Winter 2011/12

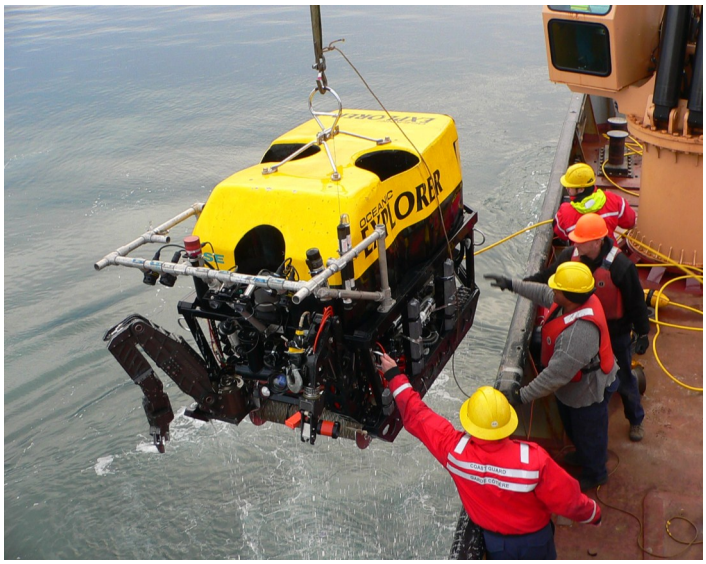
VENUS
Victoria Experimental Network Under the Sea

University of Victoria

The Ocean Online, Real time, Any time

Cruise News. New Cameras and Science Instruments

During the week of December 8-15, 2011, VENUS completed its 22nd observatory servicing cruise. Following two expeditions on the *Thomas G. Thompson*, we were back to familiar territory on the *CCGS John P. Tully*. On this cruise we hired the services of Canpac Divers Inc. and their mid-size ROV, the Oceanic Explorer (photo on the right). Functionally, the Oceanic Explorer proved very competent, although there were times in the strong Strait of Georgia tidal currents when we had to extend operations over several dives to accomplish all tasks. This cruise was co-sponsored with Natural Resources Canada (NRCan), who accomplished several surveys and science project tasks in between VENUS maintenance operations.



The ROV Oceanic Explorer owned and operated by Canpac Divers Inc. of Vancouver.

The new digital stills camera aka "DISCo" camera, first deployed in Saanich Inlet.

A highlight of this cruise was the deployment of three seafloor cameras to join the 300m deep webcam in the Strait of Georgia. In total, after the December 2011 cruise VENUS operates four cameras - two in Saanich Inlet and two in the Strait of Georgia. The Saanich Inlet cameras include the original digital stills C-Map Cyclops located 105m west of the Node at 104m depth and a new, similar digital stills camera, referred to as DISCo (photo on the left). These cameras are part of a broad, international experiment to monitor the benthic community over long periods with varying levels of habitat change and dissolved oxygen concentrations. The two cameras in the Strait of Georgia are

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the new HD (720p) Axis webcam, mounted on the side of one of our standard VENUS Instrument Platform and the *Eyeball* webcam which is an Axis camera with standard resolution. Making sure all planned science experiments that rely on seafloor cameras go smoothly, we are presently testing and fine-tuning user interfaces for all cameras. One of the first experiments assigned to the HD webcam in the Strait of Georgia will be a continuation of the forensics research led by Dr. Gail Anderson (SFU).

In addition to cameras, we re-deployed the Strait of Georgia East Hydrophone array, now configured with three HighTech elements and a new low-frequency digital hydrophone from Instrument Concepts (icListen). Check out the website for new data products from this hydrophone in the next few weeks.

Also, during the cruise, we conducted several ship-based surveys and deployed an autonomous penetrometer (subsurface pressure and temperature) near the Delta Dynamics Laboratory site. Three different ship-based surveys were accomplished: a multi-frequency (12, 18, 38,70, 120, and 200 kHz) echo-sounder survey near Sand Heads, several 150kHz Acoustic Doppler Current Profiler surveys in Saanich Inlet, Sand Heads, and Boundary Passage, and a 3.5kHz bottom-penetrating sonar survey near Sand Heads. The surveys conducted are a part of the NRCan research focusing on sediment dynamics.

Finally, while we were in the Strait, using the Tully's RHIB (inflatable boat), we conducted an active antenna calibration of our first CODAR station.

Calibrating Coastal Radar Antenna in the Strait of Georgia during the Dec 2011 cruise.

While the VENUS operations team was heading back, the Data Team made sure that all sensors were operating properly and streamed quality measurements into the data archive and on our website. Check it out at ww.venus.uvic.ca

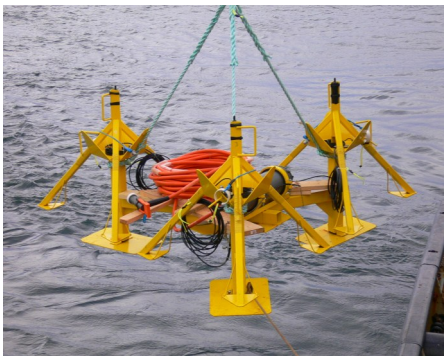
Dr. Verena Tunnicliffe (VENUS Director) and Dr. Ken Denman (VENUS Chief Scientist) deliver an interactive presentation to the review panel showing the newest data stream coming from the first Coastal Radar Station built at the Delta, BC Coal Port.

Independent Review Panel Comes with a Site Visit

In early December, Ocean Networks Canada hosted a site visit from a group of reviewers selected by the Canadian Foundation for Innovation. The occasion related to our Observatory proposal we submitted to the Major Science Initiatives competition at CFI. ONC is seeking the funds to support operations of both VENUS and NEPTUNE Canada. Reviewers came from five countries (UK, Spain, Australia, USA and Canada) for two days to examine all aspects of our operations. It was a chance for us to display the achievements of scientists, engineers and management including some hands-on displays. We will hear in March the outcome of the recommendations from this group.

The Acoustic Tracking of Marine Mammals with the VENUS Hydrophone Array

Shehin Rahemtulla (BSc Hons.), Dr. Ross Chapman (UVic)



Hydrophone array

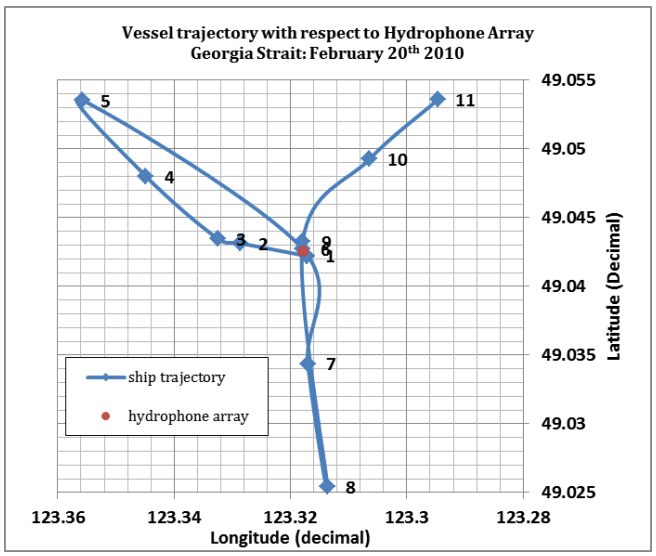
One of the more serious threats to the endangered southern resident orca population in the Strait of Georgia is degradation of the acoustic environment. Not only does noise pollution interfere with the mammal's survival skills, it has major impacts on the mammal's social and feeding activities.

The hydrophone array deployed by VENUS in the Strait of Georgia is an effective tool to study marine mammals, who are vocalizing in response to other sources which create sound. However, to track a sound source in the ocean, a minimum of three calibrated hydrophones are required. In order to calibrate the VENUS array, a sound signal was transmitted by a source from eleven different known positions in the Strait on February 20th 2010.

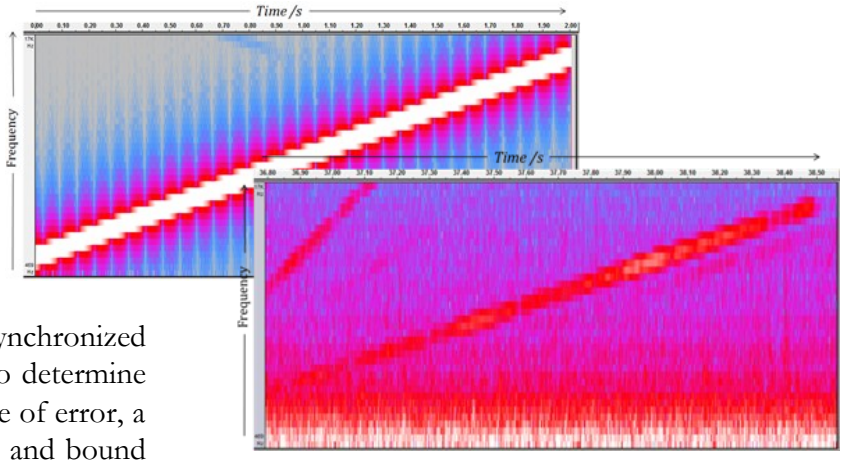
Once the signals were received by the hydrophones, they were processed to determine time delays between received signals and subsequently, the relative horizontal and vertical direction of the source.

Analysis of the time delays revealed two types of equipment issues: clock drift and unsynchronized hydrophones. In order to mimic the experiment to determine what the signals would have revealed in the absence of error, a Matlab script was used to simulate the experiment and bound the synchronization error.

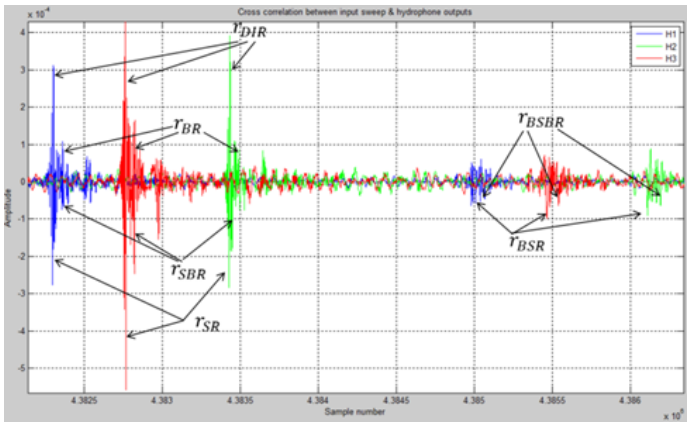
Once realistic time delays were measured for the simulated data, the bearing and vertical angle to the source were estimated using two formulas and adjusting them accordingly. Further improvements can be achieved by using three of the same type of synchronized hydrophones, measuring a sound speed profile for the Strait of Georgia, and vertically position the array in a way such that the sensors lie in more than one plane. The calibration scheme can be used by scientists to determine not only the character, but also the direction of the vocalizing marine mammal in relation to anthropogenic noise. This will further the investigation of the effect of increasing and abundant ship noise on marine mammals in the Strait of Georgia.



Position of the hydrophone array (red) in relation to the calibration signal output.



Emitted (upper) and received (lower) signal.



Received signal by the hydrophone array. Hydrophone 1=blue, 2=green, 3=red

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VENUS - 6 years of Operations and User Support

Archive: **Feb 8, 2006 - Before the Launch of Saanich Inlet Node. (L-R) Paul Macoun, Richard Dewey, Adrian Round.**

The February 8, 2012 marked the sixth anniversary since VENUS cabled ocean observatory went live with its first seafloor array in Saanich Inlet.

They have been exciting years and we are glad to report to our user community what has been accomplished—the fully operational Ocean Observing System built on the fibre-optic cabled network is available for them to connect and explore.

Built on the success of the core seafloor hardware installation and operation, VENUS is expanding into the water column and ocean surface measurements. New systems, such as Coastal Radar (CODAR), Ferry box, Buoy Profiler, AUV, and Gliders, each of which hosting dozens of new sensors, will be connecting to VENUS during 2012-2014. For more details and to learn how your research can benefit from VENUS, connect with us at www.venus.uvic.ca.

VENUS invites you to research presentations at the Ocean Sciences Meeting held in Salt Lake City during February 20-24, 2012. Learn how researchers located all over the world connect to VENUS and conduct live observations and experiments using VENUS as their research facility. Explore the VENUS data archive and ask questions to VENUS staff directly. VENUS and NEPTUNE Canada are part of the Ocean Networks Canada exhibit (booths #44-45)

Feature presentations of research on VENUS at the Ocean Science Meeting 2012:

- *Observing a year of benthic community responses to fluctuating hypoxic conditions through the VENUS cabled network.* Matabos, M.; Tunnicliffe, V.; Dean, C.; Juniper, S. K.
- *Inter- and Intra-Annual Variability of Diel Vertical Migration in a Coastal Inlet.* Sato, M.; Dower, J.; Kunze, E.; Dewey, R.
- *Study of temporal variability in benthic communities' dynamic using seafloor imagery.* Juniper, S.K.; Matabos, M.; Robert, K.; Dean, C.; Aguzzi, J.; Tunnicliffe, V.
- *Broadband Acoustics on the VENUS Observatory in Saanich Inlet.* Ross, T., Lee, W. J., Keiser, J., Lopez, A. L., Greene, C.
- *Active and passive acoustic systems on a cabled ocean observatory.* Dewey, R., Bartlett, K., Macoun, P.

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