VENUS

Victoria Experimental Network Under the Sea

Saanich Inlet

Strait of Georgia

Juan de Fuca Strait

UVic University of Victoria

Summer 2004 Newsletter

Saanich Inlet with the Institute of Ocean Science's Dock

Project Overview

The Victoria Experimental Network Under the Sea (VENUS) is an ambitious project to conduct coastal oceanography in an innovative and informative way in British Columbia waters. VENUS will be a network of instruments dedicated to observing oceanographic processes in our marine environment.
Measurements, images, and sound will be delivered to scientists, managers, the public, and a data archive via seafloor fibre-optic cables laid from three landfall sites. These cables will deliver power for instruments, lights, and robots, transmit commands from project scientists, and deliver information back on the health of our oceans. The VENUS Project will install interactive laboratories in Saanich Inlet, Strait of Georgia, and the Juan de Fuca Strait to support new oceanographic experiments for long-term studies of our coastal waters.

Keeping Current

VENUS Operating Funds

The VENUS Project has been awarded funds from CFI (Canadian Foundation for Innovation) to cover the first operating costs of the system. This once-only award will initiate operations in 2005 as the Saanich array comes on line. We can pay for backhaul, maintenance, and technical help among other 'approved' costs. We still cannot fund outreach activities as CFI is required to exclude these from its mandate. However, we will begin to look for new funding venues.

User's Guide

Want to find out how to use VENUS? How do you incorporate VENUS observations into a grant proposal? How can you configure your instrument to attach to VENUS? Find out answers to these questions and many more in the Venus User's Guide. A draft is now available on the VENUS website. Some sections are incomplete and others will greatly benefit from your comments.

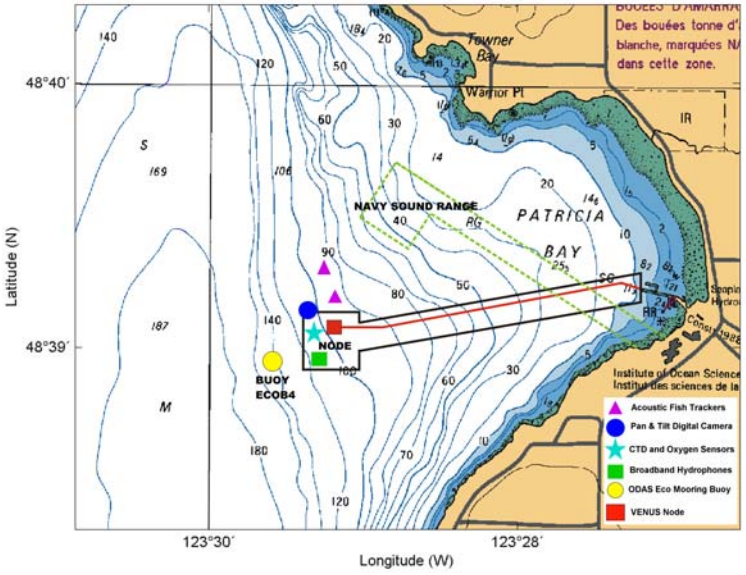
Name/Presenter	Interest
David Welch Doug Pincock, POST	Real-time salmon and other fish tracking using implanted acoustic tags (69kHz)
John Holmes	Fish detection using acoustics, specifically split beam and imaging systems (i.e. DIDSON)
Svein Vagle John Ford	Passive acoustics, directional hydrophone systems, tracking and monitoring mammal communications, wave and wind noise, wave breaking.
Ruthy Yahel	Zooplankton dynamics as revealed by acoustic water profilers (ZAP).
Ruthy Yahel	Sediment resuspension by fish and other biological activity. Seasonal and episodic events?
C.S. Wong Jay Cullen	Chemical variations over time and space, carbon, iron, sulphur, oxygen, pH
Debbie Ianson	Chemical budgets, including renewal events, Nitrogen, Oxygen, and carbon cycles, remineralization rates. Inverse modelling to handle budgets
Michael Whiticar	Methane cycles and budgets
Dario Stucchi	Deep water renewal and time series, retain and compliment IOS archive
Verena Tunnicliffe Kim Juniper	Benthic community respiration.
Verena Tunnicliffe Ben Wilson	Herring behaviour and seasonal dynamics
Kim Juniper	Microbial community dynamics, mapping and temporal resolution of microbial mats
Matt Boekner	Selective exclusion studies, meiofaunal recruitment rate to sediments, and relations to water column processes
Paul Snelgrove	Seasonal variations in benthic larval recruitment rates/success.
Diane Masson	Renewal and exchange dynamics
Angelica Pena, Jim Gower	Long-term changes in primary productivity and renewal events
Rich Pawlowicz Richard Dewey	Acoustic bubble cloud tracking, source, cause and effect?

Saanich Inlet Workshop: June 22, 2004

On June 22 2004, a Workshop hosted by Jim Gower at the Institute of Ocean Sciences addressed the status of the VENUS project and reviewed the various scientific interests in Saanich Inlet. The meeting had three foci:
1) Project updates (presented by the VENUS team),
2) Scientific interests by individuals and groups, and
3) Discussion of specific instrument types, locations, and common scientific themes.

The science interests grouped themselves naturally into water column studies, acoustics, and benthic studies; either shallower or deeper than the anoxic layer. Kim Juniper identified a near permanent microbial mat between 100 and 120m isobaths, and a seasonal mat at depths below 120m. Although there is significant interest in water column data, VENUS is not funded for a profiler at this stage. Summarized in the table above are brief descriptions of the broad scientific interests of various individuals as presented at the workshop. Ann Gargett's advice from her experience from LEO 15 is to expect data/information over-load and the detection of unexpected events. Plans continue for the deployment of the Saanich Inlet observatory components, shore station, cable, node and preliminary instruments, this fall (2004). A chart showing possible instrument locations appears below.

Saanich Inlet Instruments



Several instruments have been ordered for use on the VENUS Observatory in Saanich Inlet. The majority of these sensors will reside on a bottom-mounted platform located within a few hundred meters of the node. This platform will house a SIIM (Scientific Instrument Interface Module), into which the following devices will be plugged:

- Seabird 16plus Conductivity, Temperature & Depth Instrument
- Pro-Oceanus Gas Tension Device
- Aanderaa Dissolved Oxygen Optode
- ASL Zooplankton Acoustic Profiler (200 kHz)
- RDI Workhorse ADCP (300 kHz)

The Seabird 16plus CTD will provide measurements of conductivity, temperature and depth, while also supporting the gas tension device through an auxiliary serial interface. These data will be supplemented with dissolved oxygen measurements from the Aanderaa Oxygen Optode. The ASL zooplankton profiler will initially be located on this platform facing upwards; and velocity estimates will be provided by the RDI ADCP located nearby.

Three separate platforms will also be deployed on the Saanich Inlet node within the first year. This will include a hydrophone array, designed and built by Svein Vagle at IOS, a pan and tilt digital camera, and a string of acoustic receivers for David Welch's tagged salmon. Additional node ports will be available for other instruments and sensor suites. Current plans are to visit the node sites, ROV accessible at 100m depth, at least twice a year.

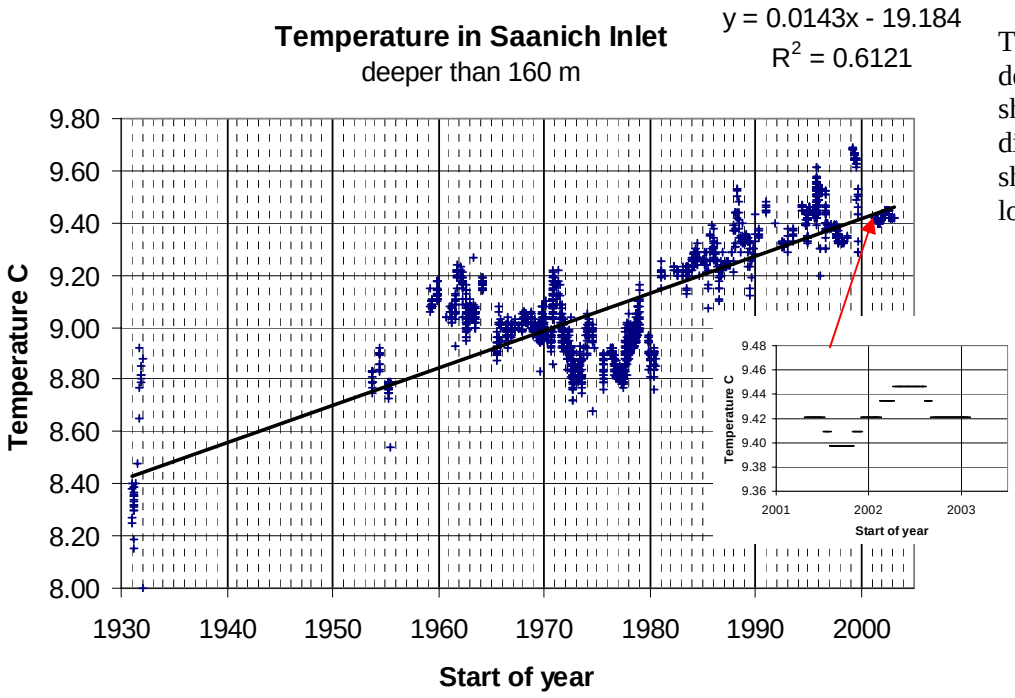
Saanich Inlet Deep Water Temperatures

Jim Gower and Dario Stucchi, IOS, July 2004

Saanich Inlet was formed by ice flowing from the coastal mountains, around Vancouver Island and out to sea along Juan de Fuca Strait. It is one of the few fjords in the world formed by ice moving from the mouth to the head (southwards in our case, from Satellite Channel and up over Saanich and Metchosin), rather than from glaciers which are usually above the head, flowing down the fjord to the mouth. Maximum depth of Saanich Inlet is about 230m, deeper than the 80 m depth of Satellite Channel. Deep water is therefore trapped in Saanich Inlet. This water appears to change properties only very slowly over the years, with input of variable amounts of new water (renewal events) occurring each fall.

IOS maintains an archive of water properties (http://www-sci.pac.dfo-mpo.gc.ca/osap/projects/bcinlets/default_e.htm) in coastal inlets, including Saanich The figure below shows a plot of deep temperatures since the first measurements were made from research ships in the early 1930s. Over periods of a few years, temperatures appear to vary over a range of only about 0.4°C. Occasional changes of up to 0.2°C (up or down) appear linked to renewal events. There is an apparent long-term warming trend (the best fit line slopes 0.014°C per year), with a period of decreasing temperature between 1960 and 1980. This pattern is strikingly similar to the global mean temperature, and it is possible that Saanich Inlet may be following the global trend relatively closely.

In February 2001, a temperature logger was inserted into the concrete mooring block of buoy 46134 at a depth of about 150 m. The logger had a temperature resolution of 0.012 degrees, and over the two years of the deployment, the measured temperature remained within four of these steps. This range is much less than that indicated by the ship measurements, suggesting that renewal events between February 2001 and February 2003 had little effect on temperature. The concrete block introduces a smoothing time constant of about 3 days. Perhaps also bottom temperatures are more stable than temperatures in the water column. The temperature record (inset below) suggests an annual cycle of 0.014°C amplitude, peaking in early May, and a long-term temperature increase rate of 0.021°C per year. Global temperatures are presently rising at about 0.02°C per year. A more sensitive instrument, such as will be deployed by VENUS, should show the annual cycle, long term warming and any temperature changes due to renewal events in great detail. The Seabird Microcat, for example, has resolution about 100 times that of the logger (0.0001°C).



Temperature data collected in the deep basin of Saanich over 70 years shows interannual variations and a distinct warming trend. The inset shows averaged temperatures from a logger in a concrete block at 150m.

Strait of Georgia and Juan de Fuca Strait

Over the last few months our focus has been negotiations with Global Marine Systems Limited (GMSL) & Ocean Works (OW), contracting initial data transfer studies, and focussing on the Saanich Inlet deployment. Several background activities have also been on-going with respect to the Strait of Georgia and Juan de Fuca Strait. On August 14, 2004 the University of Washington and the Applied Physics Laboratory in Seattle submitted a revised proposal to the U.S. National Science Foundation to extend the VENUS Juan de Fuca cable across the border into U.S. waters and install a Major Bottom Package (CTD, ADCP, and various chemical sensors) and a Vertical Profiler System (based on the ORCA mooring in Puget Sound). The proposal requested "infrastructure" funds and indicated that numerous "science" oriented proposals would follow next February (2005). A related news release confirmed that the State of Washington will begin preparations to remove the two dams on the Elwha River starting in 2008. This will re-establish the Elwha River as the major source for direct freshwater and sediments into Juan de Fuca, and hopefully see the return of significant salmon runs.

The VENUS team has two upcoming cruises in support of VENUS related activities. Presently scheduled for November 8-15 and December 13-20, the VENUS team and Phil Hill are booked on the CCGS Vector for studies in the Strait of Georgia, Saanich Inlet and Juan de Fuca Strait. Work will include possible cable route surveys using the ROPOS submersible, as well as instrument servicing on the Saanich Inlet array (anticipating an October deployment). Users with specific pre-deployment interests who might be able to use these two cruise opportunities are requested to contact the VENUS team (venus@uvic.ca).

Outreach

VENUS, along with NEPTUNE Canada, has pursued funding sources to support education and public outreach. Original funding for these projects through CFI and BCKDF is for the project infrastructure and does not include outreach. Currently we produce brochures, quarterly newsletters, posters, and maintain our website. These current communication outreach formats only act as teasers compared to the products and resources that potentially could be generated by the future ocean science database.

Several institutions have expressed interest in having on-site monitors with live ocean feed and interpretive data. These venues will provide the opportunity for the general public to gain a greater understanding and appreciation about the oceans. VENUS and NEPTUNE will create a long term data management and archive system. Available data will provide a multitude of opportunities for interpretation and display. Future funding would allow us to contract personnel for the purposes of data manipulation, conversion algorithms and outreach/education development.

L– R Adrian, Paul, Verena, Richard, Debbie, Ruthy, Melissa

VENUS Team:

Verena Tunnicliffe, Project Director (250) 721-7135
Adrian Round, Project Manager (250) 472-5364
Richard Dewey, Science Coordinator (250) 472-4009
Deborah Smith, Project Coordinator (250) 472-5366
Paul Macoun, Instrument Engineer (250) 472-5369
Ruthy Yahel, PDF (250) 472-5367
Melissa Rotella, Research Assistant (250) 472-5357

venus@uvic.ca
www.venus.uvic.ca