NEPTUNE Canada
Transforming Ocean Science

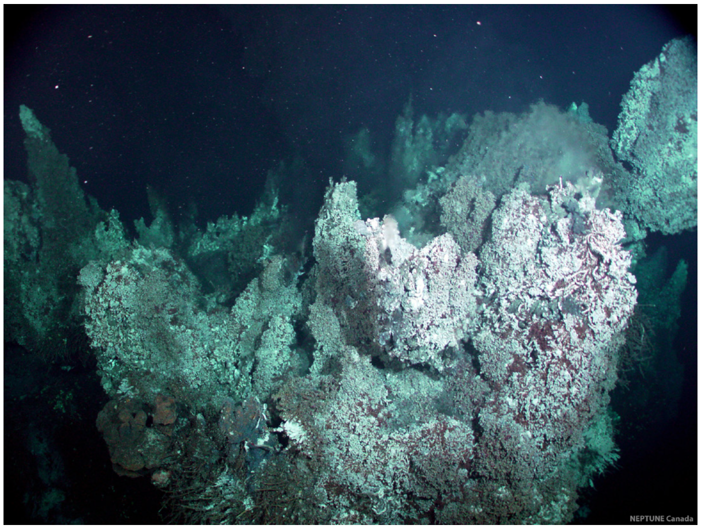
Director's Report

Chris Barnes, Project Director

On 8 December 2009, NEPTUNE Canada (NC) went live with the flow of data to the scientific community and public. This issue focuses on describing some of the scientific results from several principal investigators. It gives cause to celebrate all the successes achieved over the last year and the accumulated 10TB of data and imagery. This issue also summarizes the last installation cruise to the Endeavour Segment of the Juan de Fuca Ridge: the most challenging site to instrument logistically. It involved finding routes to lay the three 6km cables from the node over the harsh basaltic seafloor of the ridge flank marked by crevasses, lava collapse depressions, and into the central rift axis marked by hydrothermal venting. Two of the three cables were installed with instruments and after a month of receiving valuable data, one cable failed. Elsewhere on the observatory, a new model of the crawler with added instrumentation was deployed successfully; also at Barkley Canyon, the vertical profiler with its 11 instruments operated well up to heights of 250m above the seafloor but developed a fault and was brought back to shore for modifications.

My appointment as Director of NEPTUNE Canada comes to an end on 30 June 2011 following a decade in the position. The objective of the role included taking the project to a point where the infrastructure was installed and the initial operating funding secured. This has been largely achieved. The NC Director position will be widely advertised over the next two months with the Search Committee chaired by Martin Taylor, President and CEO of Ocean Networks Canada (ONC). It has been a privilege to serve as Director and to see the observatory become a reality through many challenging phases and through both the dedication of its staff and the support of UVic, funding agencies, and many stakeholders and partner institutions. The nature of the position will change to some degree with the new Management Agreement between ONC and UVic, whereby more autonomy is delegated to ONC in building NC and VENUS as national facilities.

I would like to take this opportunity to pay special tribute to Brian Bornhold whose contribution to NC's success has been invaluable. After five years as Project Scientist and formerly as Co-Chief Scientist, he is ending his contract with NC but will continue to be involved through his policy work with ONC.



Resembling a fantastic crown, this structure is found at the pinnacle of Grotto Hydrothermal Vent's north tower, where several of our Main Endeavour Vent Field experiments are located. 2182m depth

The Canada Foundation for Innovation (CFI), one of our main funding agencies, recently announced a new program for operating support for Major Science Initiatives such as the NC/VENUS observatories. CFI also announced a new funding architecture related to the $600M designated in the 2009 federal budget, including the Leading Edge Fund - for more details go to http://www.innovation.ca/en/news?news_id=240. NC expects to submit a proposal to CFI to expand the observatory and further discussions will be part of the NC workshop being planned for April. As a condition of the 2009 award a CFI external review committee visited Victoria on 3 December to examine the expenditures of the current operating grant for ONC/NC/VENUS.

Interactions with international partners continue. In early December, two scientists from Tongji University, Shanghai, China will visit as a follow-up for a MOU agreement for collaboration. In early January, an Italian Ocean Technology Mission will visit us and industrial companies in Victoria and Vancouver; the Department of Foreign Affairs and International Trade (DFAIT), which sponsored a similar mission of five Spanish observatories last year, will facilitate this.

As we draw to the end of 2010, we are pleased to recognize the major achievements that have been made in NC instrument installations and the first year of operational results. We will be sharing these advances at this month's conferences of the American Geophysical Union in San Francisco and the ESONET General Assembly in Marseille, France. The results are being acknowledged in an article in *Science* magazine as one the major scientific breakthroughs of the past year. Hopefully, 2011 will yield even greater successes.

Successes, Setbacks and Exciting Prospects

Lucie Pautet, Associate Director Engineering

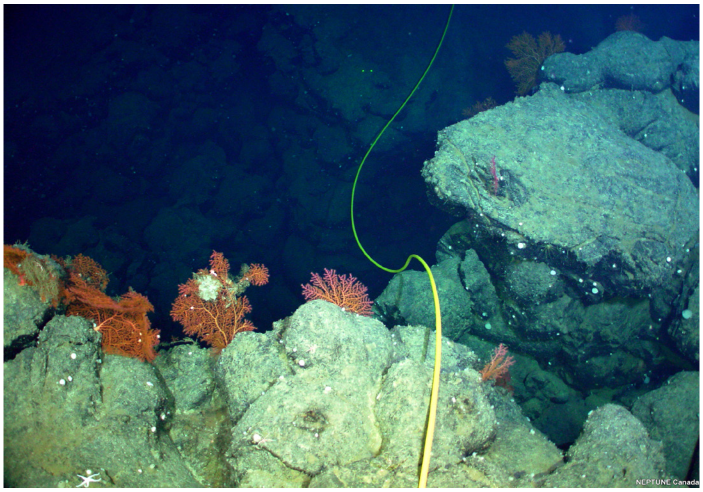
After years of planning and more years devoted to the installation of the infrastructure, NEPTUNE Canada went live a year ago. Finally, scientists could use the system and enjoy the power of its infrastructure. However, the challenges the engineering team faces did not stop there. The Endeavour node was yet to be instrumented and instruments left on the seafloor several months before needed to be inspected or repaired. There were many successes and also some setbacks as anyone would expect with such a complex and innovative project. Some hard lessons were taken and we look forward, next year, to demonstrating how much we have grown.

On paper, the cabling of the Endeavour node was without a doubt the most challenging feat we would encounter this year, in practice, it would reveal itself to be even more challenging. Initially, the biggest fear was the treacherous terrain. Was there a route to lay a cable through an active part of the ridge? Incredibly there was one, but we had to re-survey at low altitude for several hours to find our way through a zone of steep cliffs and deep crevasses invisible on the initial survey. Unfortunately, that was not the most difficult part we also had to overcome a failed cable, problems at depth with the cable drum, and even a partial power failure on the ship. It is only thanks to the quick thinking and creativity of all the people on-board, the ship's crew, the NC team, its Highland Technologies contractors and of course, the ROPOS submersible team, that the Main Endeavour and Regional Cabled Mooring (RCM) North fields were finally connected along with their phenomenal suite of instruments.

We installed rubber mats to protect the observatory extension cable at stress points where the cable is draped over sharp rocks and deep crevasses. 2110m depth

The loss of connection with the Main Endeavour Field one month later should not take away from that result. Armed with the experience acquired during the September 2010 Endeavour cruise, we are preparing to bring the field back online on our next cruise. At the same time, we will inspect currently installed instruments and install new equipment expanding the potential of the observatory even further.

2011 will also bring the opportunity to replace some instruments such as cameras and hydrophones which have given mixed satisfaction. A process has been engaged with the scientists to review how their needs might have evolved and inform them of the trade-offs we have to face. Through this operation, we want



The NEPTUNE Canada power and communications extension cable drapes downward over a rocky precipice at Endeavour Ridge. 2115m depth

to clearly acknowledge that the real power of the observatory lies with the scientists. The more they and new users get involved the more relevant and efficient we will become. Their input is key when selecting instruments. It is also paramount when they inform us of potential projects and future scientific interests so together we can assess the degree of flexibility needed when adding to our infrastructure. It is thanks to their continuing involvement that NEPTUNE Canada will grow stronger and better in the years to come.

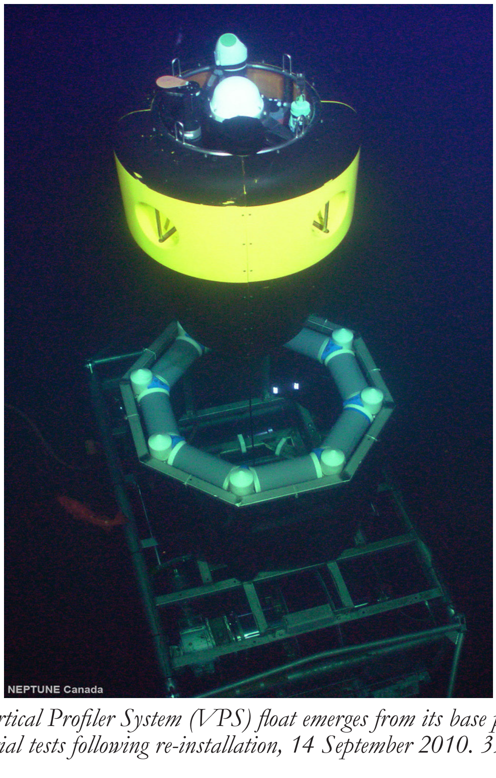
Spider crabs were frequent visitors as NEPTUNE Canada installed instruments and tested communications at various Endeavour Ridge sites. This crab extended a leg to touch the ROPOS manipulator during our test power-up. 2196m depth

Instruments Now Deployed at all Five Node Sites

Mairi Best, Associate Director Science

On 12 September 2010, the *R/V Thompson* set sail with the captain and his technical team, ROPOS specialists, and NEPTUNE Canada scientists, engineers, technicians, and graduate students to start the Journey to Endeavour. This group was supported by DMAS and other NC staff onshore. By the time we returned to port on Thanksgiving Day, we had completed 24 ROPOS dives (some over 30 hours long). While at times frustrating, it was a great success, with 2 trans-ridge cables successfully laid (the 3rd brought back for communications analysis), and a total of 41 instruments, 2 junction boxes, and 3 interface adapters deployed. This translates into over 600 additional data streams flowing to the archive (including state of health information), and most of them will be searchable through the Oceans 2.0 interface.

Some equipment unfortunately did not stay working long, specifically the vertical profiler at Barkley (after a successful 250m profile), the HD camera at Endeavour, and the auxiliary seismic instruments at ODP 1027. Those problems look solvable. The remaining instruments installed, including a range of complex instruments at Endeavour and a sophisticated suite on Wally II, started sending back reports from the deep, real-time. Unfortunately, the connection to Main Endeavour Field has since gone down, however over a month of data was captured before that event, which is keeping researchers busy while the engineering group makes plans to address the situation next summer.



The Vertical Profiler System (VPS) float emerges from its base platform during initial tests following re-installation, 14 September 2010. 396m depth

We now have operating instruments at all five nodes. While there will continue to be more added, and no doubt more that need some modifications, it is appropriate now to thank all those who have brought us this far. With the new hires in our engineering group, it is now possible for the science resource team, including our relatively new Research Theme Integrators (RTI's) and Data Specialists, to focus on facilitating the scientific data and interpretations. Areas that we will be working on in the coming months include: web environment evolution, data products, instrument requirements, proposal development, workshop plans, and conference interactions and presentations.

A reminder, NEPTUNE Canada related talks are listed on our calendar, which is linked from our homepage http://www.neptunecanada.ca. We will be present in force, providing demonstrations and highlighting opportunities at the upcoming American Geophysical Union meeting this month in San Francisco (including at the Ocean Networks Canada booth) – we look forward to meeting with you there or otherwise hearing from you.

The new science staff benefit from a strong foundation laid over many years largely by Brian Bornhold. Brian has decided to step back from his very active intense role as Project Scientist, though we know he won't completely stay away from an observatory that he's built through everything from facilitation of science workshops to application of "Blue Goop" to bolts. Brian, your contributions have always been above and beyond the call of duty, our thanks to you is immense.


NEPTUNE Canada project scientist Brian Bornhold (left) and NEPTUNE Canada contractor Kim Wallace (right) discuss the Barkley Benthic Pod 2 deployment, 23 May 2010.

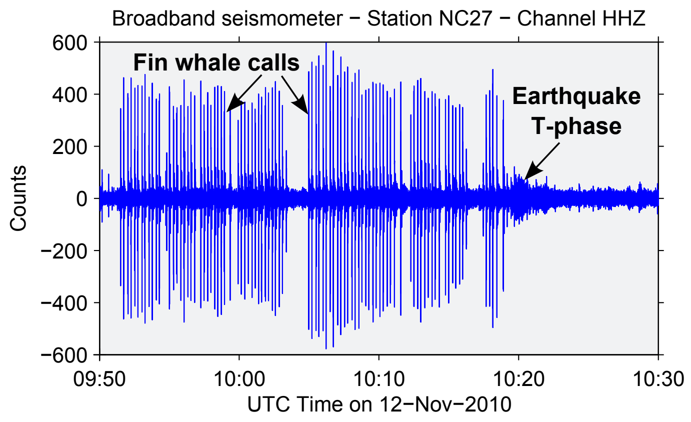
Listening to the Deep

Michel André from the Technical University of Catalonia, Spain

Sources of sound produced by human activities can induce physical, physiological, and behavioral effects on marine fauna. Because noise has only been added recently to the list of marine pollution sources, there is almost no information on current ambient noise levels in most regions or on their effects on marine life, particularly on cetaceans. Underwater observatories offer a unique opportunity to assess the large-scale acoustic ecology of the oceans.

The Laboratory of Applied Bioacoustics (LAB) of the Technical University of Catalonia (UPC) is the coordinator of the ESONET NoE Demonstration Mission, LIDO (Listening to the Deep-Ocean, http://www.esonet-noe.org/main_activities/demonstration_missions), a project that is actively contributing to the coordination of high quality research by allowing the real-time long-term monitoring of marine ambient noise at several geographical locations. Based on the LIDO development and in partnership with the NEPTUNE Canada observatory, the LAB (http://www.lab.upc.es) is implementing a fully automated real-time detection and classification system that analyses the online acoustic flow of hydrophone data coming from NEPTUNE Canada. Through a series of detectors analysing the full frequency band and a regularised radial basis function neural network, the application will allow immediate mitigating actions when facing acoustic events that could be harmful to individual cetaceans or populations and the long-term monitoring of noise. From the NEPTUNE Canada database, the LIDO processing server downloads the stored raw data from the Folger Passage, Barkley Canyon and Barkley Slope hydrophones at a speed of ~172MB (uncompressed) every 5 minutes. For the first time in the field of passive acoustic monitoring, the live audio data streams as well as the output of the statistical analysis (noise measurements, acoustic presence and distribution of species over time) will be available online for public access at http://listentothedeep.com, starting on Wednesday, December the 8th, 2010.

Broadband seismometers reveal baleen whale behaviour



Spikes in regular time intervals on NC seismometer data were a mystery to seismologist Taimi Mulder (Geological Survey of Canada) until she met Michel André and William Wilcock (University of Washington) on a multidisciplinary NC workshop. Above shows that on closer inspection of the spikes revealed that the seismometers are well suited to observe abundance and behaviour of baleen whales. For instance, seismologist Garry Rogers (Geological Survey of Canada) noticed that a fin whale stopped singing a song it was singing for about 4.5 hours after the arrival of the T-phase (seismic energy travelling at sound velocity though the ocean) from a magnitude 5.1 earthquake that occurred on November 12, 2010, at 9:46 (UTC) in the Fox Islands, Aleutian Island chain.

Temporal Variations in a Gas Hydrate System

Lisa Roach, Eleanor Willoughby and Nigel Edwards from the University of Toronto

The aim of our experiment is to investigate the temporal variations in the compliance of gas hydrate formations. Gas hydrates have been assessed as a formidable alternate source of energy. They contain immense stores of powerful greenhouse gases, are relevant in climate change science and may possibly be impactful as a geo-hazard. It is the wide ranging reach of gas hydrates, both as potential resource on the one hand and potential hazard on the other that encourages the need for their characterization. The advent of NEPTUNE Canada allowed us to realise our experimental goal, a significant part of gas hydrate characterisation, as we were able to deploy our seafloor compliance (SFC) package at site ODP 889. This package comprises of a differential pressure gauge (DPG) which measures the change in pressure of the water column and a gravimeter which records the acceleration of the seafloor in response to the pressure applied by the water column. Seafloor compliance is sensitive to the variations in shear modulus with depth in a sedimentary section and is reflective of gas hydrate content.

We have been able to monitor the known gas hydrate deposit, Bullseye vent, at Site ODP 889 over the period of 7 months (October 2009 – April 2010). The compliance data are very consistent with previous field studies. Further, during this time we have captured the passage of several earthquakes and a tsunami. Figure 1 shows the average change in gravity over the months of November 2009 to February, 2010. It highlights the average daily variation in gravity over the period and shows the large changes in gravity variation during the times where there are significant earth tremors. Figure 2 shows the response of the compliance gravimeter along with that of two bottom pressure recorders, during the earthquake offshore northern California, January 10, 2010. Over the long term the NC compliance installation affords us the opportunity to record these phenomena in a different waveband than normally employed in earthquake seismology, and investigate whether these seismic events can be linked to any measureable change in the gas hydrate system.

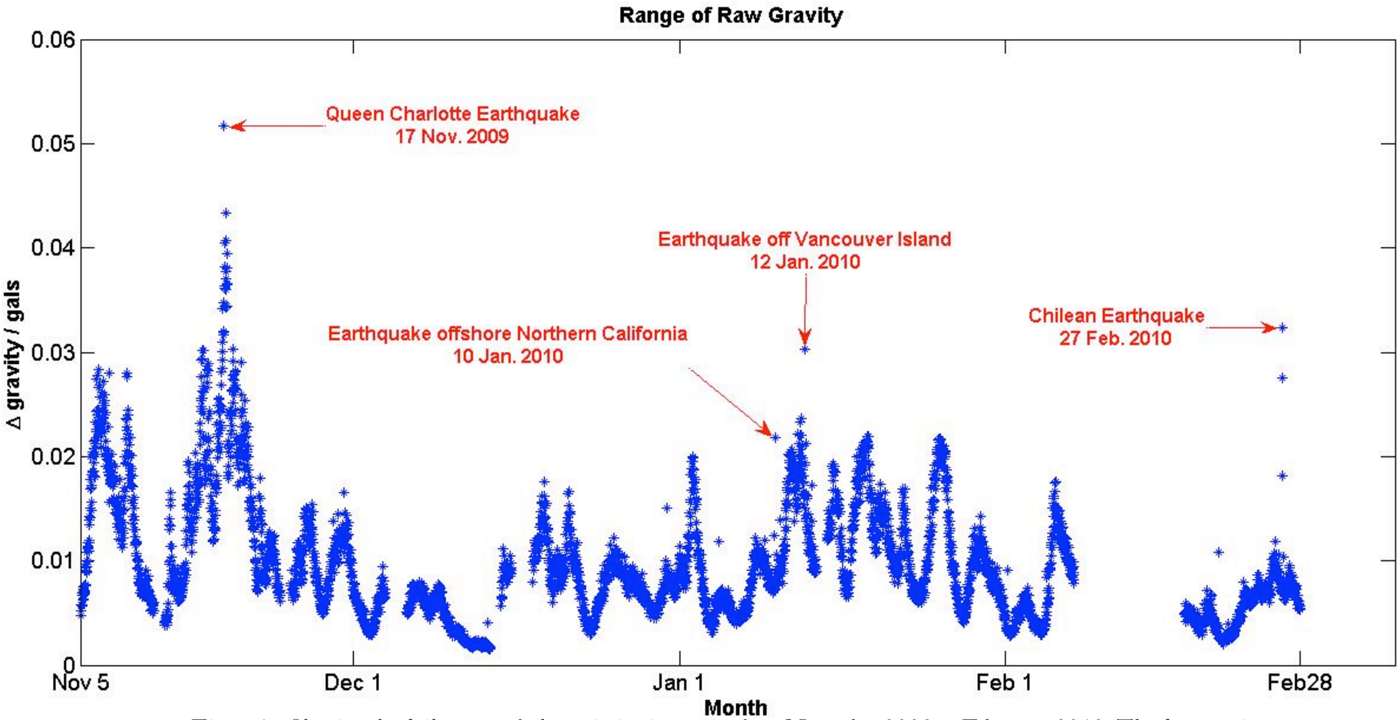


Figure 1: Showing the daily range of the variation in gravity from November 2009 to February, 2010. The data gap in February was because the instrument was off. CREDIT: NC DMAS Plotting Utility

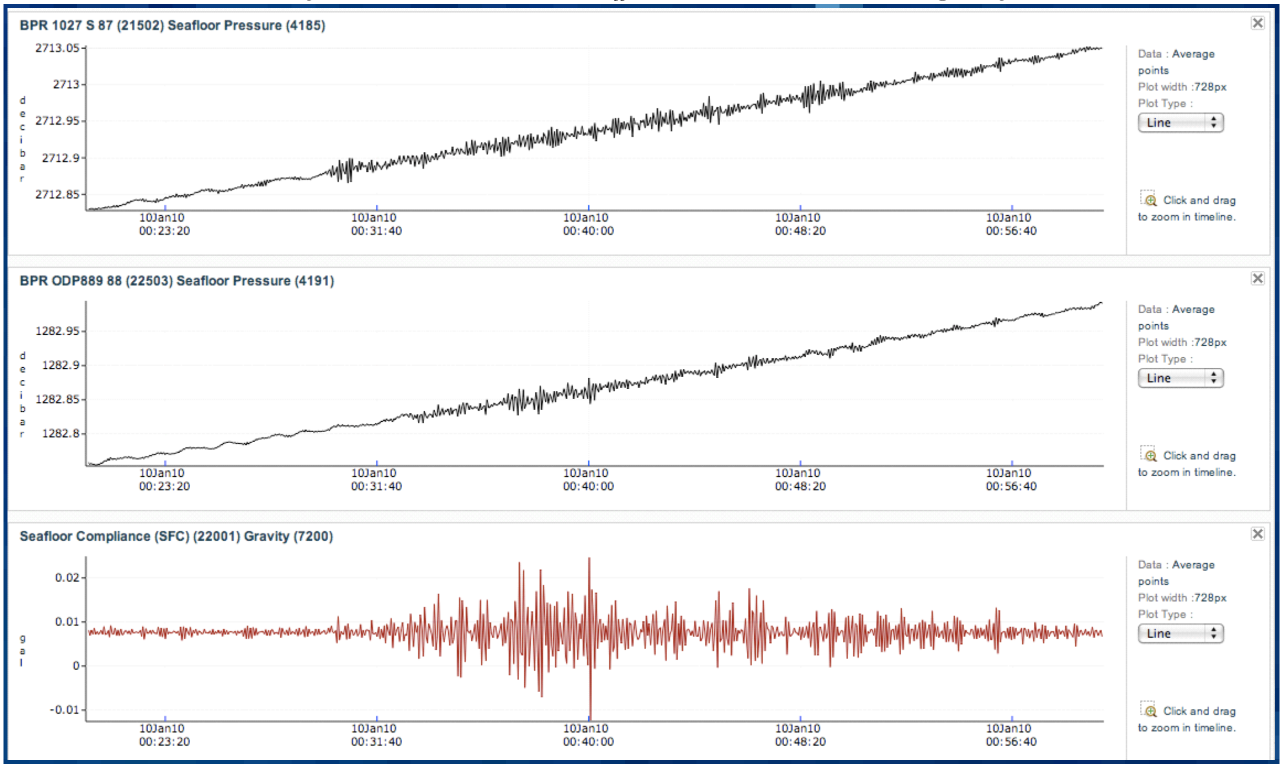


Figure 2: Though the gravimeter is neither intended nor optimized for earthquake or tsunami studies, because it records seafloor accelerations, the instrument has responded to large events in the region and very large events in the same hemisphere (indicated in red on Figure 1). This figure shows the gravimeter response during a magnitude 6.5 event offshore Northern California and two Bottom Pressure Recorders (BPR) traces (at the same Junction Box and at node ODP 1027, respectively) for comparison. CREDIT: NC DMAS Plotting Utility

High Temporal Resolution Oceanic Observations using a Multi-frequency Echosounder at Folger Pass

Rich Pawlowicz from the University of British Columbia

A 3-frequency (38, 123, and 210kHz) upward-looking echo sounder deployed in 95m of water at the near shore Folger Passage node reveals a wealth of information about the temporal variability of fish, zooplankton and bubbles. Long term physical and fisheries related biological oceanographic data exists for the West Coast of Vancouver Island (WCVI) based on traditional physical and biological sampling methods, however these methods are often limited to non-continuous annual or bi-annual surveys that do not provide variability between the sampling periods which are often spaced by external conditions such as weather or even funding consistency.

The customised multi-frequency BioSonics DT-X Digital Scientific Echosounder began operation in the fall of 2009 and in general provided continuous high temporal resolution data. Visualization of the 3-frequency data is accomplished by mapping the low frequency data to the red band, the mid-frequency data to the green band, and the high frequency to the blue. Intensity of the echo return is indicated inversely with color intensity, that is, the strongest returns from all frequency bands will be white. The maximum amplitude return from the sea surface was "zeroed" to black in order to provide a distinct trace, similar to the "whiteline" feature often used to show the bottom in downward looking sonar's.

Figure 1 a) shows the pressure fluctuation from a CTD co-located with the echosounder. Mostly dominated by a mixed tide, it also reveals an area of high-frequency variability superposed on the tide which can be interpreted as pressure variations due to very large surface waves 96m above the CTD. These pressure fluctuations coincide with a "fuzziness" in the averaged surface return, which is marked by the dark line at a range of about 96m in the one-minute averaged multi-frequency data in Figure 1 c). Wind speed from an offshore meteorological buoy on La Perouse Bank seen in Figure 1 b) shows that the period immediately preceding the high-frequency variability was a time of increased wind speed. This coincides with a period of greater intensity of return from all bands (the white patches) in the upper 10m of the water column, at ranges of 86-96m. This is likely due to echo returns from bubbles being injected into the ocean by breaking waves. These injected bubbles can represent a significant increase in air-sea gas exchange.

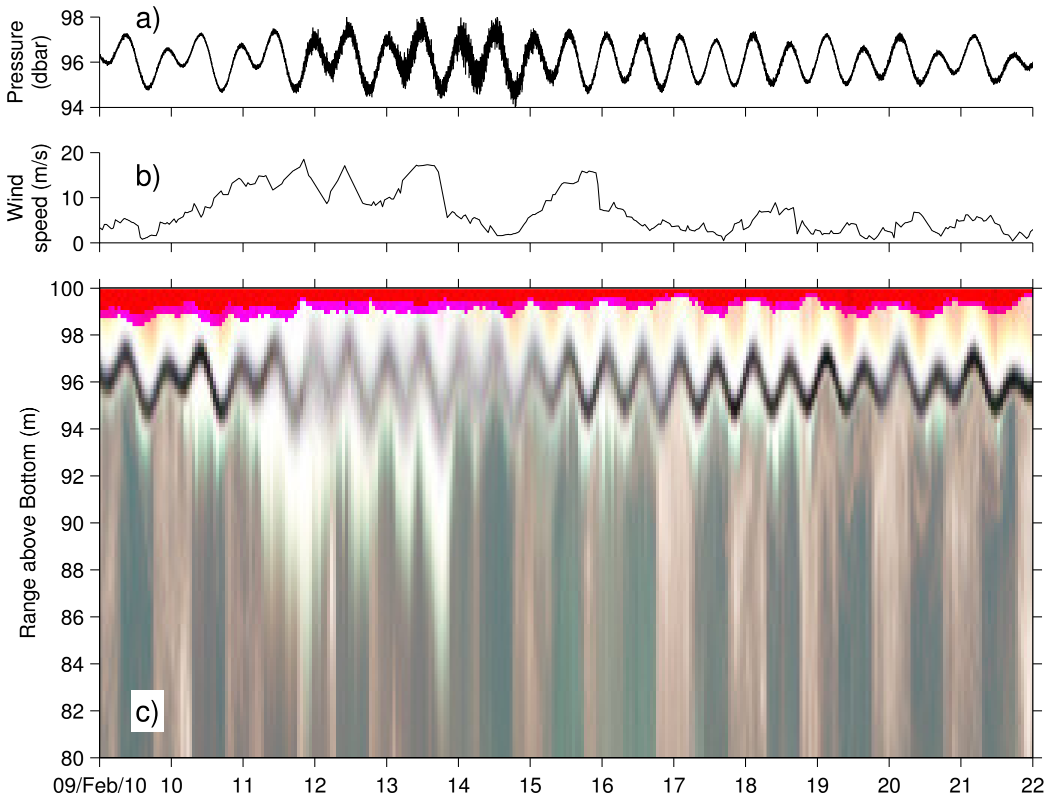


Figure 1: a) 1-minute pressure readings from an SBE16 pressure recorder at 95m. b) Wind speeds from weather buoy C46206 (La Perouse Bank). c) Near-surface returns. CREDIT: NC DMAS Plotting Utility

Significant biological details can be seen in the more finely resolved 1-second interval data. In Figure 2, single scatterers (reddish-white) can be seen as upward moving streaks slowly filling the water column at the beginning of dusk (diel) migration of zooplankton into the surface waters at night. Larger targets possibly representing dense schools of fish (in pure white) can also be seen. Their appearance is often associated with the beginning of long, faint traces moving steeply upwards which rise at a rate that is near the maximum rise rate for bubbles and may represent the exhalation of bladder gases that can accompany depth changes for some fish species. Also, in the background one can see small upward turned "smiles". These likely represent scatterers travelling slowly through the field of view of the transducer.

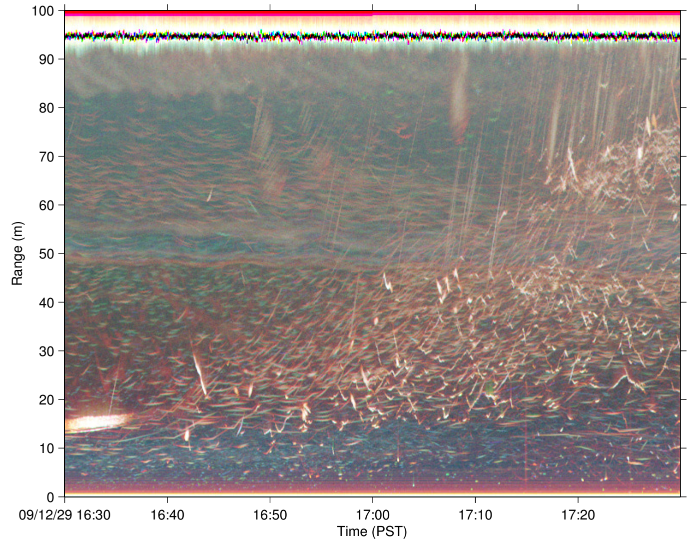


Figure 2: Observations over 1 hour near dusk.

Quantifying Deep-sea Surface Bioturbation

Katleen Robert from the University of Victoria

The Barkley Canyon black and white video cameras located on Pod 1, Pod 2 and Pod 3 have been used in the last year to monitor surface bioturbation by the deep-sea benthic megafauna. Bioturbation is the mixing of sediment that occurs when organisms such as flatfish, echinoderms or gastropods either ingest particles, track over the seafloor or bury themselves. These behaviours result in physical and chemical alterations of the sediment properties providing important ecological functions and services such as decomposition of organic matter, pollutant burial and nutrient interchange.

By making sweeps of the field of view every two hours, abundance and movement patterns of specific taxa have been recorded. Particular focus has been given to flatfish, skates and sea urchins. Positions of organisms on the seafloor are being recorded using a polar coordinate system based on the pan and tilt values of the camera (Figure 1). Organisms' sizes and displacements are measured using a Canadian grid system (Figure 2) which was built using two laser beams separated by a distance of 10cm and a horizontal scaling ruler laid underneath the instrument platform during deployment.

The aim of this project is to quantify the level of bioturbation occurring in proximity of the Pod 2 camera located at 400 meters water depth. We hope to provide an estimate of the time required for animals to fully turn over the surface area represented in the camera's field of view.

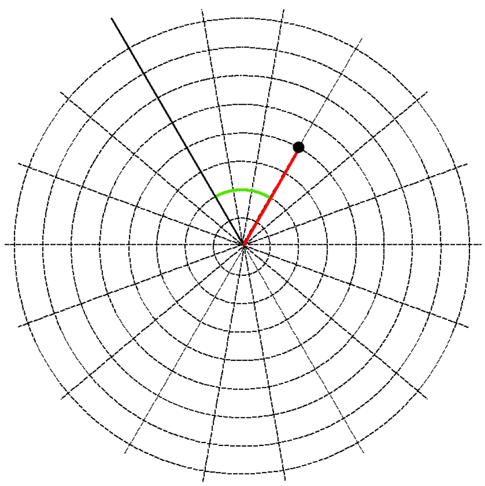


Figure 1: The position of an organism within the camera's circular field of view can be described using a polar coordinate system. It is based on the distance from a point on the seafloor below the camera (red) and the angle (green) away from the reference direction (black).

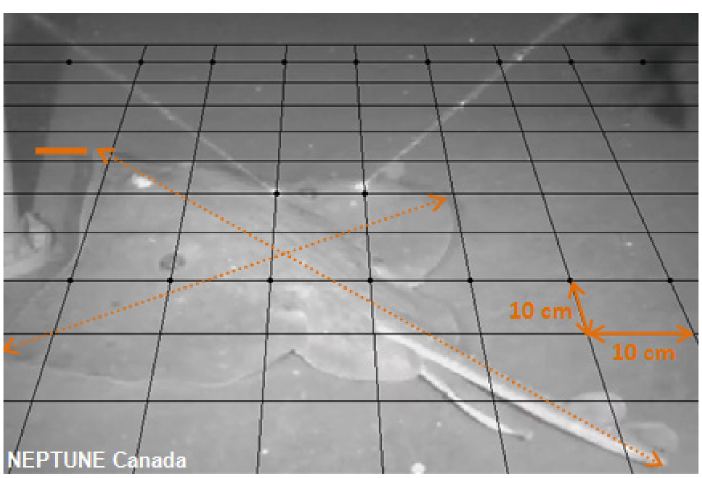


Figure 2: Example of a Canadian grid overlaid on an extracted video frame where a large skate passing in front of the Pod 2 camera can be seen. In the image above, each square represents 100cm3. Based on this, it is possible to estimate that this fish is ~56 x 79cm and its nose is located ~145cm from the camera.

Wally's First Year

Laurenz Thomsen from Jacobs University Bremen, Germany

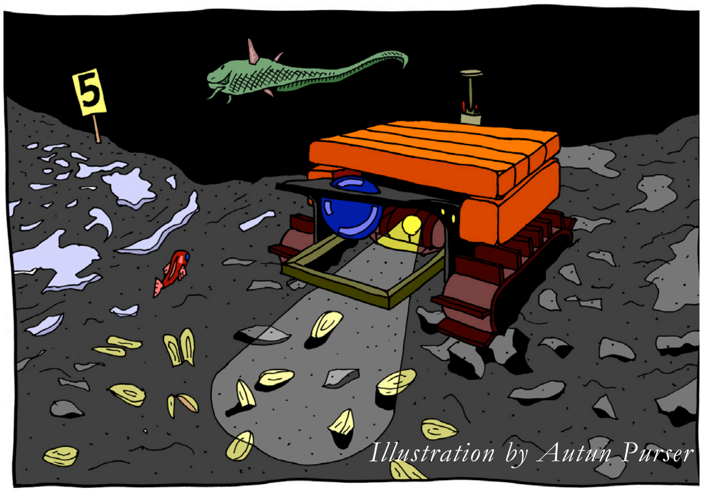


Illustration by Autun Purser

The research group at Jacobs University Bremen, Germany is using Wally the crawler for NEPTUNE Canada research. The study site is in Barkley Canyon and was nick-named "Wallyland" by their Canadian colleagues. Wally is the product of eight years of development by a group at the Jacobs University of Experimental Oceanography (OceanLab) in Bremen.

During the first year of NEPTUNE Canada's operations, they investigated the fluxes of the greenhouse gas methane and the community structure of the animals living at the study site. Methane is released at this site into the water column. As the dataset from NEPTUNE Canada is so huge, they started to use statistical programs from space research.

The group have determined that the bottom currents, the temperature of the seawater, and the tides can be detected at this 900m water depth (Figure 1) which is strongly influenced by the release of methane. They also found out that during this past year, the visitors to Wallyland include fish, spidercrabs, and jellyfish amongst others, in strongly varying abundance. Some spidercrabs visited the site to mate. We also found out that algae-blooms in surface waters above Barkley Canyon arrive at the seabed after a few days in the 900m water column after death and descent into the deeper ocean.

The researchers at Bremen continue to be very excited about the NEPTUNE Canada project and enjoy this great collaboration with their Canadian colleagues.

http://mars-srv.oceanlab.iu-bremen.de/esonetcrawler.html
http://mars-srv.oceanlab.iu-bremen.de/index.html

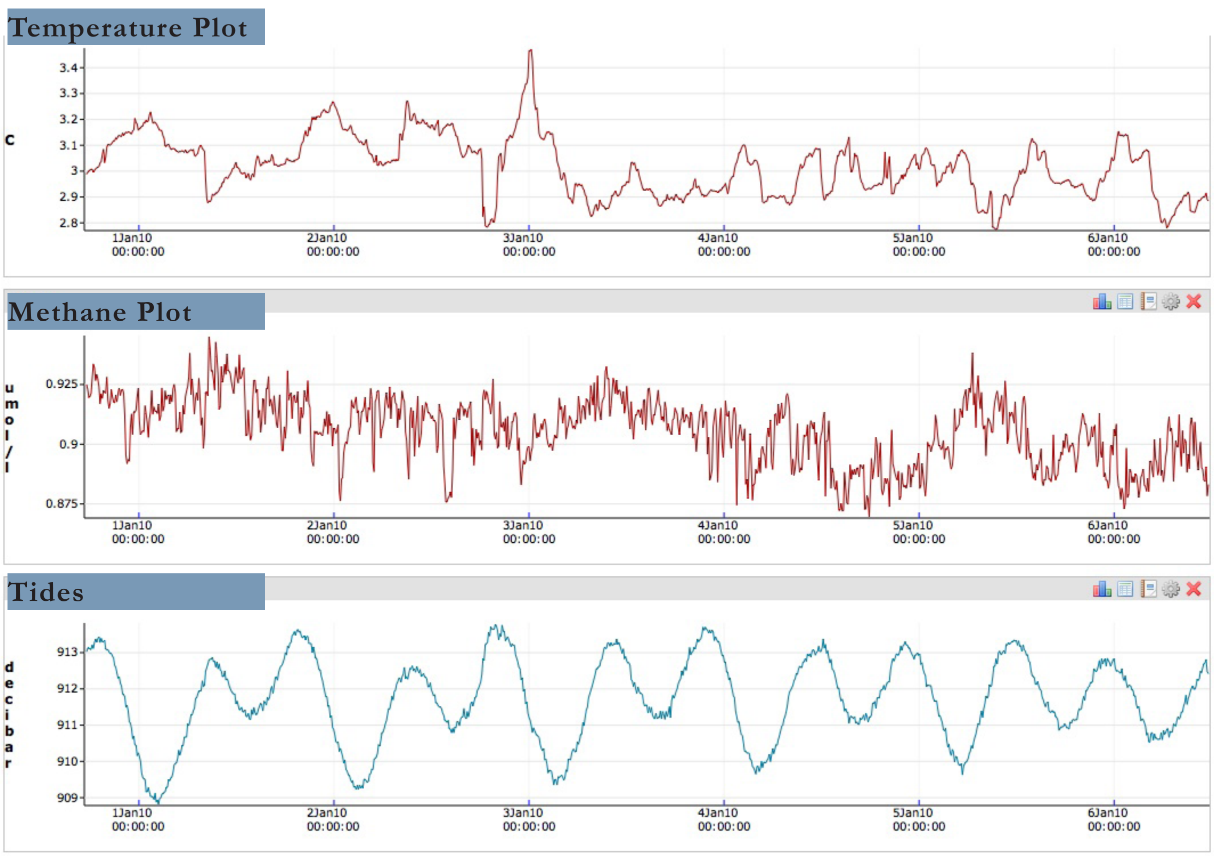


Figure 1: Plots from Barkley Canyon hydrate field at 900m water depth for 1 - 6 January 2010 showing correlations between temperature, methane and tides. CREDIT: NC DMAS Plotting Utility

Cabled Observatory Vent Imaging Sonar (COVIS)

Peter Rona, Russ Light, Karen Bemis and the COVIS team (Applied Physics Lab at UW and Rutgers)

COVIS (Figure 1) was powered and began acoustic imaging of hydrothermal flow at the Grotto Vent cluster in the Main Endeavour Field joining the NEPTUNE Canada seafloor cabled observatory on 29 September 2010. The purpose of our experiment is to acoustically image, quantify and monitor seafloor hydrothermal flow on timescales of hours (response to ocean tides) to weeks-months-years (response to volcanic and tectonic events) to advance understanding of these interrelated processes. To achieve this, COVIS acquires acoustic data from a fixed position on the seafloor (Figure 2) at a range of tens of meters from targets to make three types of measurements: 1) volume backscatter intensity from suspended particulate matter and temperature fluctuations in black smoker plumes which is used to reconstruct the size and shape of the buoyant portion of a plume; 2) Doppler phase shift which is used to obtain the flow rise velocity at various levels in a buoyant plume; 3) scintillation which is used to image the area of diffuse flow seeping from the seafloor.

The system can direct the sonar transducers under software control with 3 degrees of freedom; pitch, roll and yaw. This translation system allows the sonar to be levelled relative to seafloor and pointed at particular areas of interest in the vent area. Plume and Doppler imaging uses a very narrow 1° x 128° 400kHz fan beam which is received by a multi-channel receiver and beam formed into 256 (nominally) receive beams. A broader beam projector is used for examining diffuse flow. This projector produces a beam 28° x 130° and can be operated at either 200 kHz or 400 kHz. The same multi-channel, beam forming receiver is used as with the plume/Doppler imaging. The raw receive data along with platform attitude data (magnetic heading, pitch and roll) is collected for each transmission and stored locally on the COVIS solid state hard drives. NEPTUNE Canada will periodically upload this data to the shore station for processing. COVIS will autonomously collect plume, Doppler and diffuse flow data on a typical cycle of every 4-6 hours per day. The current configuration is generating about 700 Mb of data for each cycle.

Figure 1: COVIS on deck of R/V Thomson. COVIS is 4 meters high with the sonar heads and orientation mechanisms on top, syntactic foam around the middle (orange), and sonar electronics in pressure housings between tripod legs.

COVIS is presently positioned to remotely acquire data to measure these flow parameters coordinated with in situ experiments at a site at the north-eastern corner of Grotto (Remotely Activated Water Sampler = RAS for diffuse flow; Benthic and Resistivity Sensor = BARS in a black smoker; Temperature sensor array in biota in diffuse flow; HD video camera). COVIS is also imaging an intense plume discharging from black smokers on top of the north tower at the north-western corner of Grotto. The COVIS team is working to display time series of the buoyant plume images in near real time on the NEPTUNE Canada website. With the failure of the extension cable into the Main Endeavour field, only one month of data has been captured to this point; hopefully, the cable problem will be corrected in mid-2011.

This initial phase of the work is devoted primarily to engineering. COVIS was designed and built by the Applied Physics Lab at the University of Washington in partnership with Rutgers University with support from the National Science Foundation (NSF award OCE-0824612 to APL-UW; NSF award OCE-0825088 to Rutgers). The COVIS team is working to eventually display all three types of acoustic measurements in near real time accessible to the community on the NEPTUNE Canada website.

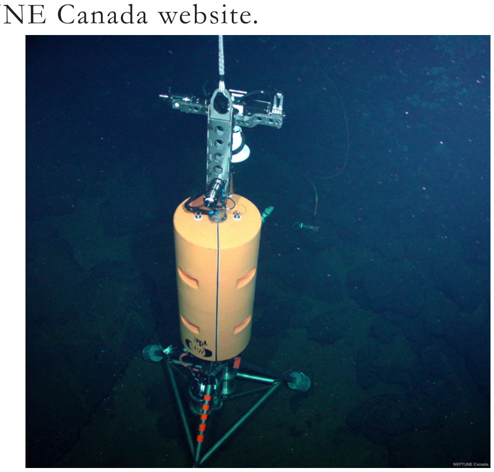


Figure 2: COVIS deployed on the seafloor in the Main Endeavour Field. A video of the deployment of COVIS "Amazing Sonar Deployed" can be viewed at: http://www.youtube.com/neptunecanada#p/u/2/ltQWKm-ma48

A Day in the Life of NEPTUNE Canada Data Flow Operations

Benoit Pirenne, Associate Director IT, on behalf of the Data Management & Archiving System Group

Instruments are now reporting data from all five nodes on the NEPTUNE Canada facility. After a year of operations, it is interesting to paint a picture of the daily activities related to the data flow.

Data Acquisition

These days, DMAS is recording data from over 250 individual science sensors (e.g., temperature, pressure, oxygen saturation, ...) as well as from 1250 engineering sensors (mostly reports from the junction boxes). The total amount of scientific scalar measurements received on a daily basis amounts to about 10 million! The number is clearly much larger still for the engineering values, as about 100 million of them are received, parsed, converted and calibrated every day. Moreover, most of these values are checked against pre-determined limits and alerts are sent to network operators on staff, should the values reach a threshold.

Every day, an average of 900 raw data files are recorded in the archive which, after compression, amount to 50 GB of storage space at UVic and at the University of Saskatchewan, where the safe backup copy of the holdings is located. The files contain anything from instrument and junction box logs to hydrophone, ADCP or video data. Figure 1 shows the growth of the archive, month after month (numbers include the VENUS contribution) for the past year.

Each day about 600,000 log messages and alerts are received from dozens of different management software systems, operating systems and network equipment, each looking at a different part of the land-based or subsea infrastructure. The messages do not of course all relate to actual problems but do provide "debug" information that is useful for the analysis of a problem that might occur later, offering a possible "smoking gun" to help identify and address problems sooner.

Data Access and Distribution

Currently, over 7900 users have indicated their willingness to explore our services by registering. This number increases daily by more than 20 new users.

Registered users make use of various tools available on the web site such as the project environment, Plotting Utility, SeaTube or the Data Search Screen. Data products generated by user requests from the Search Screen are sent to various users: every day on average, 22 of those are sent to Canadians (excluding NEPTUNE staff activities), 7 to the US, 2 to China and 2 to Germany. This does not include files sent to special users such as Michel André (see Listening to the Deep article) whose project is downloading every file produced everyday by the NEPTUNE Canada hydrophones to perform the detection and identification of possible sources in the audio streams.

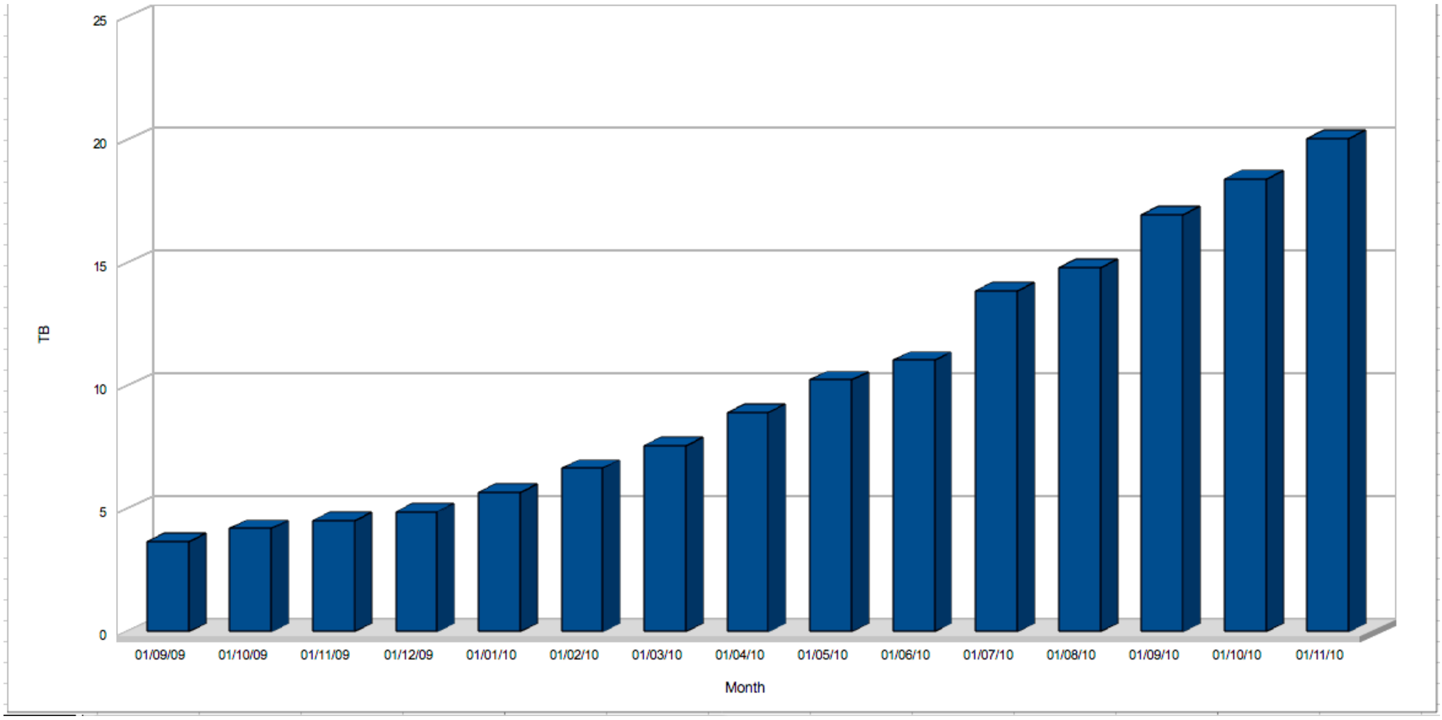


Figure 1: Total holdings in the DMAS database (for the past year) for VENUS & NEPTUNE Canada data.

New Services

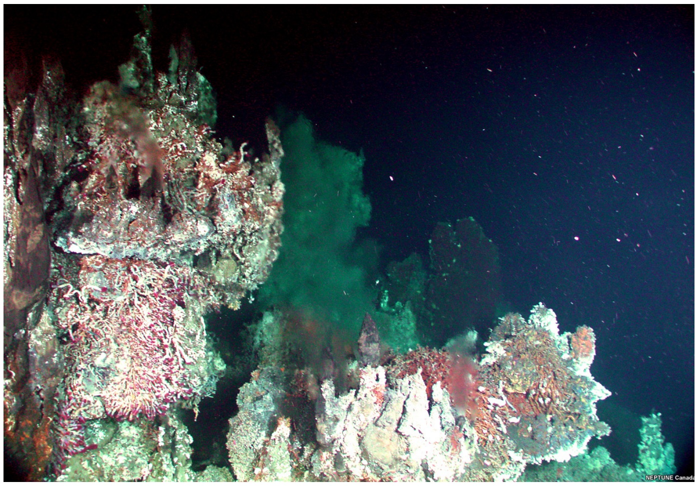
Recently, new and improved interactive services have been added to the Oceans 2.0 suite. As a summary, Figure 2 below presents what is available, with a note indicating the recent feature changes.

New features are constantly in development and are coordinated with the science users representatives. An example of an upcoming improvement is in the area of custom hydrophone data processing. Another development which we hope to release in a few months is a game that will allow the public at large to participate in the scientific endeavour by contributing their time to help scientists identify the content of video clips. More on these and other exciting new features will be presented in a forthcoming Newsletter.

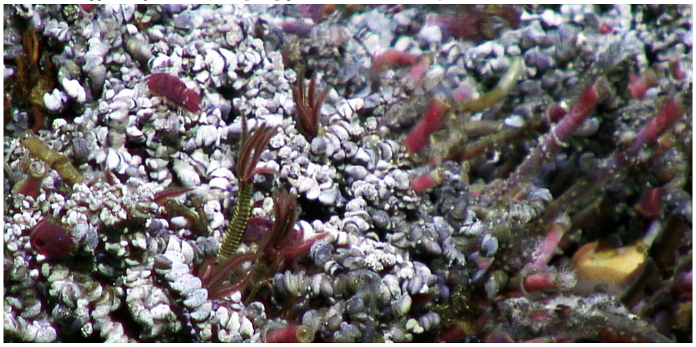
Oceans 2.0 Service	Address	Recent feature changes
Search	Dmas.uvic.ca/home	Search by Location is the default; better management of instrument location changes; new data products are being added constantly
CodeRunner	Dmas.uvic.ca/CodeRunner	Interface improved significantly; new templates
PlottingUtility	Dmas.uvic.ca/PlottingUtility	Search by location; publish interesting searches
SeaTube	Dmas.uvic.ca/SeaTube	Dives sorted differently, shorter load time
eCamera Control	Dmas.uvic.ca/Camera	Only active cameras selectable; more field of view maps; ability to turn camera on and off at will for those with access authorization
Infrastructure details	Dmas.uvic.ca/DeviceListing	Search & View all information on all devices, sensors, sites, ...
Project space	http://wiki.neptunecanada.ca/dashboard.action	Various improvements

Figure 2: Ocean 2.0 feature update.

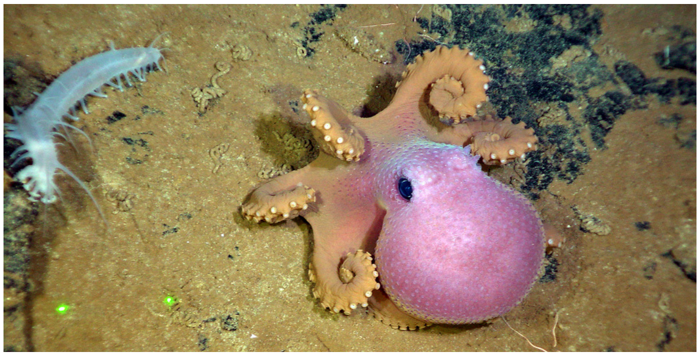
September 2010 Installation Photo's



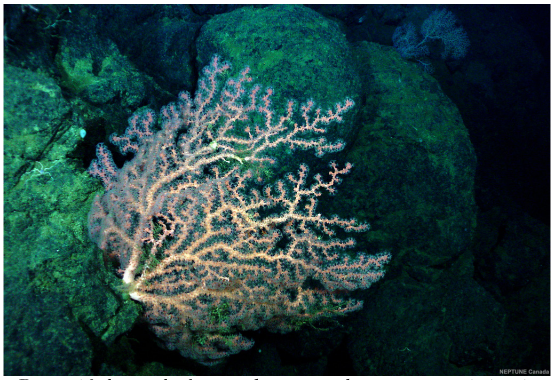
Diffuse flow emerging from Grotto Hydrothermal Vent.



Specially adapted tubeworms, scale worms and limpets thrive in the hot sulfide-laced waters of Grotto Hydrothermal Vent.



This pink octopus and crawling holothurioud were observed by ROPOS during cable route surveys between Endeavour Node and the north Regional Circulation Mooring (RCM) instrument platform at Endeavour Ridge.



Beautiful coral observed atop a deep-sea precipice in the Endeavour rift valley.

NEPTUNE Canada's Inspired Team Continues to Grow

Fern Johnson, Associate Director Finance and Administration

NEPTUNE Canada has now completed the transition from the installation phase to full operations. Significant changes have and will continue to take place within the organization structure to better serve NC users, with a primary focus on the scientific community.

NEPTUNE Canada is collaboratively managed by the Project Director, Dr. Chris Barnes and four Associate Directors which together comprise the Executive Committee and each of whom leads a group of specialists to provide the needed support to this science megaproject. The current makeup of each of these groups is available on the NC website at:

http://www.neptunecanada.ca/people-community/neptune-team/

The Finance and Administration working group led by Fern Johnson, Associate Director, Finance and Administration provides overall administrative support, in the areas of accounting and finance, purchasing, human resources, facilities, travel, event coordination and communications to NEPTUNE Canada. In August, Karen Douglas was a very welcome addition to the admin group as Technical Administrator. She is currently finishing a BSc in Earth and Ocean Sciences at UVic and has previously worked with both NEPTUNE Canada as a Metadata Specialist, and VENUS in Operational Data Support over the past two years.

The Data Management & Archive Systems (DMAS) group led by Benoit Pirenne, Associate Director Information Technology provides ongoing support to the network and DMAS systems via the Systems Administration group. The Development and Quality Assurance groups also continue to work to provide cutting edge tools and technologies for data storage and data users. Four new DMAS staff members including one systems administrator and three developers joined NC this fall. Dennis Breckenridge, with over twenty years of experience in several large scale storage networks including those at BCAA, TELUS, ICBC, UBC, and BC Hydro, replaced Eric Kolb (who left NC this summer), as a Mission Critical Systems Administrator. Khai Yih Ong moved from Calgary to Victoria in October, to become the first of an expected two additional Intermediate Java Developers to join NC. Michael Thorne and Helena Jeeves followed in November as Senior Front End Application Developers. Michael and Helena, both with extensive experience will be creating and improving a suite of exciting new rich internet applications for the seafloor observatory. In addition, NC will be advertising additional DMAS positions in the new year.

The Engineering group led by Lucie Pautet, Associate Director Engineering not only provides ongoing support to the physical infrastructure, but also provides leadership in the testing and maintenance of additional instrument deployment cruises. Plans for this busy group include the addition of expertise in the form of engineer/technicians in the near future.

The Science group led by Mairi Best, Associate Director Science provides NEPTUNE Canada's main interface with the science community and is concentrating on expanding the user base. This team has grown rapidly in the past six months to provide the needed resources to engage new experiments and provide support to existing. In addition to the two Data Specialists and four Research Theme Integrators (RTI) added to staff this year, NC is currently seeking an additional RTI and a competition for a new Project Scientist will be held early in 2011.

NEPTUNE Canada advertises all employment opportunities on the web at:

http://www.neptunecanada.ca/about-neptune-canada/opportunities/

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