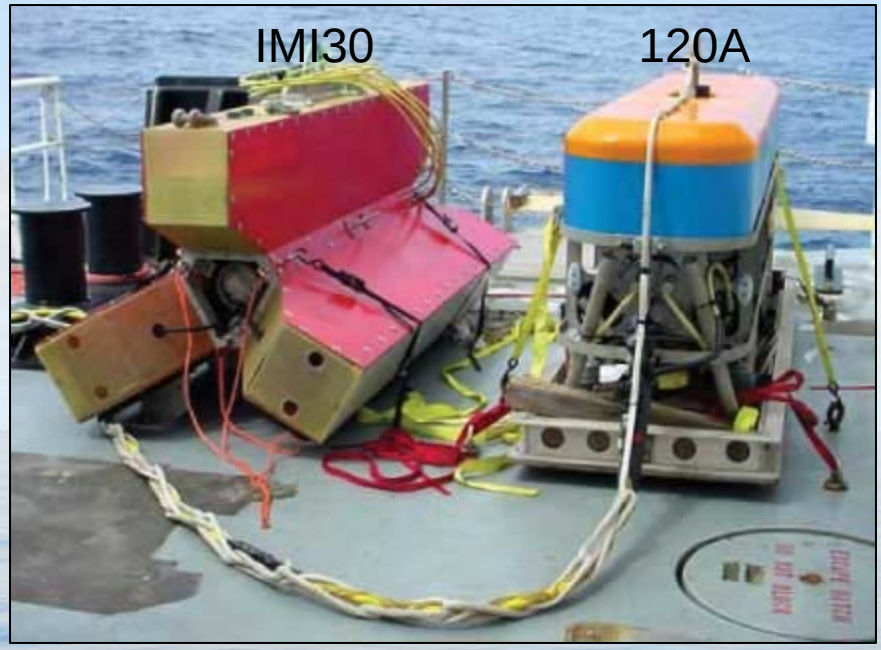
Deep Submergence Mapping

The Tools:

DSL-120A, IMI30, MR1, and IMI12



Letter from Margo Edwards and Chris German to the Community: July 13, 2006

Dear All,

You have recently seen the Letter to the Community posted to this mailing list concerning the addition of *ABE/Sentry* to the National Deep Submergence Facility (NDSF). That letter included the simultaneous announcement that the deep-tow sonar system DSL-120A would cease to be a formal component of the NDSF in 2007. A very pertinent question arising from that message is: How will access to state-of-the-art deep-tow sidescan sonar be provided to the US marine research community in future? The purpose of this message is to answer that question for the specific case of potential users developing programs for NSF sponsorship in which case the DSL-120A will continue to be available for use at no additional cost to science program budgets.

Since 1999, the Deep Submergence Laboratory of the Woods Hole Oceanographic Institution and the Hawaii Mapping Research Group (HMRG) of the University of Hawaii have collaborated on designing and fabricating hardware and software for seafloor mapping systems and operating these systems at sea. One direct result is that the DSL-120A and HMRG's IMI-30 exhibit great similarity in terms of sonars, electronics, and data acquisition, processing and management. Further, HMRG participants have sailed on every DSL-120A cruise to date, and the two groups meet frequently to continually improve their joint efforts.

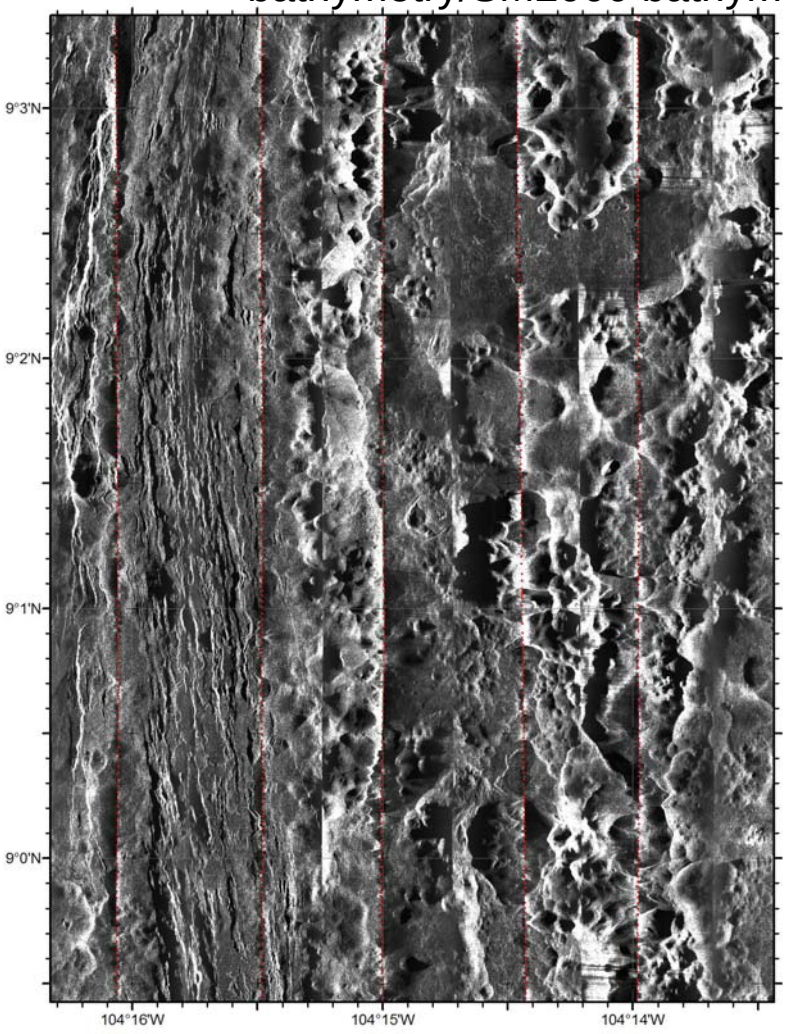
Consequently, it has been agreed that in 2007, HMRG will take over prime responsibility for, and become the "home port“ of the DSL-120A as part of the continuing DSL-HMRG partnership. Thus, the key contact for future use of the system (e.g., for all proposals submitted to NSF on or after 15 August 2006) will now be Margo Edwards. Although outside the NDSF, the DSL-120A will continue to be available for scientists to request as shared-use instrumentation with no impact on science program budgets for NSF-funded projects. Other agencies sponsoring research that uses the DSL-120A will continue to be required to pay their share of costs for the operating year, as is true for all other UNOLS systems (e.g., ships, submersibles, ROVs, technicians, etc.). For NSF-sponsored programs, participation of the DSL-120A will be funded through the University of Hawaii's Specialized Services Facility.

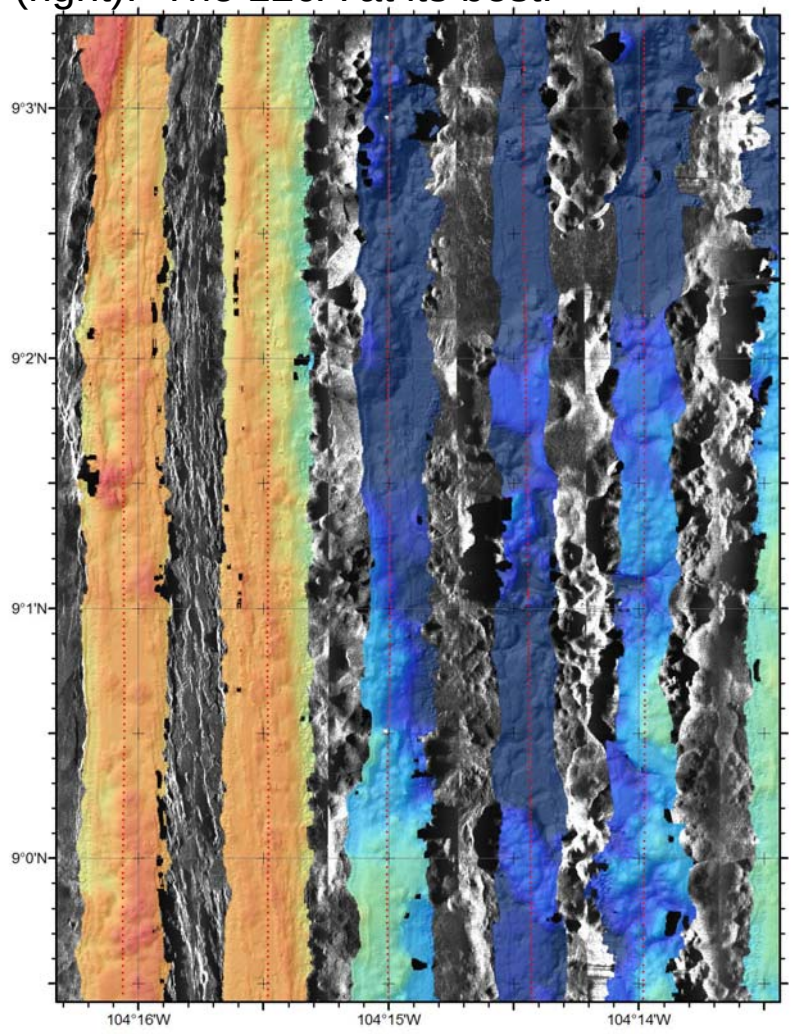
Current Status of The DSL-120A

- The 120A sonar was deployed at two sites on the EPR, at 9°50'N and at the 9°N Overlapping Spreading Center during March of 2007 for a Klein/White/Perfit cruise (AT15-17).
- The 120A collected roughly 7 days of data for site reconnaissance before Jason was deployed for sampling.
- The system worked at its usual high level of excellence collecting sidescan, phase bathymetry, and SM2000 multibeam bathymetry which were all used to generate stunning mosaics of the recent flows at 9°50'N and the two limbs of the 9°N OSC.
- Following the successful cruise, control of the 120A was transferred from DSL to HMRG. **Gear was divided at sea and the system was then shipped to its new "home port" of Hawaii.**

DSL-120A Data From Klein, 2007

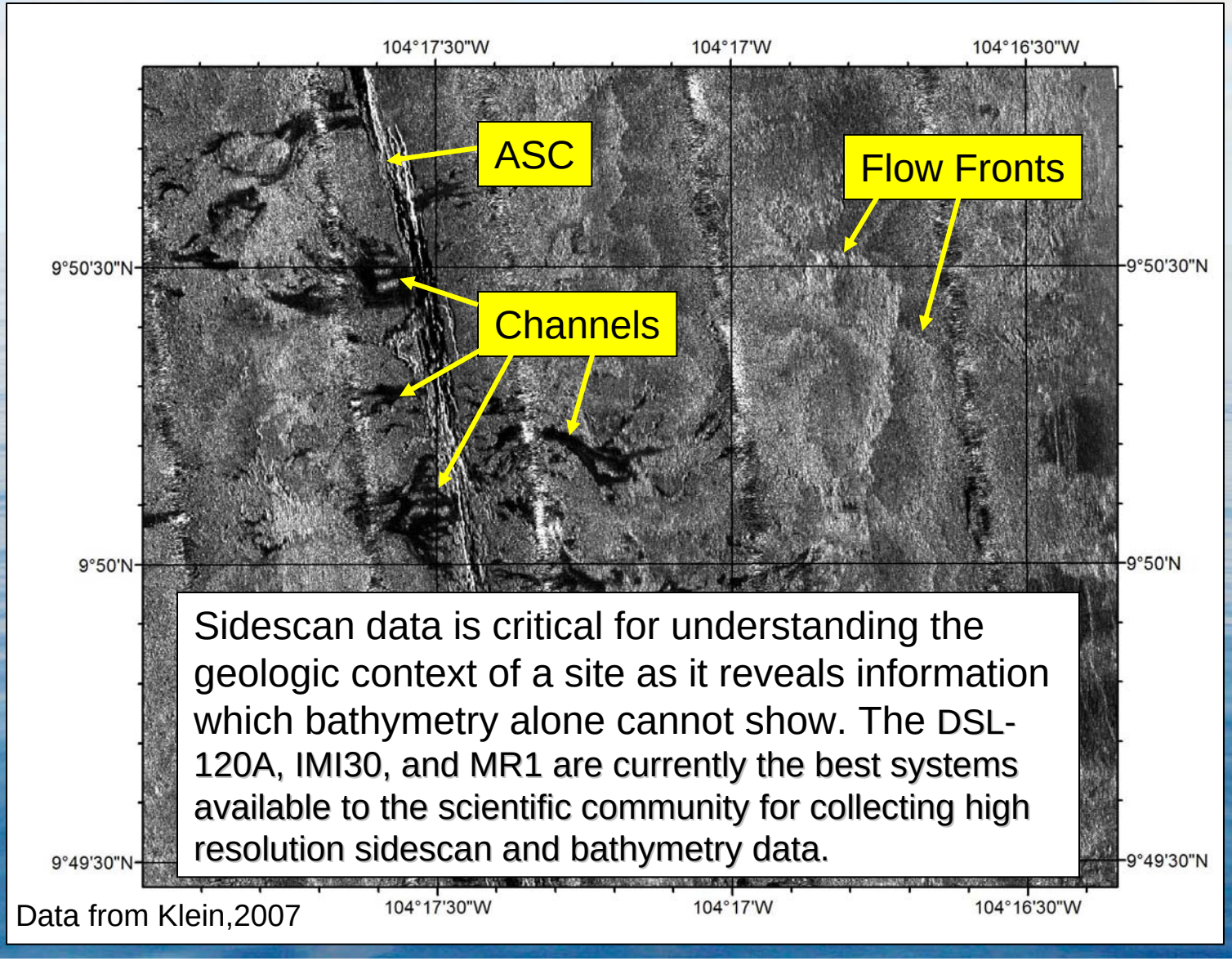
This is 2 meter sidescan imagery (left) and uninterpolated 5 meter phase bathymetry/SM2000 bathymetry (right). The 120A at its best!





The strength of the DSL-120A, IMI30, and MR1 is sidescan

(Although the bathymetry is pretty nice as well!)



Sidescan's Legacy

SeaMarc II NSF Cruises		
1986, HELSLEY, HONOLULU	SUVA1987, MOBERLY/COULBOURN, PERU - CHILE TRENCH AND FOREARC	1987, MACDONALD, EAST PACIFIC RISE
1987, FORNARI, EAST PACIFIC RISE	1987, MACDONALD, EAST PACIFIC RISE	1988, CHRISTIE, AUSTRALIAN-ANTARCTIC DISCORDANCE
1988, DUENNEBIER/SCHLANGER , MARSHALL ISLANDS GUYOT/SEAMOUNT	1989. LONSDALE, HONOLULU - SAN DIEGO	1989, BREEN/DOLANSE, BAHAMAS-HISPANIOLA COLLISSION ZONE
1989, MANN/ROSENCRANTZ, SWAN ISLANDS TRANSFORM FAULT	1989, SUNDVOR/VOGT/CRANE, BERGEN - BERGEN	1990, LUNDBERG, TAIWAN COLLISION ZONE
1990, MACDONALD, SAN DIEGO - MANZANILLO	1991, LONSDALE, EASTER - EASTER	
SeaMarc II Non-NSF Cruises		
1987, KROENKE/PRICE, NORTH FIJI BASIN	1987, COULBOURN/HILL, PAGO PAGO - HONOLULU	1987, REED , MOLOKAI CHANNEL
1988, AT&T PHILIPPINE, TAIWAN CABLE SURVEY	1988, AT&T MIAMI, KINGSTON CABLE SURVEY	1990, SHOR, GUAM - KAOHSIUNG TRANSIT
1990, KARIG, MANILA - GUAM	1990, SHOR, NEWARK - REYKJAVIK	

HAWAII MR1 NSF Cruises		
1991, SMITH, HAWAII	1992, CLARK/REED, SOLOMON SEA	1992, TUCHOLKE,MID ATLANTIC RIDGE
1992, MACDONALD,EPR	1993, TAYLOR, WOODLARK	1993, HESSE, LARBRADOR SEA
1996, GRINDLAY, PUERTO RICO TRENCH	1996, TUCHOLKE, MID ATLANTIC RIDGE	1996, TAYLOR, LAU BASIN
1997, FRYER, MARIANAS	2001, FRYER, MARIANAS	2001, STERN, MARIANAS
2003, EMBLEY, MARIANAS	2004, KURZ, GALAPAGOS	
HAWAII MR1 Non-NSF Cruises		
1994, COFFIN, MACQUARIE RIDGE	1994, NEW ZEALAND	1994 NEW ZEALAND
1994, NEW ZEALAND	1995, KOREA	1995, SOUTH AFRICA
1995, LIVERMORE, SCOTIA SEA BACKARC	1997, INDIAN OCEAN	1997, INDIAN OCEAN
1997, GULF OF ALASKA	1998, BALLARD, MIDWAY	1998, TOKYO-SAN FRAN
1998, SAN FRAN-HONOLULU	1998, HONOLULU-TOKYO	2001, INDIAN OCEAN
2001, YOKOHAMA-GUAM	2001, GUAM-SYDNEY	2001, CENTRAL PACIFIC

Sidescan's Legacy 2

DSL-120 Cruises (Since 2000)

- 2000, Fornari, EPR-Galapagos
- 2001, Schouten, EPR
- 2002, Tivey, Jurassic Quiet zone
- 2003, Fryer, So. Mariana Arc
- 2004, Pockalny, Southeast Pacific
- 2004, Martinez, East Lau Spreading Center
- 2005, Haymon, Galapagos
- 2005, Karson, Pito Deep
- 2007, Klein,EPR

IMI30 Cruises

- 2004, Martinez, Lau Basin
- 2005, Darby, Beaufort Sea,
- 2006, Edwards, Hawaii

Proposed and funded DSL-120A and IMI30 Cruises (2006-2009)

2006		2007		2008		2009	
DSL-120A	IMI30	DSL-120A	IMI30	DSL-120A	IMI30	DSL-120A	IMI30
2 Proposed 0 Funded	2 Proposed 0 Funded	2 Proposed 1 Funded	5 Proposed 0 Funded	4 Proposed 1 Declined 3 Pending	3 Proposed 2 Declined 1 Pending		1 Proposed 1 Pending

There have been 19 proposed surveys for the period from 2006 to 2009: but only one funded and 5 pending.

NB: Lack of agencies' cash has **NOT** led to a drop-off in proposal pressure for these systems.

Arrival of IMI-30 alongside DSL-120A: new opportunities.

The future for DSL-120A & near bottom high resolution mapping

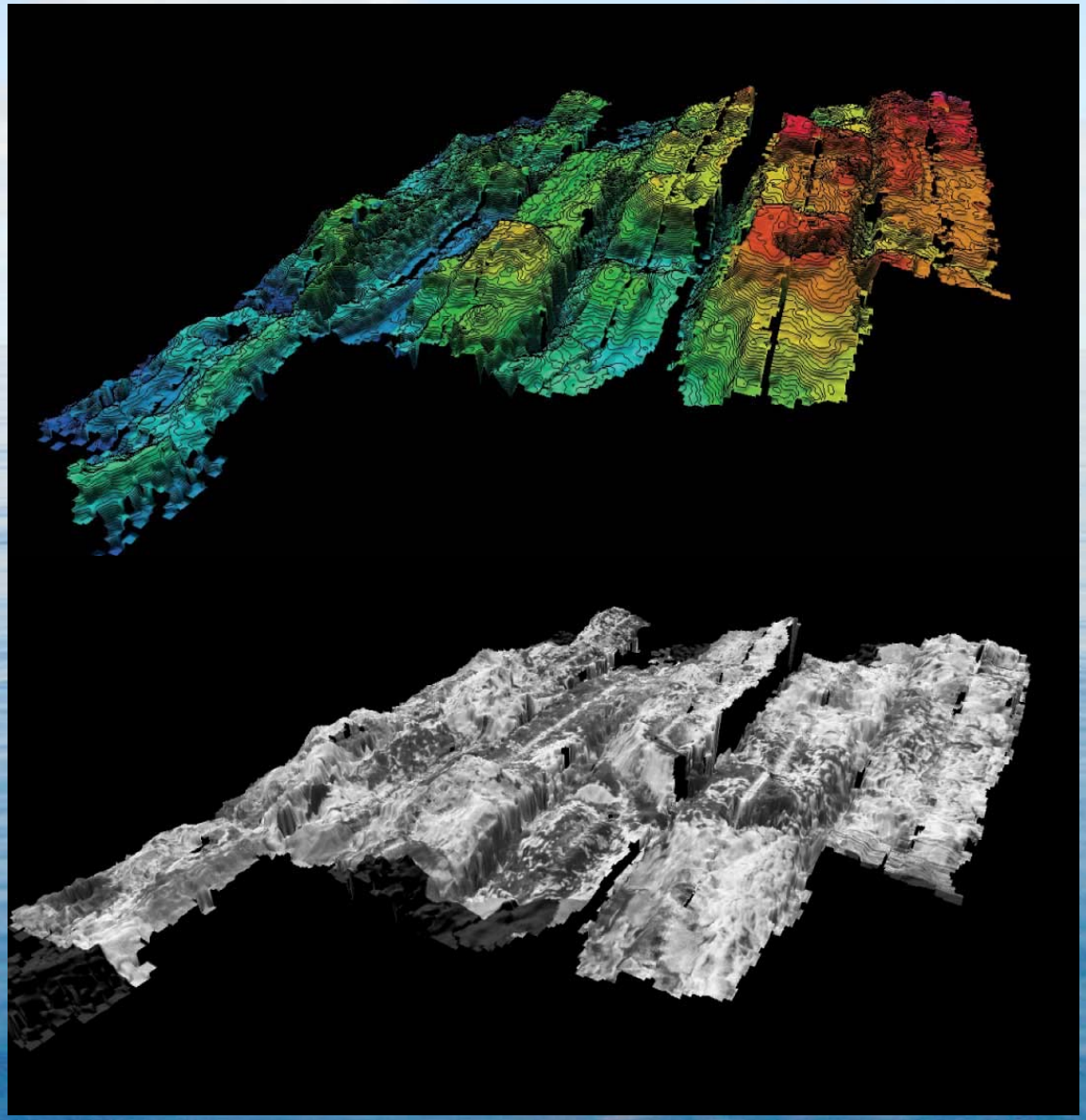
- HMRG has purchased a new magnetometer, CTD to replace those kept by DSL.
- Towed navigation system being developed by HMRG which should aid in correctly navigating the 120A data (for when LBL is not available).
- Continuing work on integrating LBL and DVL navigation into DSL-120A's hardware and processing methods (e.g. moving doppler from the 120A towfish to the depressor weight to further decouple interference between the two systems).
- Some modification of the telemetry of the 120A required to converge with other HMRG mapping systems: would allow for a common spares kit for all vehicles - exactly the kinds of economy of scale envisaged in July 2006 letter.
- Ixsea Octans was not transferred to HMRG. Replacement (and hopefully a spare as well) is a VERY HIGH PRIORITY: the Ixsea Octans is needed to collect the high precision attitude information essential for generating high quality data mosaics - and that is what the scientific community requires.
- $60K has been requested in 2007 to make sure the 120A is able to continue collecting data at the same high level that the community EXPECTS
- The real time display developed for the DSL-120A has shown it's adaptability: now being used for IMI-30 and the multibeams of the R/V Kilo Moana. Continuing development of this tool would allow real-time display of laser line scanner data (HMRG hopes to receive a donated system this year) and SM2000 data (collected by both DSL-120A and Jason II).
- Any development (either in hardware or software) for the DSL-120a directly aids in the long term development of high resolution near bottom sidescan mapping using the generation of AUVs that are currently under development *(incl.* SENTRY).

IMI30 Update

Just like the EPR, right ?

In 2005 the IMI-30 traveled to the Beaufort Sea on the USCGC Healy. With ice conditions so harsh that the icebreaker itself got stuck, and the IMI30 was deployed for only a short time.

IMI30 Field Trials – A Success!



- Summer 2006 cruise on the R/V Kilo Moana paid for by the University of Hawaii.
- Lowering was on the northwestern slopes of the Big Island of Hawaii (Mahu Kona area).
- Sidescan, bathymetry, and sub-bottom data were all successfully acquired.

Future Work On The IMI30

- Engineering work is currently being done to increase the signal strength to the arrays & widen swath-width.
- Integration of magnetometer & CTD are currently underway
- At least one more sea trial will be performed this summer to test the system
- Possible work for the system includes survey around the island of Oahu as well as survey work in the Indian Ocean for NIO.