Summer/Fall 2008

VENUS
Victoria Experimental Network Under the Sea

University of Victoria

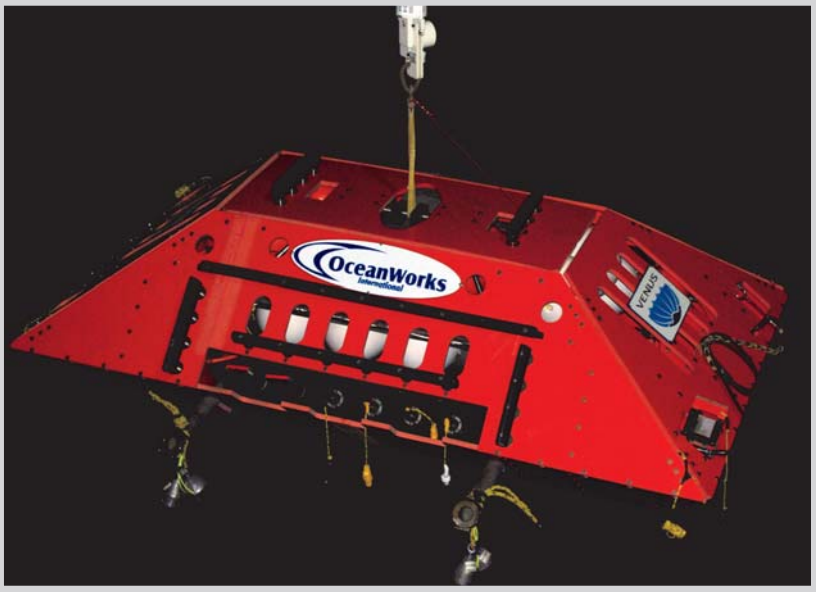
The Ocean Online, Real-Time, Anytime

KEEPING CURRENT

Newsletter Contents

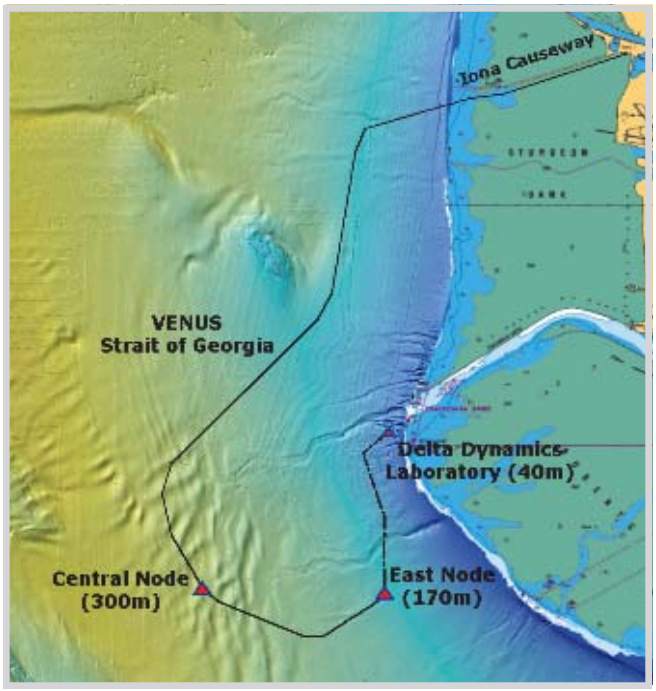
VENUS INSTALLATION IS COMPLETE!

Adrian Round (VENUS Project Manager)



Strait of Georgia Central Node being deployed to 300m

In the early hours of **September 24th 2008**, the last VENUS Node pod was slowly lowered 300m to the bottom of the Strait of Georgia. The ROPOS ROV was quickly launched over the side of *CCGS John P .Tully* and the deepest installation effort on VENUS was soon underway. Despite poor visibility, the skilled ROV pilots soon had the pod safely nestled into the Central Node base. At 05:27am, the Iona Shore Station reported that the VENUS SOG Array now had two functioning Nodes. Over the next 10 hours, the VENUS Team deployed and connected the Central Node instrument platforms, marking completion of installation of the VENUS cabled ocean observatory. Stretching over 40kms in length, three science sites (Strait of Georgia Central, East, and Fraser Delta), depths ranging from 40 to 300m, completion of the Strait of Georgia Array represents a major milestone in cabled observatory technology.



Map of the VENUS Strait of Georgia Array, Depths 40—300m

VENUS Proposes Expansion To Serve Research

Verena Tunnicliffe (VENUS Project Director)

The University of Victoria submitted a proposal to the Canada Foundation for Innovation on October 3, 2008 entitled: *Subsea Laboratories on VENUS: enhancing the capabilities of* Canada's cabled ocean networks. The proposal was formulated over the spring and summer 2008

(Continued on page 4)

Challenges on the Delta Front

Richard Dewey, Paul Macoun, Gwyn Lintern (NRCan)

This past cruise on the *CCGS John P. Tully* was co-sponsored by VENUS and NRCan, with a particular focus on the Fraser River Delta slope. After installing the final Central Strait of Georgia Node, we headed up to the Delta slope and put ROPOS on the

Figure 1. ADCP on DDL after 6 months

bottom to recover the DDL platform for scheduled maintenance. Although we were able to find the platform in the swirling maelstrom of suspended sediment, we discovered that it had been buried by up to a metre of newly fallen mud (Fig. 1 & 2). Sedimentation rates of 10-30cm per year during the freshet had been expected, but we were seeing 60-80cm covering our platform's pedestal legs. In addition, the cable, running all the way from the East Node some 7 km away, was also (locally) buried. The platform's original design called for pull pins to release the legs. After 8 deployments and recoveries without

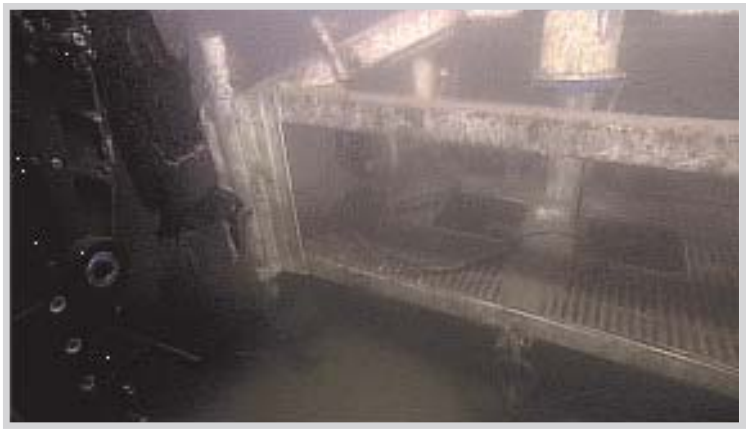


Figure 2. DDL, 60cm deep in the sediment

needing this feature, we had bolted the removable legs to the frame. Lesson learned. Several attempts were made to recover the platform and free the end of the cable from the sediments, including vacuuming and digging the sediments away, cutting the tops of the steel legs with an underwater saw, and pulling with our 7 ton recovery spectra rope. After breaking the line on one attempt, we convinced the Captain that another pull attempt might work, if the lift was slow enough. With patience and excellent crew coordination, we successfully recovered the platform. Unfortunately, only 4 metres of the wet-mate connector and cable were pulled from the mud, and we had to leave the site without re-deploying the DDL. Our work now includes a redesign of this platform, with taller legs and a means for securing cable ends and connectors in this "dynamic" sediment region.

New Data Streams on VENUS Observatory!

Jaklyn Vervynck (VENUS Data Manager)

Following successful deployment of the Strait of Georgia Central Node VENUS now features new data streams from SeaBird CTD (Conductivity, Temperature and Depth), Aanderra Optode, Wetlabs ECO-NTU, RDI Acoustic Doppler Current Profiler (ADCP), ASL Zooplankton Acoustic Profiler (ZAP), and a Hydrophone Array. We also deployed a new Pro-Oceanus Gas Tension Device (HGTD) and a Nortek Vector Current Meter in Saanich Inlet. New data are available at www.venus.uvic.ca/data/data_plots.php) to view and for download at www.dmas.uvic.ca/Search. ADCP data products (Fig. 3) are coming online soon.

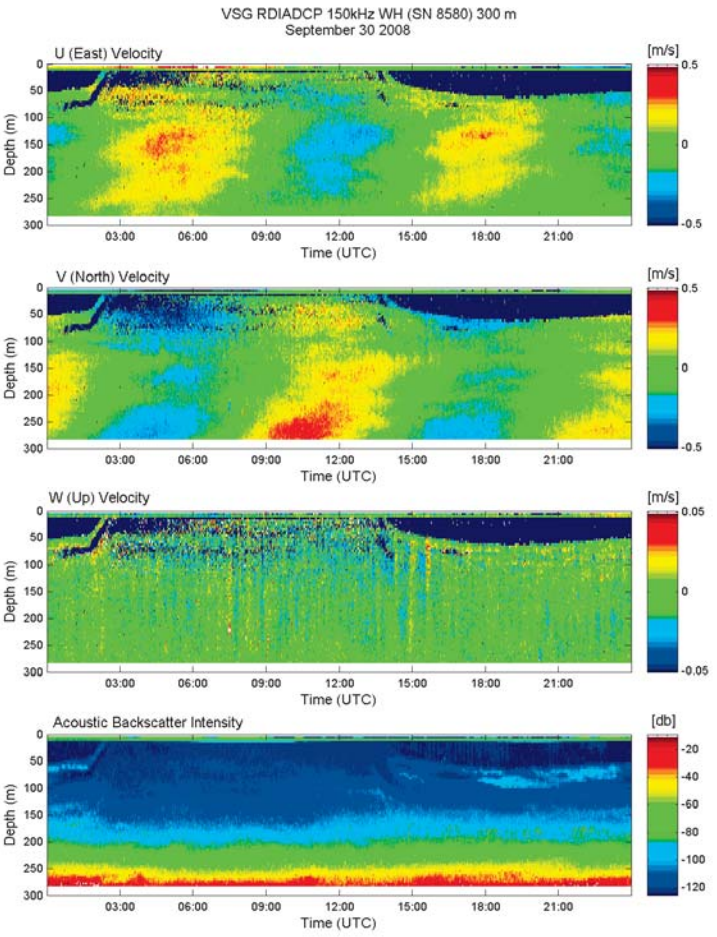


Figure. 3 RDI ADCP 150kHz WH (SN 8580) data from September 30 2008. U, V, W velocities and Acoustic Backscatter Intensity

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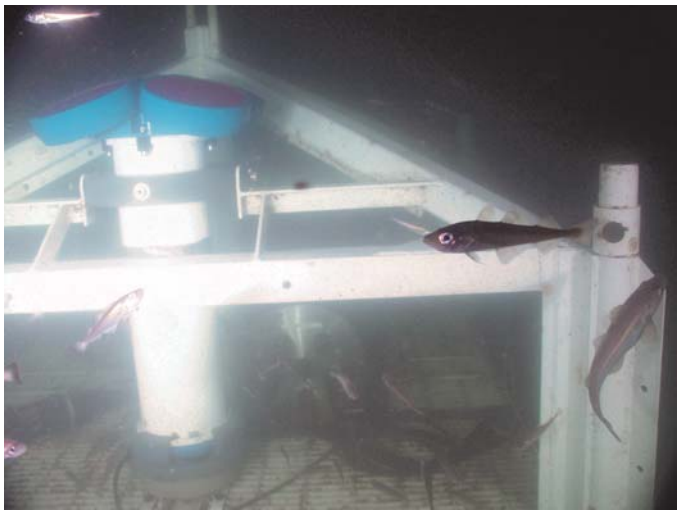
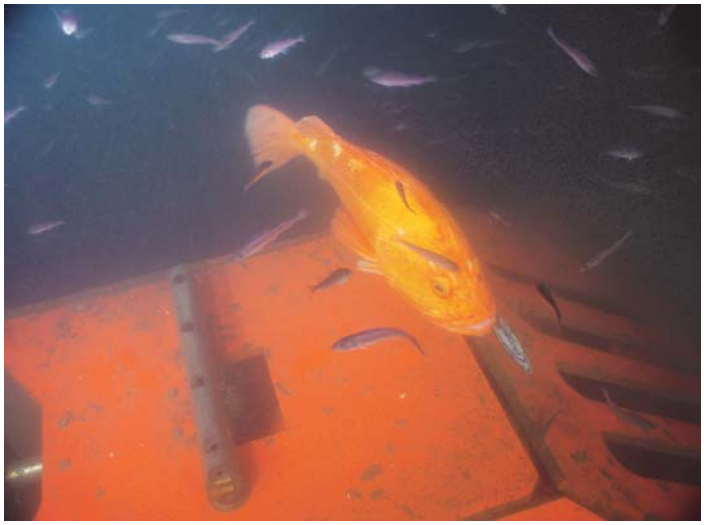
Delta Dynamics Instrument Platform (40m). 6 months later



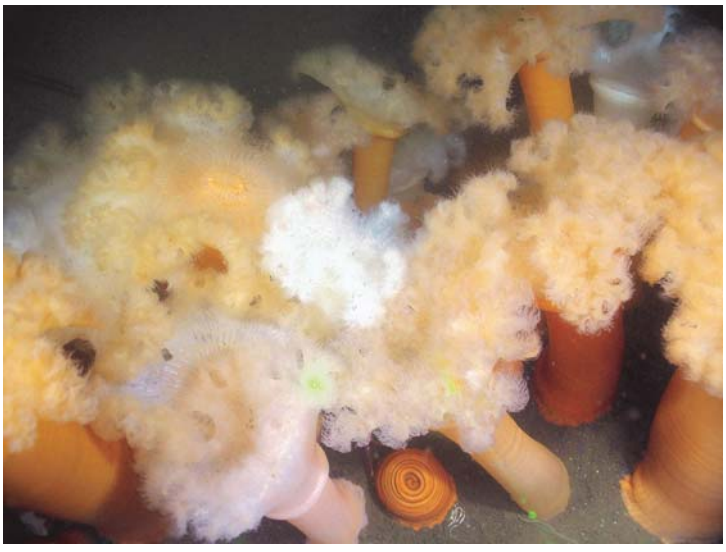
VENUS Strait of Georgia Instrument Platform (300m)

Strait of Georgia VENUS Instruments Platform (175m). Surrounded by Pollock



VENUS Strait of Georgia East Node (175m). Rockfish

ROPOS ROV attempting to cut off the legs of the buried Delta Dynamics platform



Anemone Colony, Saanich Inlet (100m)

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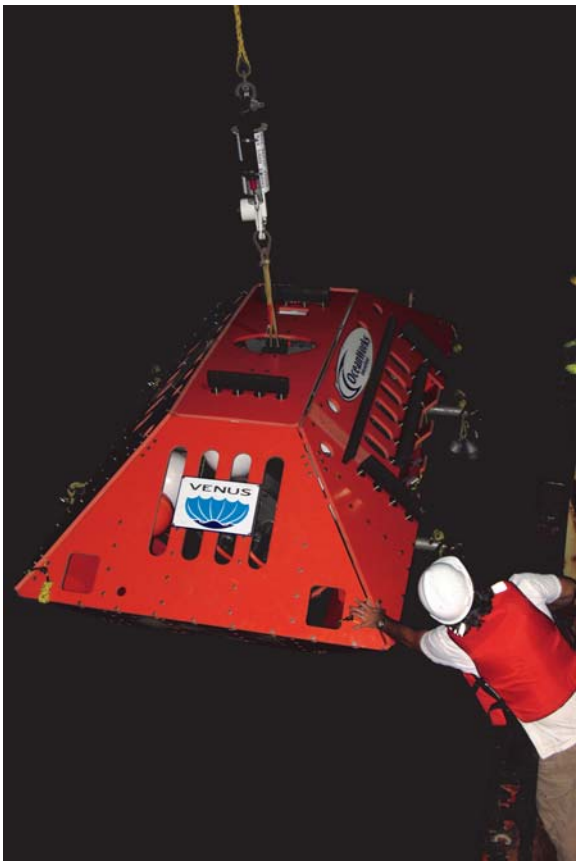
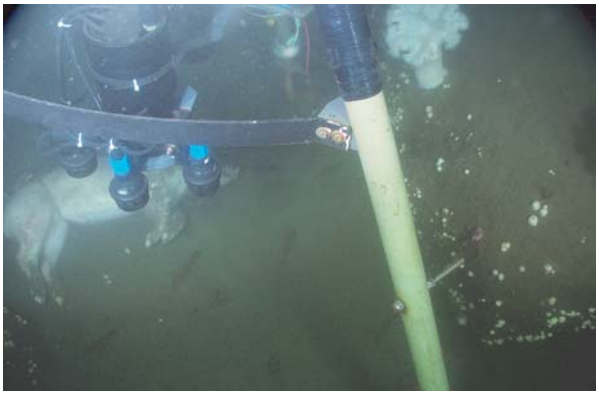
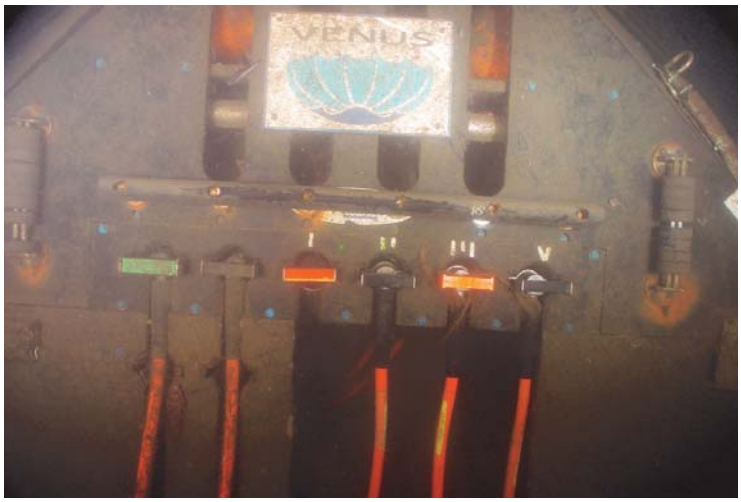


Deployment of the VENUS Strait of Georgia Central Node, Sep. 2008

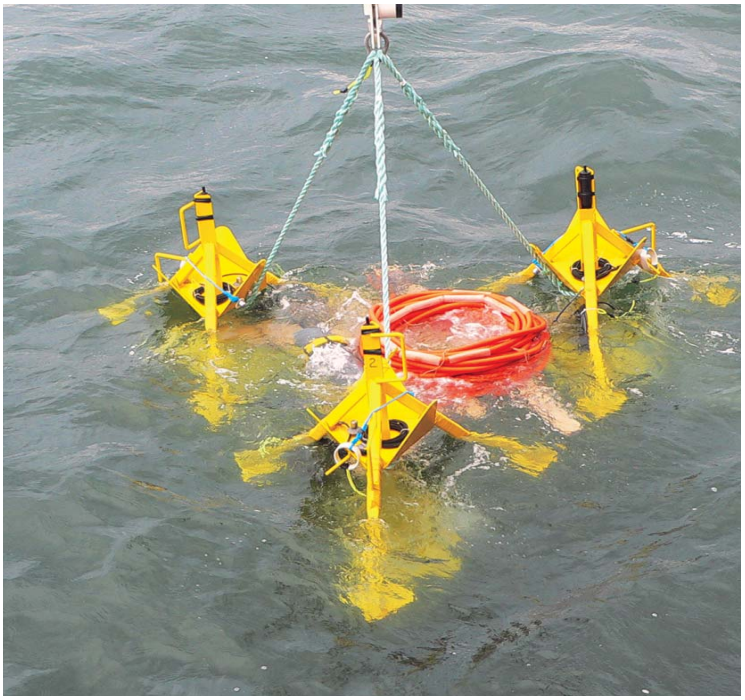
Strait of Georgia East Node Instrument Platform. Time for maintenance



Forensic Experiment on VENUS. Episode III



VENUS Saanich Inlet Node (100m). Operational since 2006



Strait of Georgia Hydrophone Array being deployed to 300m

VENUS Cyclops C-MAP Camera System

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Transmissometer Biofouling Protection System

Paul Macoun (VENUS Project Engineer)

Figure 4. INFREMER Biofouling system on VENUS

A customized bio-fouling protection system was installed on the Saanich Inlet SeaTech Transmissometer in February 2008. This local chlorination system was developed by engineers at the French research institute IFREMER.

The system is comprised of 3 electrodes, one adjacent to each optical window on the Transmissometer, and one centrally located between the two windows. The electrodes are supported by a small housing which contains the system controller and several Lithium cells.

The principle used to reduce bio-fouling is the electrolysis of sea water, which produces free chlorine in the vicinity of the optical windows. The controller alternates voltage potential between the central electrode and each window electrode switching every 10 minutes.

Figure 4 shows the IFREMER system mounted on the SeaTech Transmissometer. Figure 5 is a graph of Transmissometer data from March 1—Aug 1 2007 (+ symbol) overlaid with data from the same interval the following year (lines). There is a noticeable difference from before and after the system was mounted to the Transmissometer. The 2007 data indicate progressive fouling and resulting signal attenuation. The 2008 data look reasonable until mid-summer. The engineers at IFREMER believe the Lithium cells had become depleted at this point, and as a result we begin to see signal attenuation in June and July 2008.

In September 2008 the bio-fouling system was redeployed on the Transmissometer. The latest improvement to the system was the inclusion of a cable linkage to a Scientific Instrument Interface Module (SIIM). The system is now powered continuously through the VENUS array.

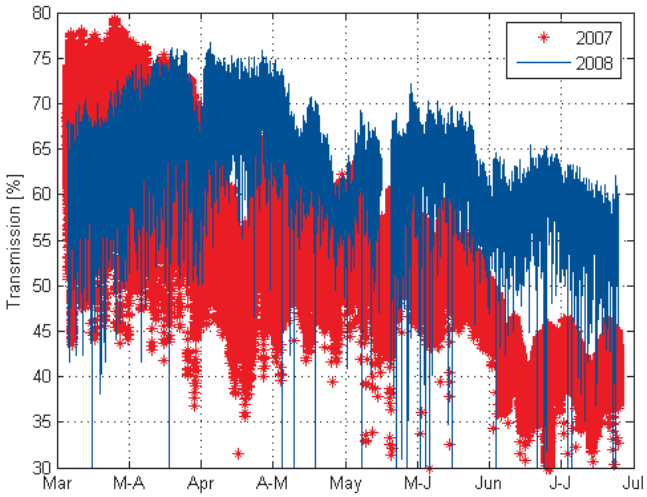

Figure 5. Transmissometer Data Comparison 2007-2008

VENUS and IFREMER will continue to collaborate on bio-fouling protection systems. The present plan is to use the local chlorination system to protect other optical instruments on the various observatory platforms.

NEPTUNE Canada Platform 1 and IFREMER TEMPO-Mini

Richard Dewey (VENUS Associate Director, Research)

Figure 6. NEPTUNE Canada Platform on VENUS, Saanich Inlet

Another milestone was reached on September 28, 2008, when a NEPTUNE Canada platform (#1), hosting a suite of instruments, an OceanWorks Secondary Junction Box (JB), and an IFREMER camera system (TEMPO-Mini) was deployed in Saanich Inlet and connected to the VENUS Observatory. The JB functions much as a VENUS SIIM, providing control and monitoring of multi-port power and communications to all sub-systems. Mounted on the *Highland Technologies* designed platform are: 1) a 300 kHz RDI ADCP, 2) a Nortek Aqua-Dopp current meter, 3) an IOS Bottom Pressure Recorder (BPR), with temperature, 4) a NAXYS broadband IP hydrophone, 5) a Kongsberg rotary sonar, and 6) the IFREMER TEMPO-Mini camera and LED light system, which additionally hosts two Aanderaa Optodes and a temperature probe. This deployment accomplishes several key in situ tests, including a full assessment of the JB, the NC platform design, new instrument drivers, low-light camera systems, near sediment oxygen variations, and all the associated data management and interface systems. The platform will be recovered in February 2009, after which the various components will be prepared for deployment on the NEPTUNE Canada Array off the west coast of Vancouver Island. For more details, see www.neptunecanada.ca. .

VENUS Student News

Andrea Price (University of Victoria)

I am an undergraduate student heading into my fourth year at UVic pursuing a major in Earth Sciences and a minor in Ocean Sciences. I started working for VENUS in May 2008 as a recipient of a NSERC (Natural Science and Engineering Research Council of Canada) undergraduate student research award. These awards are given out to encourage students to pursue careers in natural science and engineering.

One of my main tasks this summer was to assess two different software programs on their abilities to complete QA/QC (Quality Assurance/ Quality Control) checks on incoming live data streams. As part of this project I also updated the VENUS QA/QC plan.

One of my tasks that I found particularly interesting was taking video clips and still images using the CMAP Cyclops camera. This subsea camera, mounted on a tripod, is located at 103m depth in Saanich Inlet. It was fascinating to glimpse into a small part of Saanich Inlet for a series of months and observe the interactions between the various species of fish, crab and zooplankton.

I was also involved in processing data from the hydrophone array located in the Strait of Georgia. This involved running Matlab code to create mp3 files and spectrograms of the sound clips. A spectrogram (Fig. 7) is a visual representation of sound and by scanning these spectrograms it is possible to identify various sounds such as boats, large ships, and planes, as well as marine mammals. For the first time we found sound clips of whale vocalization. By creating a more detailed spectrogram of the whale vocalizations the structure of the sound can be visualized. This will then be analyzed by experts in the field of marine mammal acoustics.

During my time working for the VENUS Project I learned about oceanographic data collection and the various challenges that are associated with deploying instruments on the seafloor for extended periods of time. It was really interesting looking at the live data streams from Saanich Inlet and the Strait of Georgia. This helped me expand my knowledge on the physical and biological processes occurring in these regions.

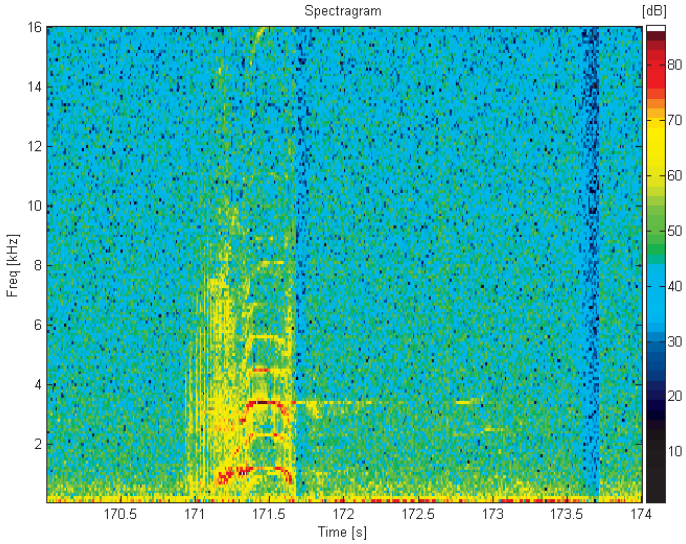

Figure 7. Spectrogram of whale sound. Strait of Georgia. August 2008

It was a great experience working for VENUS and it increased my interest in oceanography, data collection and instrumentation. I am excited to see how VENUS will grow over the next decade and the new projects that will be undertaken.

To hear sounds recorded from the Strait of Georgia please visit VENUS Multimedia gallery, Sound samples.

(Continued from page 1)

by over 40 scientists across Canada and the US to define the next steps in cabled observatory development. Our approach focused on four concepts: i) moveable seafloor modules complete with novel instruments that can be relocated for different studies; ii) a vertical profiler in Saanich Inlet to get us into the interior and upper waters; iii) roving instrument platforms to interface remotely (ferries, AUVs and gliders); and iv) enhanced data visualization tools. The proposal includes developments that will be led at University of Alberta, University of British Columbia, Memorial University and NEPTUNE Canada. The proposal total is $10.9M with 40% requested from CFI. We will submit a matching amount request to BC Knowledge Development Fund at the end of October.

We are very grateful to the many companies, and especially OceanWorks Int'l, for committing to help us raise the final 20%. While grant proposals are never fun in execution, the interactions and creativity were very stimulating – thank you all!

VENUS Cabled Ocean Observatory, 2008

Infrastructure Profile

- 43km backbone cables, 7 km secondary extension cables;
- Two shore stations with monitoring, control, power and data communication systems;
- Three seafloor Nodes (underwater LAN hubs, 12 ports)
- 47 instruments deployed on the ocean floor, with over 120 sensors streaming live data.

VENUS Milestones

- Feb 2006— Install of backbone cable and 100m-deep Saanich Inlet Node
- Jun 2006—VENUS Data Portal Launch—VENUS LIVE DATA!
- May 2007—Install of Backbone cable in Strait of Georgia
- Sep 2007—Deployment of East 170m-deep Node in Strait of Georgia
- Sep 2008—Deployment of Central 300m-deep Node in Strait of Georgia—VENUS Installation is Complete!