://www.whoi.edu/marine/ndsf/cruise_planning/forms/intl_ship_summ.pdf





WHOI *Access to the Sea* Task Force

NDSF Operator's Report

- **Internal Task Force charged with developing a vision for the types of ships, vehicles, and ocean observing systems that will be required over the next 10-15 years to address the highest priority scientific questions in the oceans**
- **Four working groups on Ships and Ship Operations; Vehicles and NDSF; Ocean Observatories and Observing Systems; Scientific Data Management**
- **Report completed in July 2004**



Access to the Sea Task Force NDSF-Related Recommendations

NDSF Operator's Report

- **DESSC, UNOLS and the funding agencies need to consider how NDSF will evolve over the next 5-10 years in light of the increasing numbers of tethered and autonomous vehicles in the community and the expected increase in demand for deep submergence assets by ocean observatories.**
- **Future vehicle needs include new HOV; HROV/AUV; *ALVIN* rescue vehicle; observatory-capable ROV, AUV.**

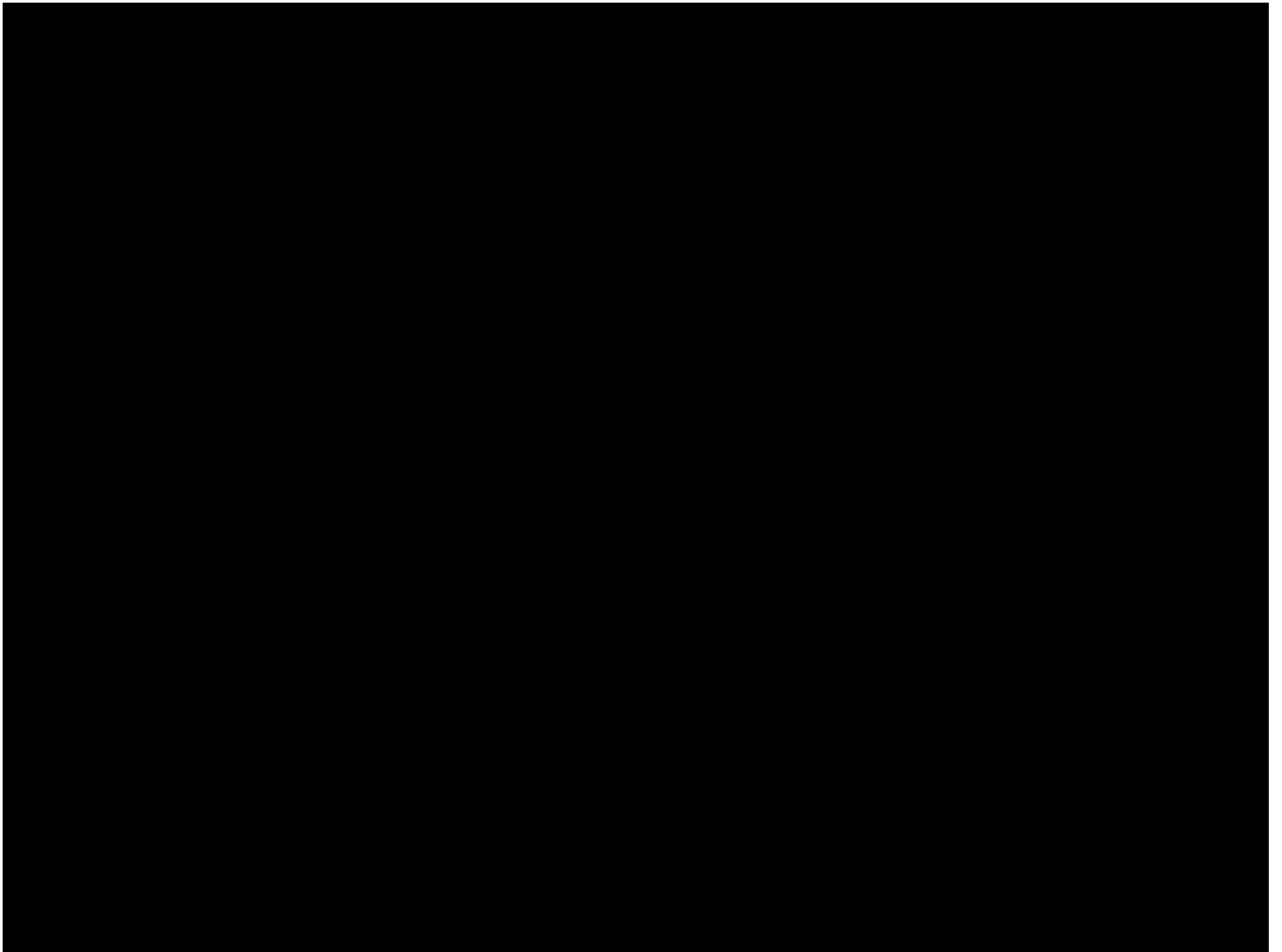


***Access to the Sea* Task Force NDSF-Related Recommendations**

NDSF Operator's Report

- **NDSF needs to establish data protocols and procedures to insure the quality of data collected by NDSF vehicles, and develop the proper tools to process, archive and serve these data to potential users.**
- **NDSF needs to more closely integrate the *Alvin* and ROV operations groups to emphasize the common elements shared by all vehicles.**
- **NDSF management and DESSC continue to work together to identify ways of obtaining candid feedback from users of NDSF vehicles.**





NDSF Archiving

NDSF Operator's Report

- 1. Frame Grabber - *Alvin* and *Jason2*, and WHOI Ships**
Examples and practical approach to providing useful data and metadata on a real-time and archiving basis as well as a template for migration of legacy data.
- 2. Summary of income from NDSF vehicle imagery/data and WHOI outreach**
(~ 1/2 FTE at WHOI deals with NDSF imagery issues)



NDSF Archiving

NDSF Operator's Report

1. Frame-grabber - *Alvin* and *Jason2*

The screenshot displays the Jason Virtual Control Van interface. At the top, three monitors show underwater footage: MONITOR 1: SubSea1, MONITOR 2: SubSea2, and MONITOR 3. Below the monitors is a data table with the following information:

DAQ: atlv720 Jason	Time: 2002/09/17 18:37:51	Hdg: 206.460 Lat: 47 57.285069 N Lon: 129 5.770818 W	Alt: 4.320 Depth: 2169.686 Bathy: 2174.006	DegC: 2.014 Cond: 3.142 Salin: -999.000 SVel: -999.000 MagX: 59600.0 MagY: 209600.0 MagZ: 319666.7 MagT: 507471.3	Live Video Sub Sea2 Sub Sea1 Plot Maps Daily / Hourly Local Area Search Results
Type: EVT NavSrc: JA32 AltSrc:		X: 5108.960 Y: 6784.448 Z: Pitch: -13.560 Roll: 1.740			
Event: TXT bottle filling					

Below the data table is a control panel with a search bar, playback controls (7290 of 8666), and a refresh rate of 5. A log window shows the following entries:

```

7290. 2002/09/17 18:37:51 EVT bottle filling
7291. 2002/09/17 18:38:09 EVT sample done
7292. 2002/09/17 18:39:56 EVT major 15 at 212 degrees
7293. 2002/09/17 18:44:52 EVT going to the base to look for a Lang sampling site
7294. 2002/09/17 18:55:58 EVT no location here for the lang sampler.
    
```

At the bottom of the interface, it shows "atlv720 - Juan De Fuca", "CRUISE INFO | SELECT ANOTHER CRUISE", and "Jason Virtual Control Van".



Virtual Van Image Highlights

NDSF Operator's Report

VirtualVan Highlights - Netscape



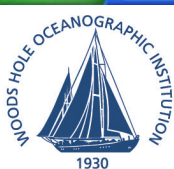
VirtualVan Highlights

CruiseID:	krus03rrl1
Vehicle:	Jason
Image:	SubSea3.20040714_171027.jpg
Time:	2004/07/14 17:10:27
Latitude:	53 8.685945 N
Longitude:	163 34.588337 W
Heading:	57.770
Depth:	4822.702
Altitude:	1.640
Classification:	BIO.jellyfish
Description:	Jellyfish

Updated: Tue Oct 12 11:10:14 2004

Edit Highlight: 
Goto: [ImageView](#)

Image 11 of 180



NDSF Archiving

NDSF Operator's Report

Frame-grabber - *Alvin* and *Jason2* and WHOI Ships

Main Entry Point URL:

http://www.whoi.edu/home/research/data_center.html

Entry Point URLs for *Alvin*, Ships and *Jason2*:

http://4dgeo.whoi.edu/alvin/FG_cruises.html

http://4dgeo.whoi.edu/shipdata/SDG_shipdata.html


http://www.whoi.edu/marops/vehicles/jason/van_cruises.html



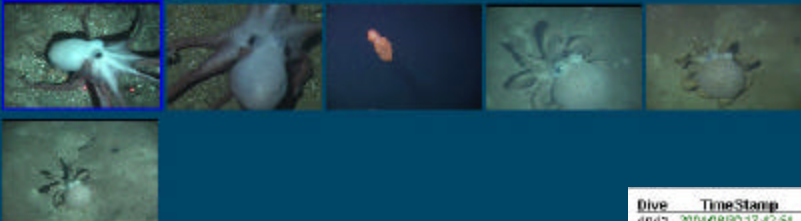
NDSF Archiving

NDSF Operator's Report

Alvin Frame-Grabber Highlights

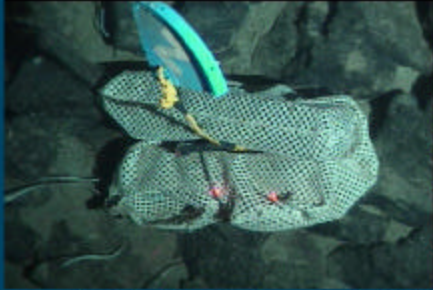


CruiseID: AT11-16
Dive: 4044
Image: SubSeaf120040831_202815.jpg
Time: 2004/08/31 20:26:16
Latitude: 42 45 27.0280 N
Longitude: 126 42 59.6920 W
Heading: 184.418
Depth: 2737.093
Altitude: 1.8
Classification: BiOctopus
Description: Octopus
 Updated: Tue Oct 12 10:09:05 2004
 Edit Highlight
 Oolo: [Frame-Grabber](#) [Image View](#)



Viewing all BiOctopus / View All Images

Alvin Frame-Grabber Highlights



CruiseID: AT11-16
Dive: 4044
Image: SubSeaf120040831_193416.jpg
Time: 2004/08/31 19:34:15
Latitude: 42 45 25.8480 N
Longitude: 126 42 57.1850 W
Heading: 104.018
Depth: 2791.209
Altitude: 1.5
Classification:
Description: Wood sample, marker N
 Updated: Thu Oct 7 16:21:23 2004
 Edit Highlight
 Oolo: [Frame-Grabber](#) [Image View](#)

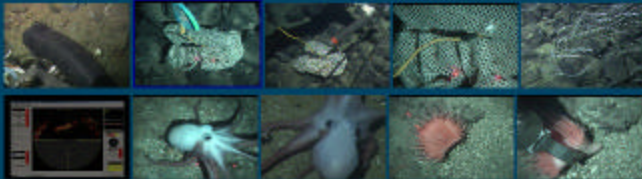


Image 33 of 110

Dive	TimeStamp	Depth	Description (AT11-16)
4043	2004/09/00 17:42:34	3257.870	Stump
4043	2004/09/00 18:52:27	3123.982	Medusa 302 (red)
4043	2004/09/00 18:53:27	3124.545	Crab
4043	2004/09/00 18:57:57	3123.149	Medusa 302 (red)
4043	2004/09/00 19:06:57	3129.351	Wood sample, marker 1
4043	2004/09/00 19:10:57	3131.097	Wood sample, marker 1
4043	2004/09/00 19:12:27	3131.637	Wood sample
4043	2004/09/00 19:45:59	3126.783	Core sample
4043	2004/09/00 20:14:32	3121.694	HiTemp 185.98 DegC
4043	2004/09/00 20:28:03	3123.640	HiTemp 173.40 DegC
4043	2004/09/00 20:35:03	3123.894	Medusa
4043	2004/09/00 20:48:33	3124.756	HiTemp sample 212.78 DegC
4043	2004/09/00 20:50:33	3124.778	Blue worms
4043	2004/09/00 20:57:36	3124.715	HiTemp probe 215.25 DegC
4043	2004/09/00 21:16:37	3127.153	Shoefish
4043	2004/09/00 21:45:38	3129.532	starfish
4044	2004/09/01 19:34:16	2701.255	Wood sample, marker N
4044	2004/09/01 19:37:46	2701.262	LoTemp 1.50 DegC
4044	2004/09/01 19:42:16	2701.343	wood close-up with crab
4044	2004/09/01 20:22:18	2732.035	Sonar display
4044	2004/09/01 20:26:18	2737.093	Octopus
4044	2004/09/01 20:29:48	2737.139	Octopus
4044	2004/09/01 20:35:18	2740.064	Red anemone
4044	2004/09/01 20:35:48	2740.132	Red anemone sample
4044	2004/09/01 20:42:48	2741.354	Red anemone and tube worms
4044	2004/09/01 20:47:18	2741.332	White anemone and tube worms
4044	2004/09/01 20:49:48	2741.366	Tube worms
4044	2004/09/01 21:04:49	2745.537	Octopus
4044	2004/09/01 22:04:21	2723.233	blue
4044	2004/09/01 22:05:21	2723.233	clisclip
4044	2004/09/01 22:10:31	2722.078	Hydrothermal Flare
4044	2004/09/01 22:15:31	2707.968	Crab, flamingo
4045	2004/09/02 17:11:35	2212.888	Crab
4045	2004/09/02 18:00:37	2212.138	Wood at marker M



NDSF Archiving

NDSF Operator's Report

2. Summary of income from NDSF vehicle imagery/data and WHOI outreach

- 350 visual requests to date in 2004. The requestors include such diverse organizations as the National Academies, National Science Foundation, Office of Naval Research and NOAA, John Wiley and Son Publishers, Grolier, McGraw Hill, Dorling Kindersley Publishing in the United Kingdom, Geo Magazine, and Popular Mechanics magazine in South Africa.
- We have also provided materials for many exhibits and special presentations at such locations as the American Museum of Natural History in New York City, Museum of Science in Boston, The Ocean Institute in Dana Point, CA, the Hull Museum in London, and museums in Austria and Germany.
- We also responded to dozens of educators around the country sharing information with their classrooms separate from the many web sites and other educational activities we also support with images and information, such as Dive and Discover, Extreme 2004, NOAA Ocean Explorer, etc.

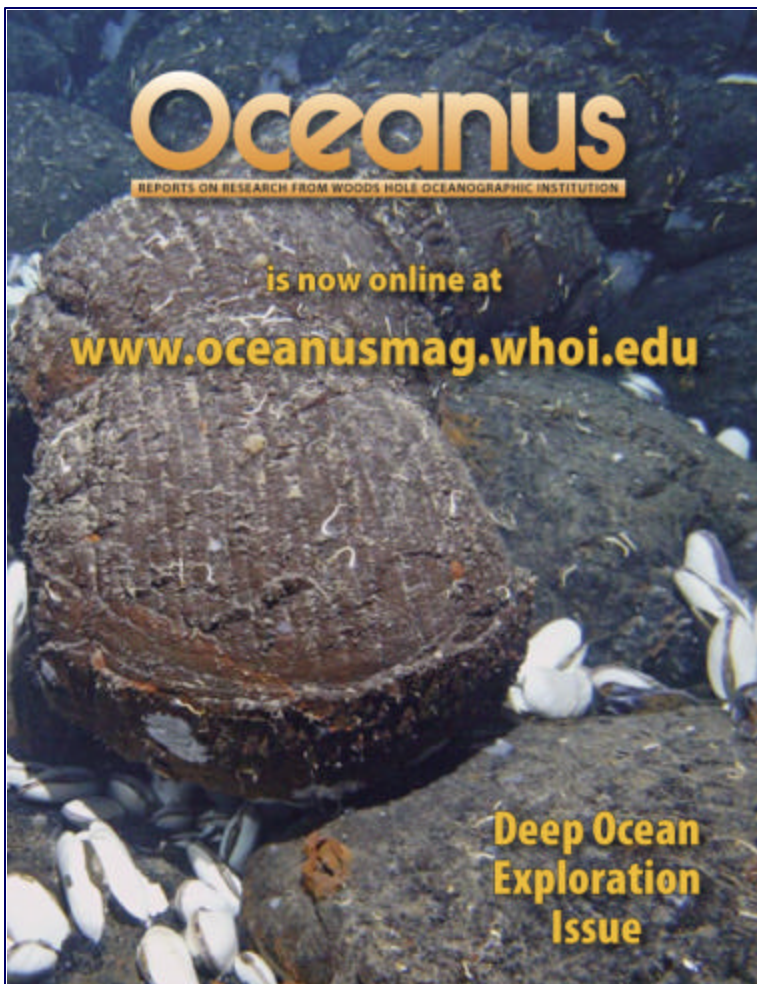
Total 2004 income received to date is \$27,898.



NDSF Archiving

NDSF Operator's Report

Oceanus - Issue on Deep Ocean Exploration



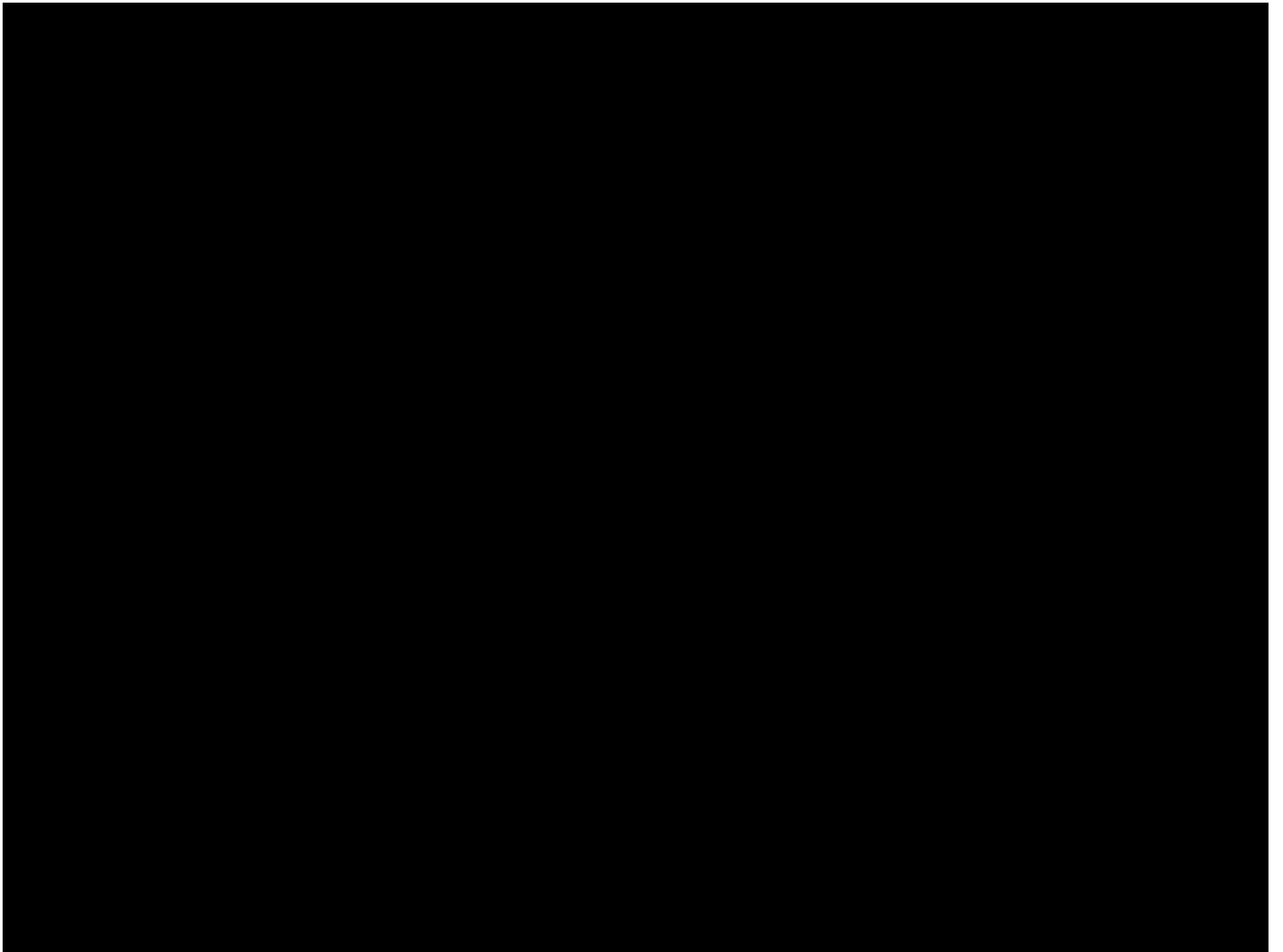
Oceanus Magazine
EXPLORING THE OCEANS IN DEPTH

Follow the latest research, discoveries, and expeditions from Woods Hole Oceanographic Institution at www.oceanusmag.whoi.edu or sign up online to receive printed issues at www.oceanusmag.com.
For more information, e-mail deepwood@whoi.edu or call (508) 289-3516.

Table of Contents: Deep Ocean Exploration Issue

<p>Melting the South Pole Ice Sheet by Eugene Domagala, Erik Morner, and the VIMS team</p> <p>Geological Evidence for a Middle Eocene Ice Sheet by David C. Rea, Erik Morner, and the VIMS team</p> <p>Ice Sheet Growth in the North Atlantic by Erik Morner, Erik Morner, and the VIMS team</p> <p>Hydrothermal Vents in the Mid-Atlantic Ridge by Erik Morner, Erik Morner, and the VIMS team</p> <p>Deep Ocean Exploration: A New Era of Discovery by Erik Morner, Erik Morner, and the VIMS team</p> <p>Exploring the Deep Ocean: A New Era of Discovery by Erik Morner, Erik Morner, and the VIMS team</p> <p>Exploring the Deep Ocean: A New Era of Discovery by Erik Morner, Erik Morner, and the VIMS team</p> <p>Exploring the Deep Ocean: A New Era of Discovery by Erik Morner, Erik Morner, and the VIMS team</p>	<p>Earthquake and Volcano Exploring the Deep Ocean: A New Era of Discovery</p> <p>Deep Ocean Exploration Exploring the Deep Ocean: A New Era of Discovery</p> <p>Deep Ocean Exploration Exploring the Deep Ocean: A New Era of Discovery</p> <p>Deep Ocean Exploration Exploring the Deep Ocean: A New Era of Discovery</p> <p>Deep Ocean Exploration Exploring the Deep Ocean: A New Era of Discovery</p> <p>Deep Ocean Exploration Exploring the Deep Ocean: A New Era of Discovery</p> <p>Deep Ocean Exploration Exploring the Deep Ocean: A New Era of Discovery</p> <p>Deep Ocean Exploration Exploring the Deep Ocean: A New Era of Discovery</p>
---	---





Survey of Future Needs and Upgrades for Deep-Submergence Biological Research

Posted March 12, 2004

37 Respondents

Macro-ecology -	28	
Microbiology -		4
Bio-instrumentation/engineers -	2	
Geology & Geophysics-	3	

*Results from Biologists only

<http://www.surveymonkey.com/s.asp?u=99909386548>



Survey of Future Needs and Upgrades for Deep-Submergence Biological Research

Survey Design:

Demographics (discipline; usage; future importance)

Tools and Samplers (usage; priority for upgrade/replacement)

Vacuum Samplers

Biobox Collection Boxes

Imaging Systems

Biological Mapping

OPEN FORUM

Demographics - experience

73% used HOVs in the past 2 years (1% never)

63% used ROVs in the past 2 years (7% never)

41% used Towed Vehicles in the past 2 years (38% never)

24% used AUVs in the past 2 years (67% never)



Tools and Samplers (12 options)

Used most often:

74% - Vacuum samplers

63% - Manipulator Claw

59% - Sediment push cores

56% - Nets and Scoops

56% - Bioboxes

40% - Water chem/in situ sensors

37% - Quantitative faunal samplers

Importance for future research:

70% - very important

61% - very important

36% - very important

28% - very important (32% not impt)

54% - very important

57% - very important

30% - very important (35% not impt)



Tools and Samplers – Upgrades (highest; high; medium; low)

Highest Priority for *Alvin*:

- 64% - Vacuum samplers
- 50% - Manipulator Claw
- 40% - Sediment push cores
- 11% - Nets and Scoops
- 29% - Bioboxes (44% impt)
- 65% - Water chem/in situ sensors
- 50% - Quantitative faunal samplers

Highest Priority for *Jason II*:

- 50% - (44% high)
- 33% - (53% high)
- 43% - (14% high)
- 25% - (25% high)
- 21% - (50% high)
- 71% - (18% high)
- 27% - (27% high)



Vacuum Samplers (Summary)

- 60% of respondents have used one in the past 3 years
- Only 22% satisfied with current samplers available with *Alvin*
- Optimal size chamber is 2 liters (37%)
- 8 to as many as possible chambers desired (56%)
- Chambers must be free of contamination, thermally insulated, removable, adjustable for size (50%)



Biobox Collection Boxes (Summary)

- 63% of respondents have used one in the past 3 years
- 55% are not satisfied with currently available boxes
- Boxes must free of contamination (61%), thermally insulated (58%), compartmentalized (58%), adjustable for size (56%); provided by the NDSF (73%); 55% of biologist use boxes not provided by themselves
- Good sealing mechanisms, Clear lids, Easy to drain



Imaging Systems (Summary)

	<i>Alvin</i>	<i>Jason II</i>
Important to current research	85%	92%
Satisfied with overall quality	49%	35%
Importance to upgrade	78%	78%
How? Camera resolution	71%	67%
How? Camera configuration	57%	60%
How? Lighting intensity	57%	60%
Importance to quantify	72%	87%
increase quantitative usability	75%	87%

Upgrade suggestions:

JII: “computer decoded holography; 3D diffractive elements instead of lenses; high-res digital still on *J2*, record the zoom and angle of the cameras”

Alvin: “record all *Alvin* channels, access to High Definition, better resolution pan and tilt on *Alvin*, move the *Alvin* 3-chip off the arm”



Biological Mapping (Summary)

	<i>Alvin</i>	<i>Jason II</i>
Prior use of vehicle to map	56%	25%
Importance of image resolution upgrade		95%
Importance to navigation resolution upgrade		91%

Comments: “Doppler navigation has been a great help with *Alvin*”

Upgrade suggestions: “The most important thing for biologists in mapping...is that the images be geo-referenced...funding should be put into continued navigation improvements”
“Make high-accuracy navigation standard rather than a potentially costly option.”



Open Forum (Selected Quotes)

“...a whole new breed of imaging systems to obtain 3-dimensional images will revolutionize the field.”

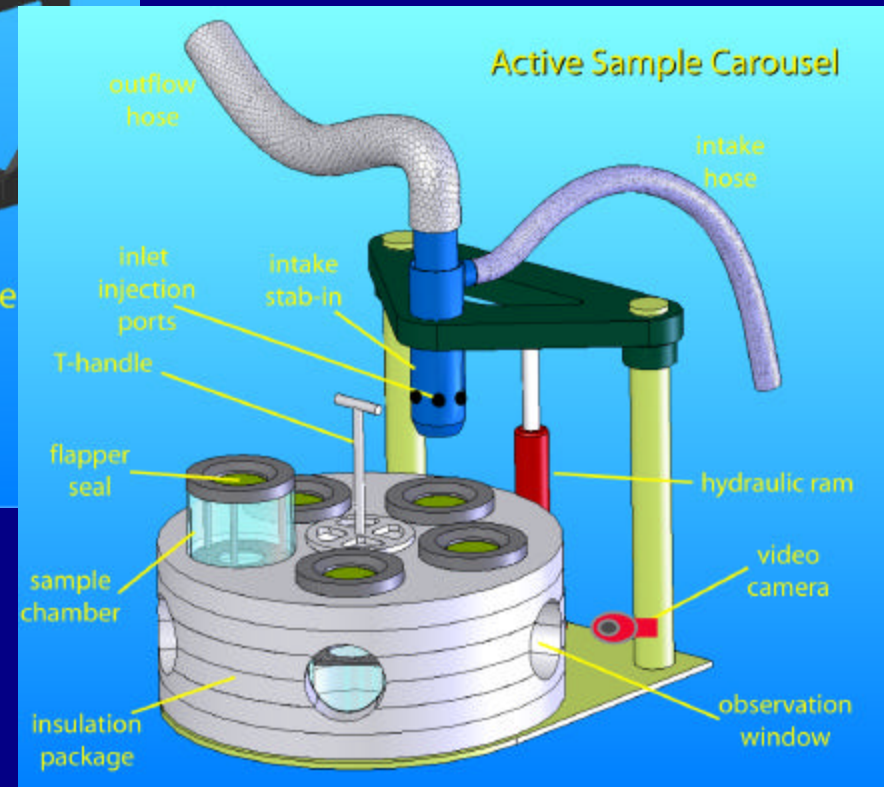
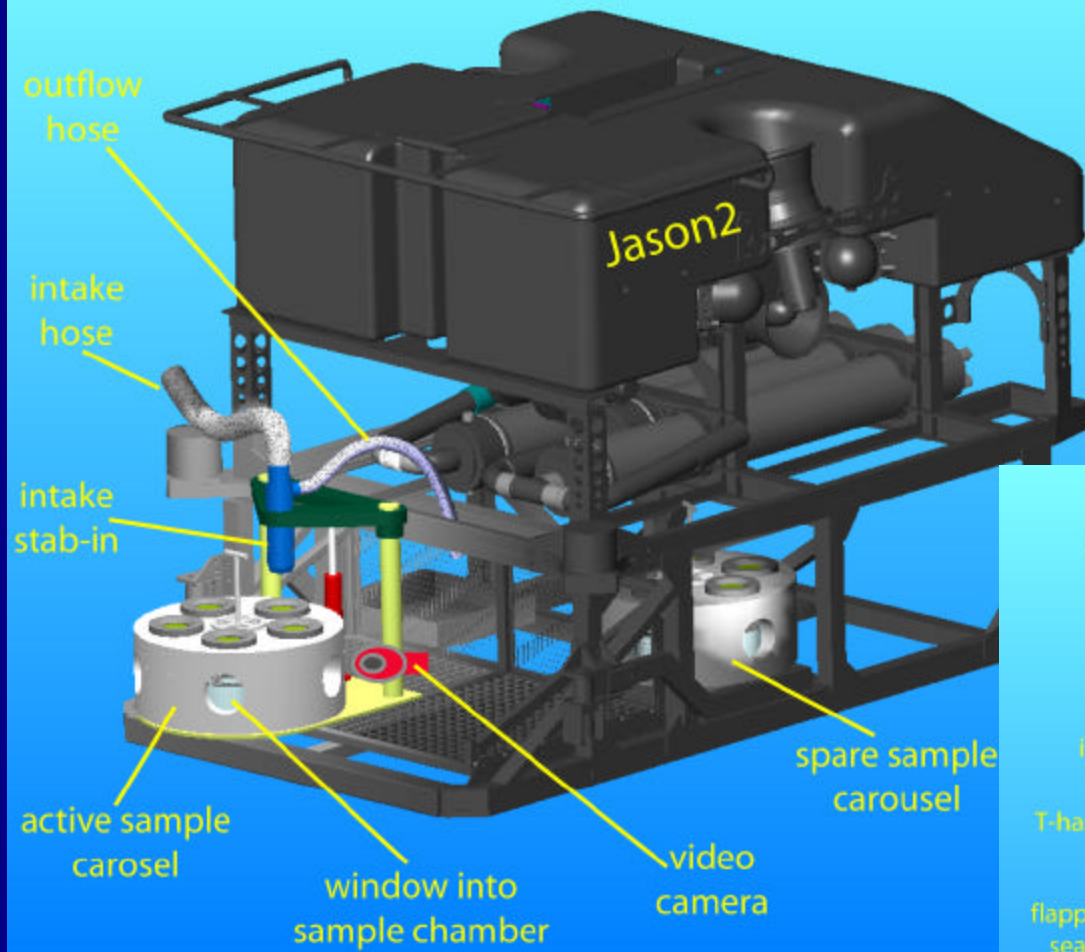
“...it would be great if there were a submersible system that could function to assist mid-water research.”

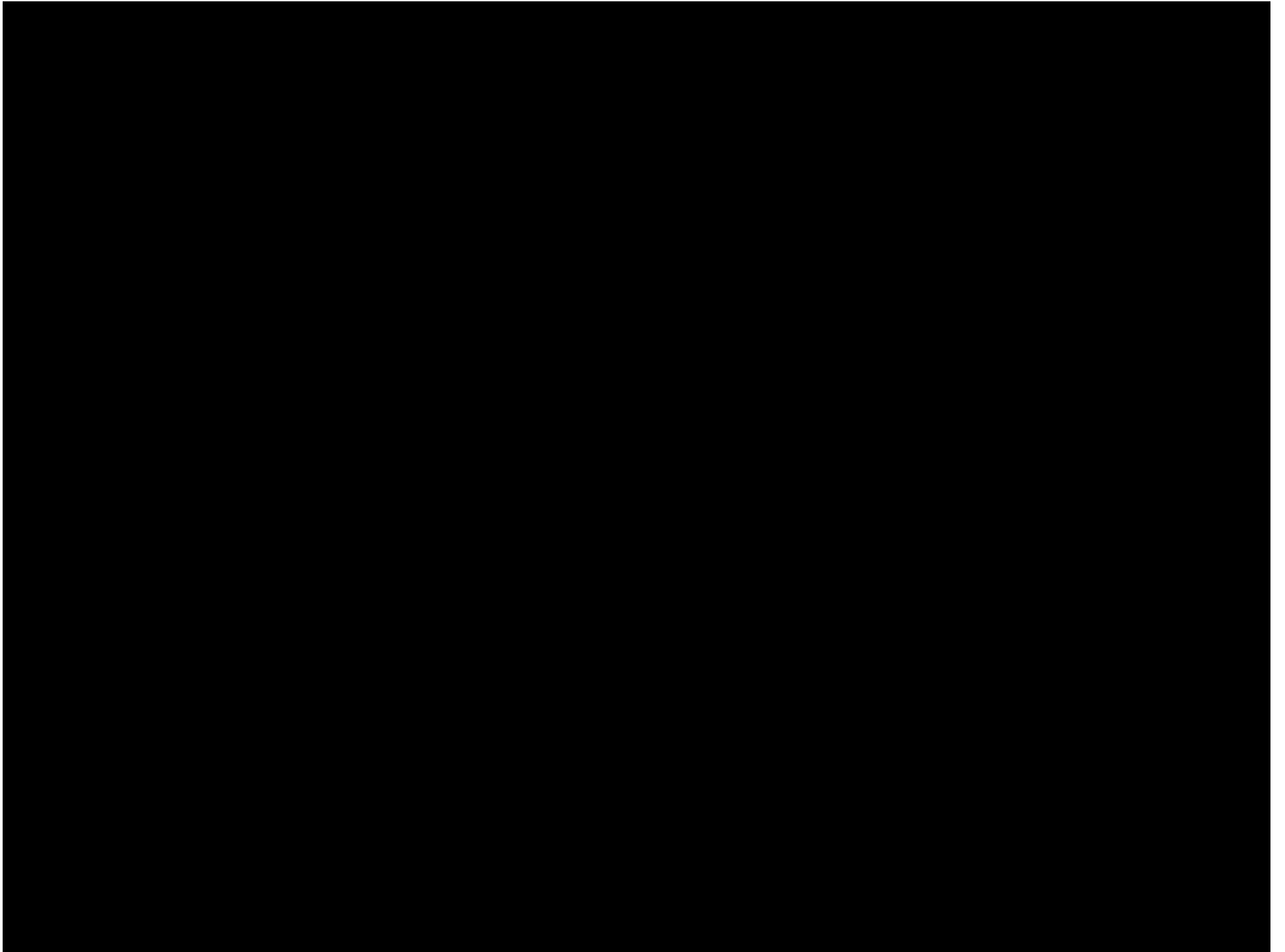
“...need a towed system that could be developed that senses a biological specimen and then takes a picture automatically. This could be towed for long periods of time and do a complete survey...independent of *Alvin*, *Jason*, or *ABE* (a new small vehicle).”

“...Use of elevators should be made more transparent...Has anyone actually compiled the data on using elevators with *Alvin* dives- are dives shorter with elevators than those without?...how often are they lost?”

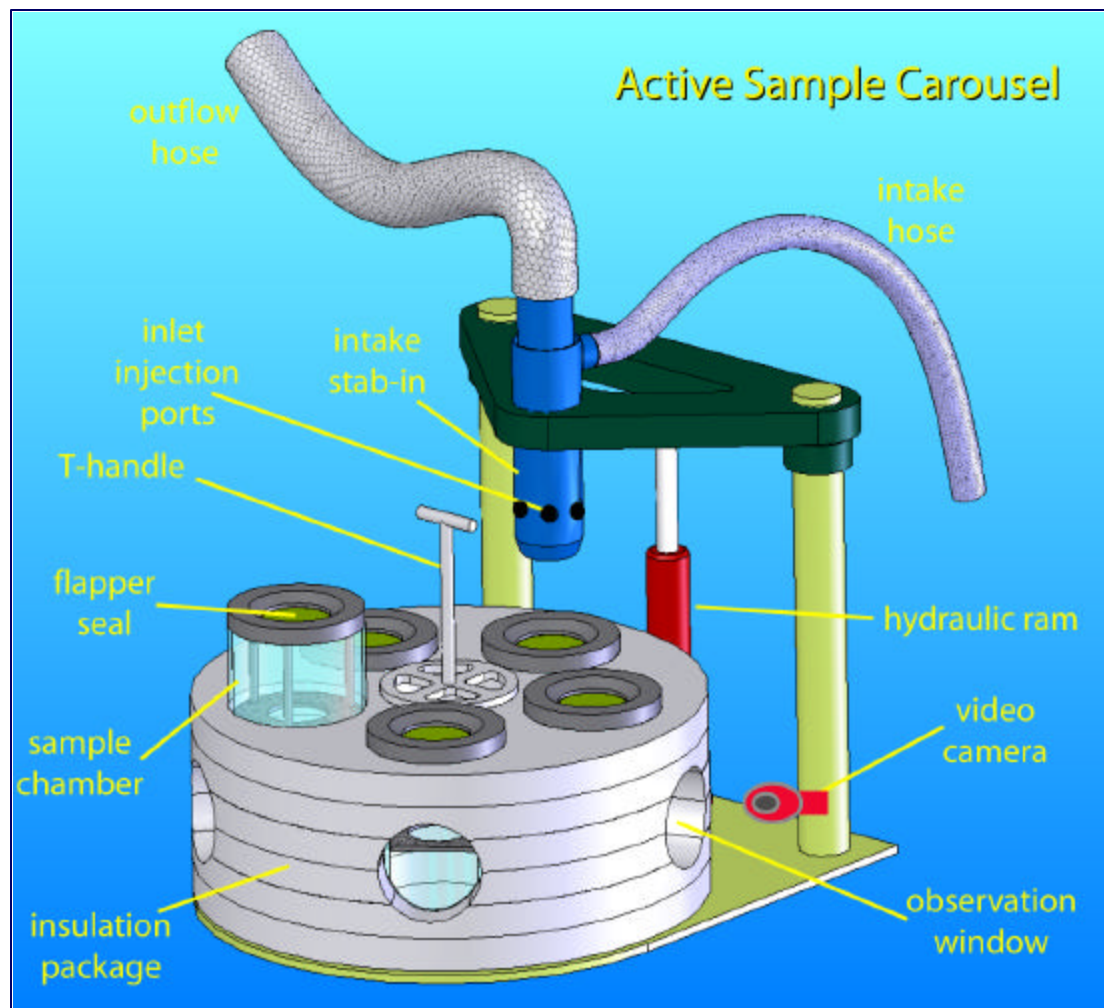


Funded Design for New Jason II Slurp Sampler





NEW DSG Multi-Chamber "Slurp"



DSG Doppler and Fiber Optic Gyro

- **New spare 300 kHz DVL for use with *DSL120* or *Jason***
- **New spare 1200 kHz DVL for use with *Alvin***
- **New Spare Ixsea Octans FOG for use with *DSL120* or *Jason***
- **Funds in hand for purchase of spare Ixsea Octans for *Alvin* (considering purchase of full INS)**

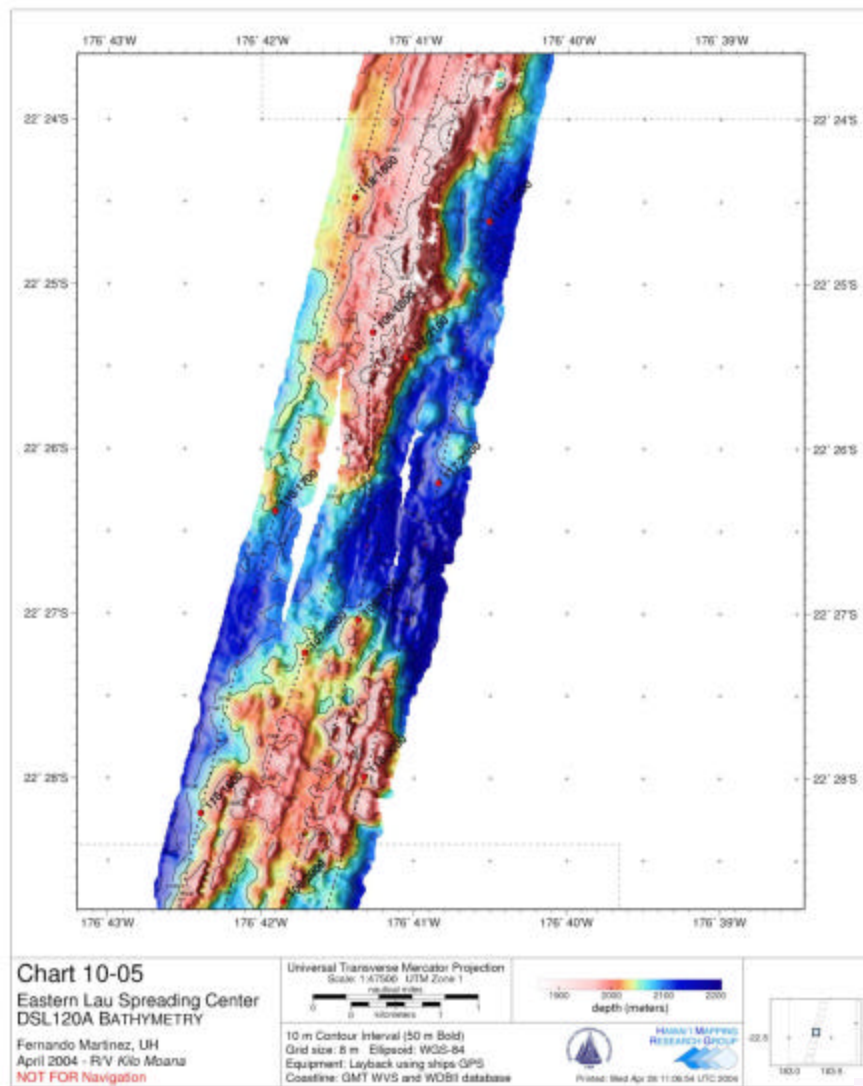


Near-Bottom High Resolution Sonar

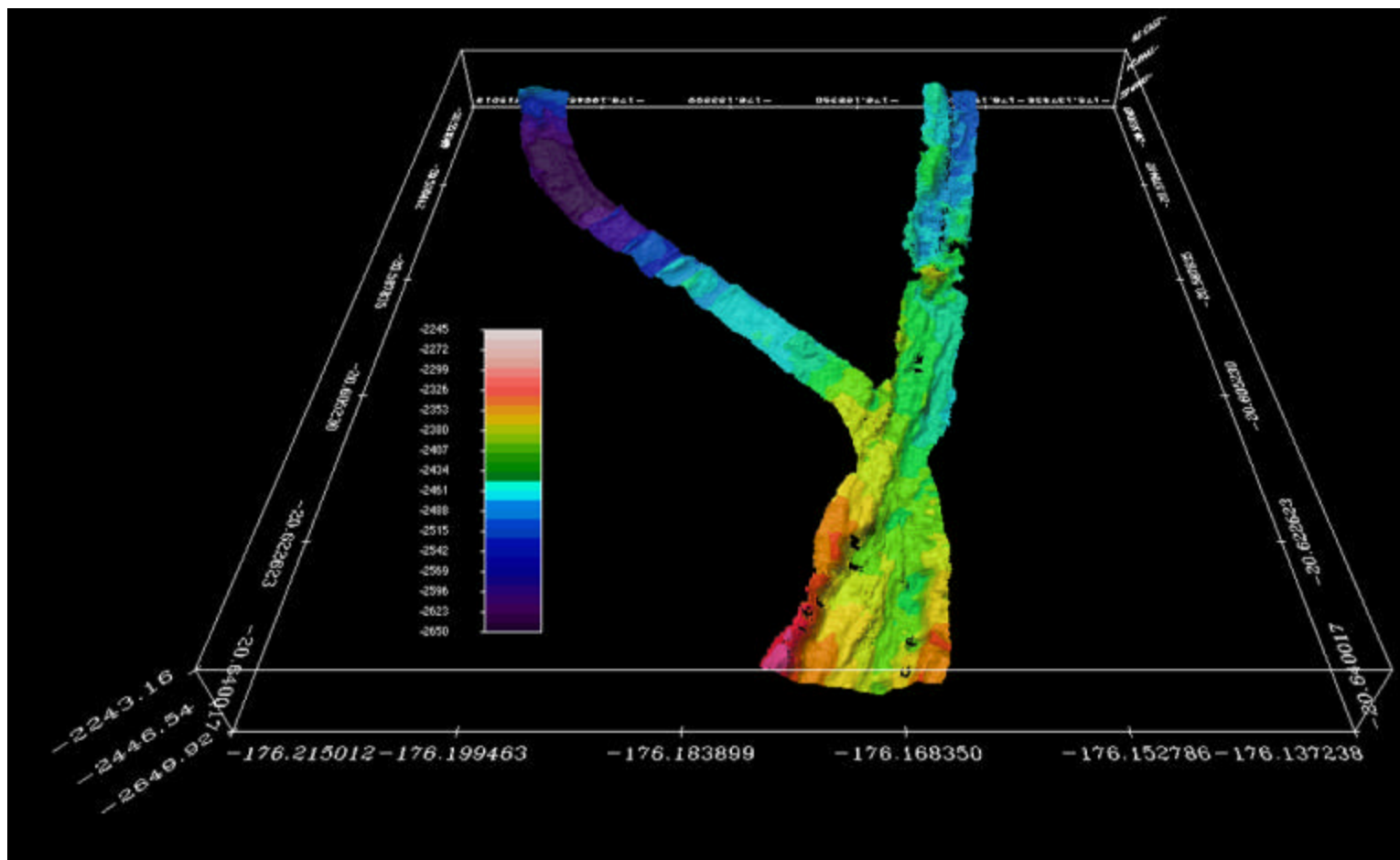
- ***Alvin:***
 - Imagenix model 881, 675 kHz for profiling
 - Sunwest SS300 CTFM for OA
- ***Jason:***
 - Imagenix 855 675 kHz for profiling
 - Imagenix 855 675 kHz for OA
- **Shared Use (*Jason II/DSL120a*):**
 - Simrad SM2000 multibeam



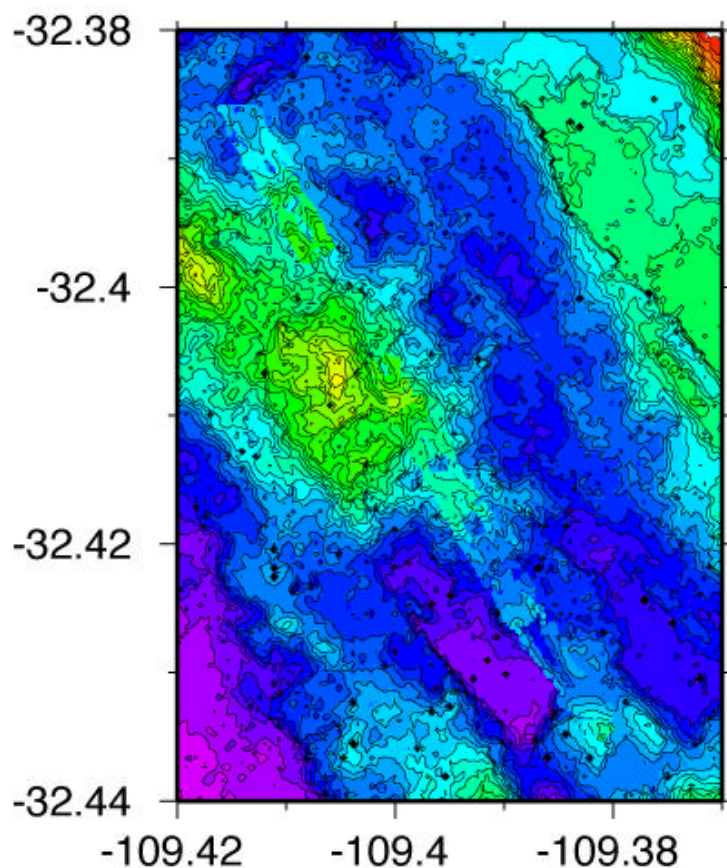
DSL-120a Bathymetry, F. Martinez (U of H) Cruise



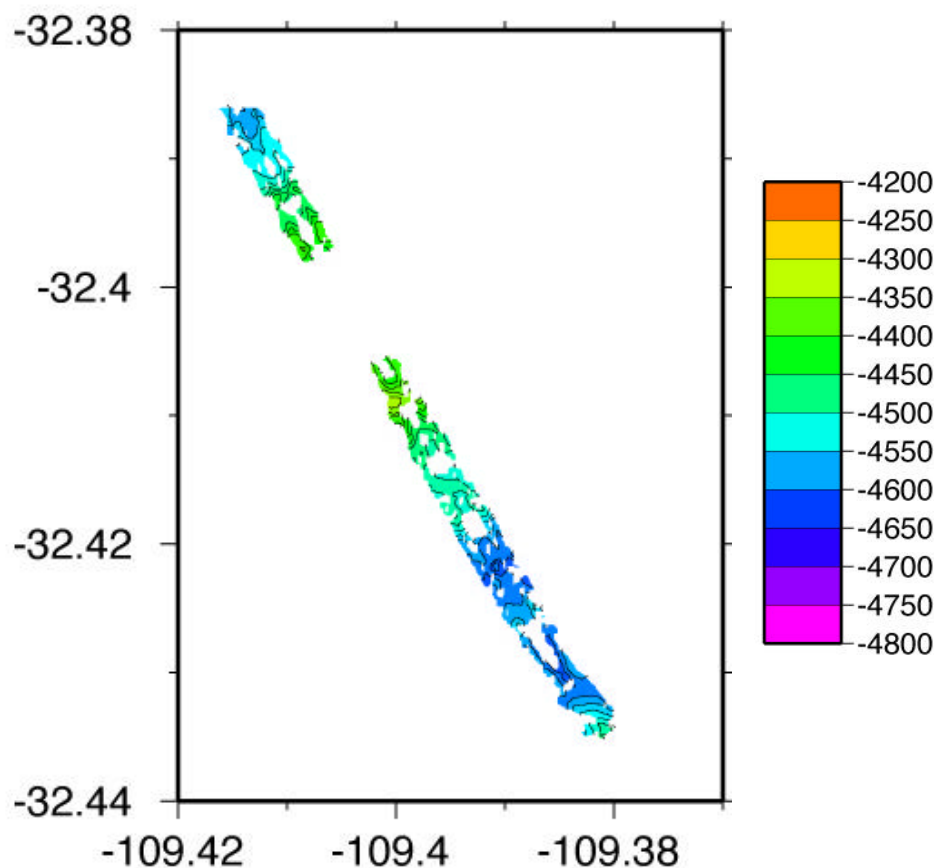
DSL-120a Gridded Bathy Shown in Fledermaus



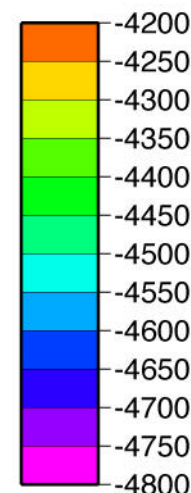
Examples of Data from R. Pockalny (URI) Cruise



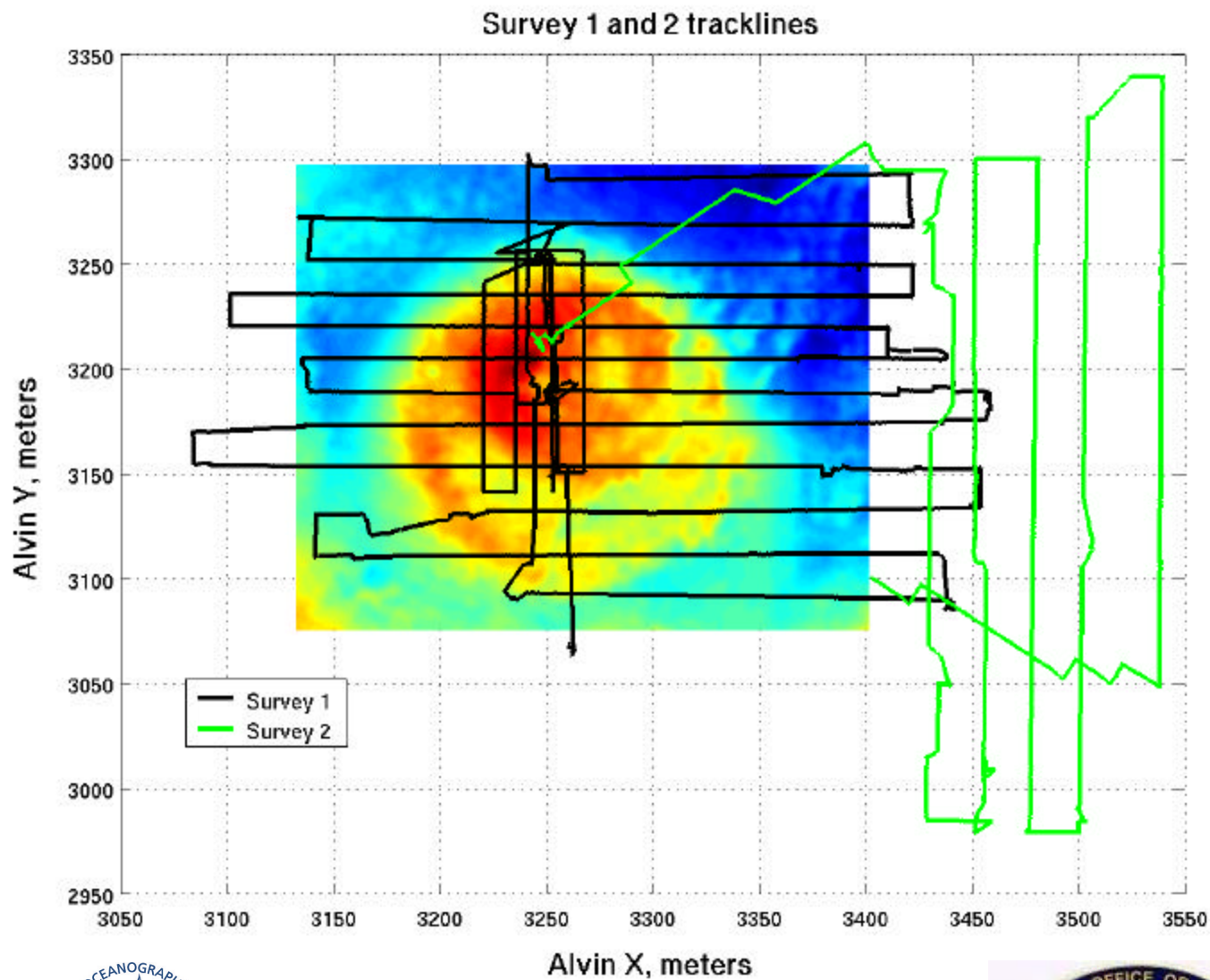
Sidescan bathy



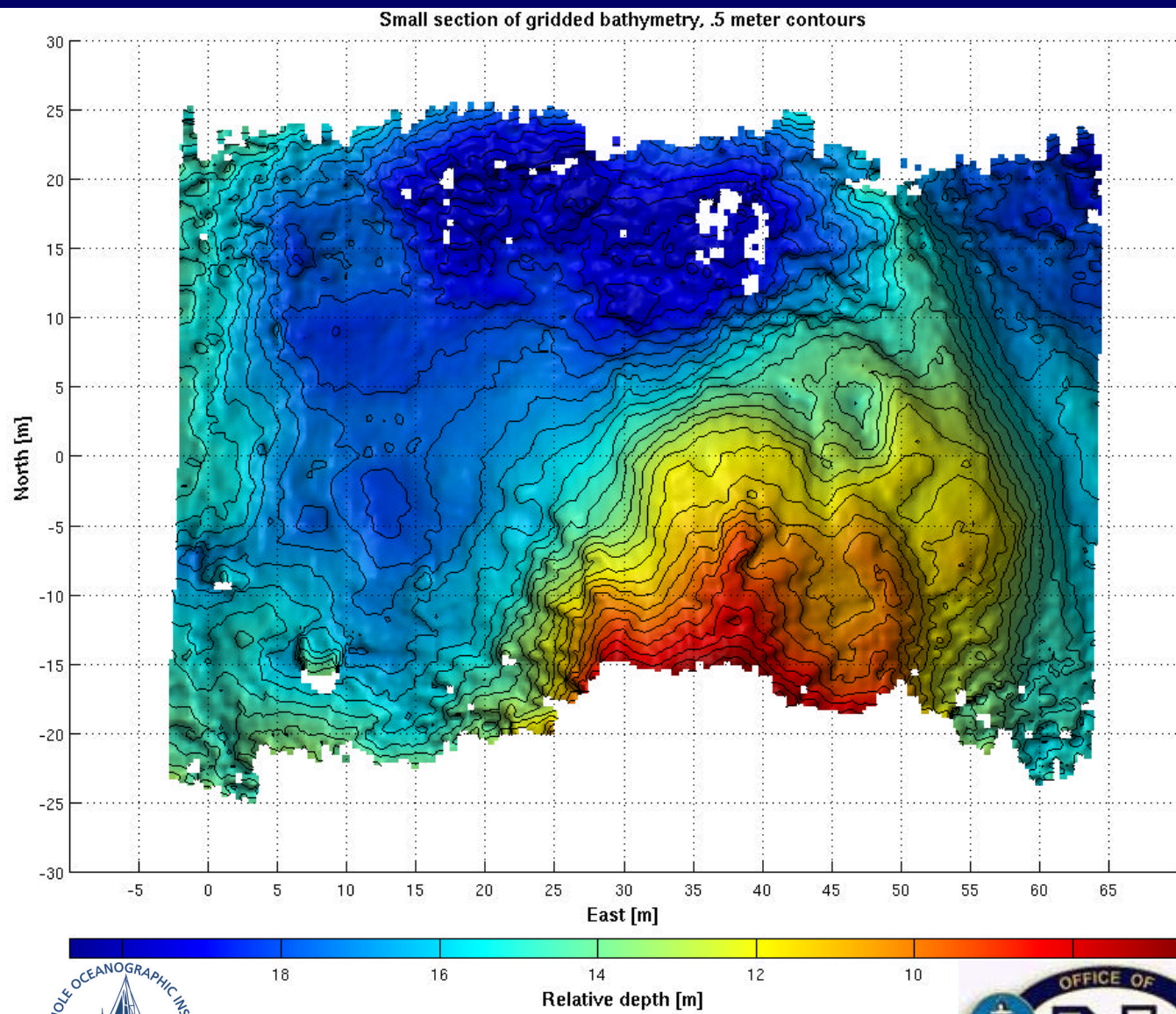
SM2000 bathy

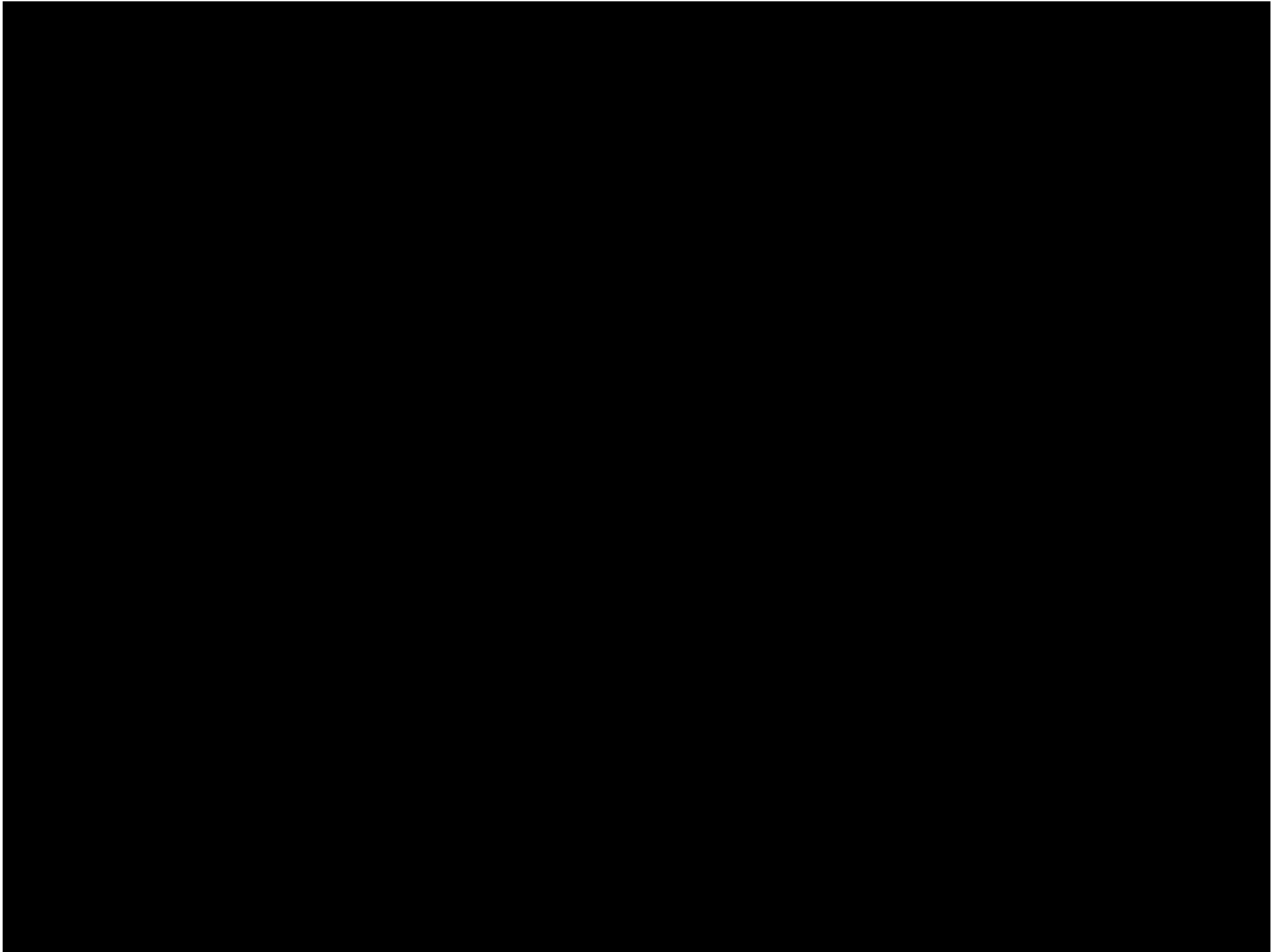


Jason II Track Lines Over TAG



SM2000 Bathy from TAG





NDSF Navigation Update

OUTLINE

1. Review of Current Capabilities
2. What's New in 2004
3. What's Next



Navigation Sensors

Review of Current Capabilities

Present Navigation Sensors

INSTRUMENT	VARIABLE	INTERNAL	UPDATE RATE	PRECISION	RANGE	DRIFT
Acoustic Altimeter *	Z - Altitude	yes	varies: 0.1-10Hz	0.01-1.0 m	varies	—
Pressure Sensor *	Z - Depth	yes	medium: 1Hz	0.0.01%	full-ocean	—
Inclinometer *	Roll, Pitch	yes	fast: 1-10Hz	0.1° - 1°	+/- 45°	—
Magnetic Compass *	Hdg	yes	medium: 1-2Hz	1 - 10°	360°	—
Gyro: MEMS	Hdg, Pitch, Roll	yes	fast: 10+ Hz	1°	360°	—
Gyro: Fiber Optic, North Seeking *	Hdg, Pitch, Roll ω	yes	fast: 1-100Hz	0.1°	360°	—
12 kHz LBL *	XYZ	NO	varies: 0.1-1.0 Hz	0.01-10 m	5-10 Km	—
Bottom-Lock Doppler *	\dot{x}_{body}	yes	fast:1-5Hz	0.01m	varies	1-3%

Planned Future Navigation Sensors

Inertial	$\ddot{x}, \omega, \dot{\omega}$	yes	fast: 10-1000Hz	0.01m	—	1%
300 kHz LBL	XYZ - Position	both	1.0-10.0 Hz	+/-0.01 m	100 m	—

* Presently supported on all NDSF vehicles:
Alvin, Jason 2/Medea, and DSL120A.



Data Products

Review of Current Capabilities

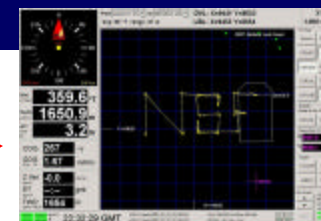
Moving toward a uniform navigation data products for all NDSF vehicles:

- **Comma-delimited 1-second spreadsheet file (.CSV Suffix):**
 - Logs time-stamped navigation and sensor data at 1 second intervals. 1 MB/hour. Compresses 5:1. Loads directly into spreadsheets (Excel, Quattro Pro, etc.)
- **Comprehensive DSL Format Data file (.DAT suffix):**
 - Logs **ALL** sensor and processed data as ASCII text, time stamped to 0.001 second. 1-60 MB/Hour. Compresses 10:1. Requires AWK/GREP and MATLAB to process. Supports renavigation capability. Data format are documented.
- **Screen Shot JPEG File (.JPEG suffix):**
 - Time stamped (to the second) screen shot image of the navigation screen. 500 KB/Image. Created when you press the “screenshot” button.
- **Navigation Configuration and Initialization Files:**
 - Initialization and Configuration files for Long-Baseline Navigation, Doppler Navigation, Transponders, Targets, etc.

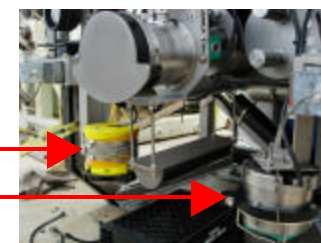


What's New in 2004

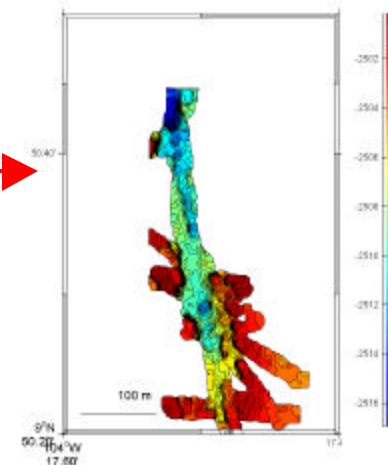
- **Doppler Post Processing and Renavigation:** Post-Processing and renavigation capability implemented for DvInav navigation program on Jason 2 /Alvin/DSL120 (Whitcomb, Kinsey).
- **High-Altitude Doppler Navigation:** 300KHZ Bottom-Lock Doppler on Jason for high-altitude Doppler navigation and control (Tivey MAR cruise).



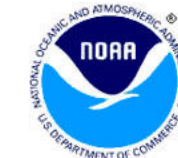
FREQ	MAX RANGE	UPDATE	VELOCITY ACCURACY
300khz	175m	1-4Hz	0.4% +/- 0.2 cm/sec
1200khz	28m	5-10Hz	0.2% +/- 0.2 cm/sec



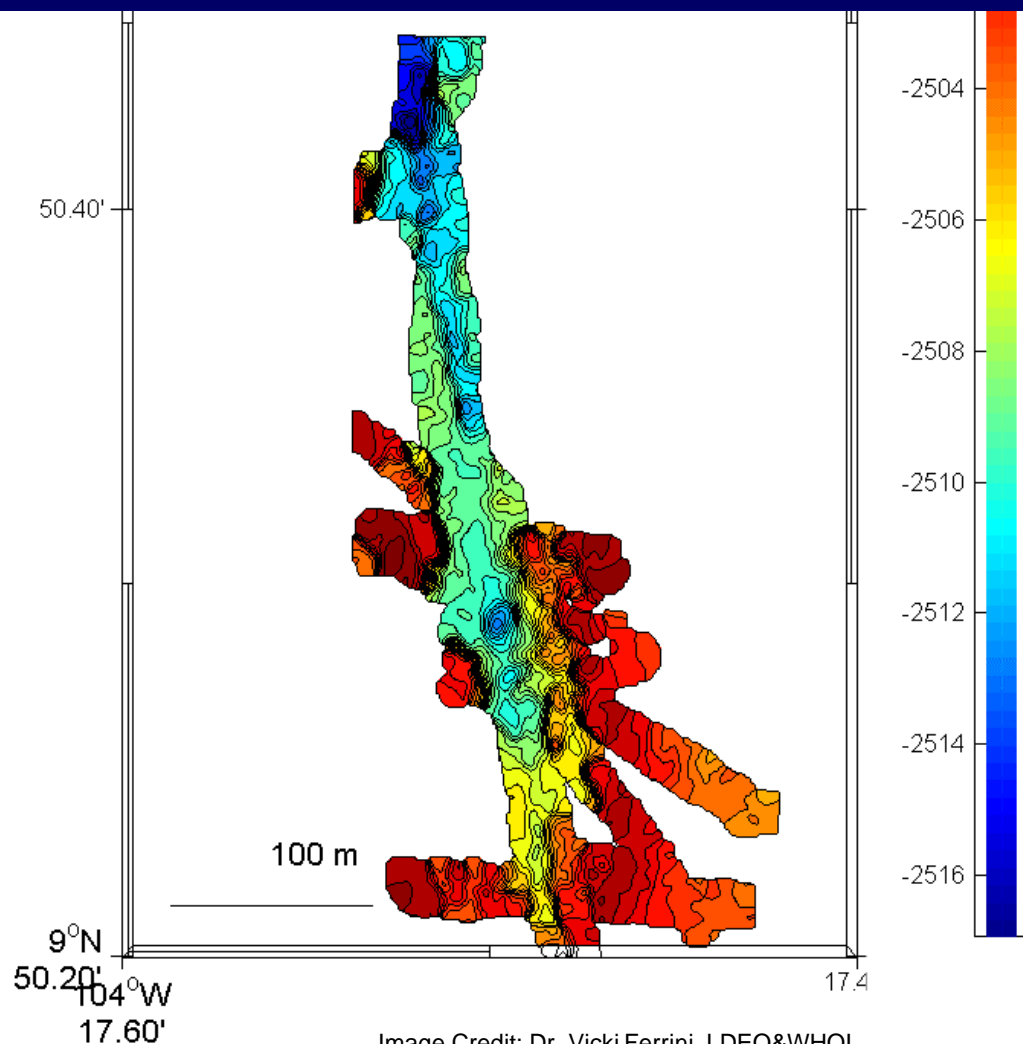
- **ADCP Profiling:** Downward Doppler current profiling on Jason 2 (Sohn TAG cruise).
- **Scanning Sonar Bathymetric Processing:** Developed Matlab package for post-processing Alvin Navigation and Imagenex data to produce bathymetric maps (Howland, Yoerger, Kinsey, Whitcomb).
Vicki Ferrini has taken the lead on improving this process (Schouten EPR cruise).



- **Micro-Modem LBL Evaluation:** Preliminary evaluation of micromodem hardware for LBL TX/RX by C. Taylor on Jason 2 and H. Singh & B. Bingham on SeaBed.
- **High Frequency LBL Evaluation:** Preliminary evaluation of 300KHZ LBL system (Marine Sonics) for Medea/Jason relative navigation by B. Bingham (Sohn TAG cruise).



What's New in 2004



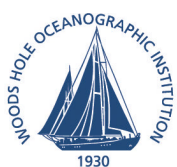
Composite Bathymetric Map of the EPR Bio-9 Area (9° 50'N, 104° 17.5'W).

Created from 7 Alvin dives by Dr. Vicki Ferrini (LDEO & WHOI). This map shows fissures within the axis, and vent structures along the eastern edge of the axis.

Four dives (3961, 3969, 3973, 3976) were conducted during Atlantis Leg AT-11-07, 28 Jan - 24 Feb 2004, Hans Schouten Chief Scientist.

Three dives (4000, 4008, 4011) were conducted during Atlantis Leg AT 11-09, 15 Mar - 1 Apr 2004, Karen Von Damm Chief Scientist.

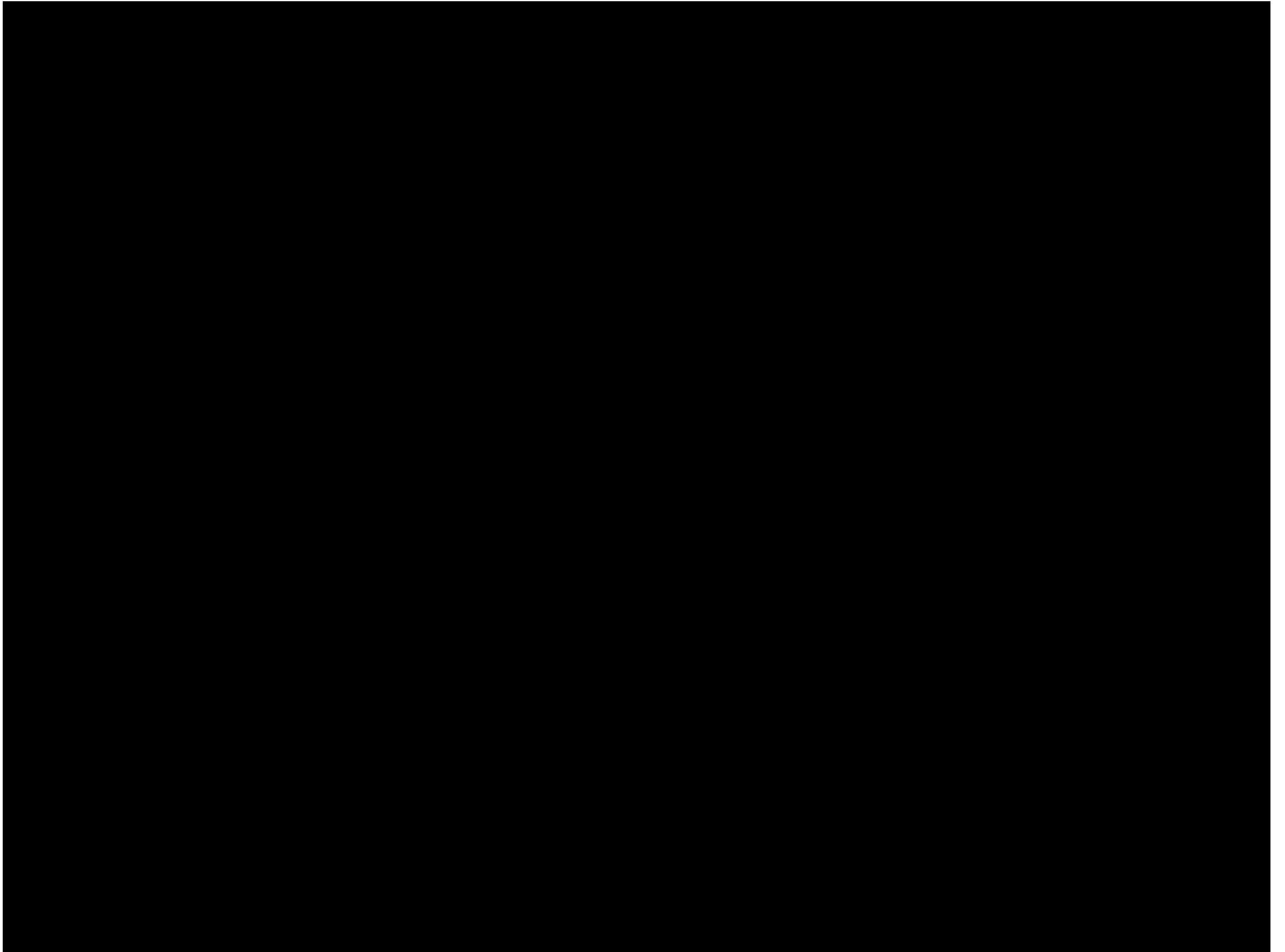
Image Credit: Dr. Vicki Ferrini, LDEO&WHOI



What's Next

- **Inertial Navigation:** Objective is to provide 100% navigation coverage on-bottom and mid-water.
 - *Alvin* inertial navigation (INS) purchase is funded. ROVs should follow suit.
 - Presently evaluating IXSEA and Kearfott candidate units.
 - Expand Dvlnav to support inertial navigation.
 - Install and test on NDSF Vehicles on engineering dives.
- **Long-Baseline Acoustic Navigation (LBL) Improvements:**
 - Existing NDSF LBL hardware and software dating from 1970's is becoming unsupportable.
 - Feasibility of modem-based LBL navigation demonstrated in 2004.
 - Next step is to develop standard modem-based hardware and software for use on: Jason 2 / Medea, DSL120A, Alvin in-hull and Atlantis top-lab, and for navigated instruments: coring, dredging, tow-cam, etc.
 - 300 KHZ LBL for Jason2 / Medea relative navigation for improved LBL coverage and dynamic positioning.
- **Synchronized LBL Networks to Support Multiple Vehicle:**
 - NSF supported project (Yoerger, Bradley).
 - Enable multiple vehicle LBL navigation in a single LBL net.
 - Preserve existing update rate and accuracy.
 - Compatible with existing Benthos LBL transponders.
- **Combined Acoustic Navigation and Communication with Acoustic Modems:**
 - NSF Supported ITR project (Singh, Yoerger, Whitcomb, Freitag, et. al.) Goal is combined navigation/communication modem network in two years.
- **Real-Time 3-D Visualization of Navigation and Scientific Data:**
 - Prototype system developed by a collaboration of UNH CCOM/JHC (Ware) and JHU (Whitcomb).





***R/V Atlantis* Maintenance Plans Improvements**

December 2004 – January 2005 in San Diego

NDSF Operator's Report

- **Installation of High Seas Net antenna and begin test period of system**
- **Begin first phase of Lab HVAC System upgrade with installation of variable speed fan control in main lab**
- **Complete repairs to # 1 Generator**
- **Overhaul # 2 large propulsion diesel engine**



Issues to be Addressed on R/V *Atlantis* 2005

NDSF Operator's Report

- Plan Bow Thruster overhaul for dry-dock period early 2006
- Continue with upgrades to LAB HVAC System
- Continue to modify lab drains
- Continue program to renew weather-tight doors
- Modify the radar platforms to minimize mast interference per *Revelle's* design

