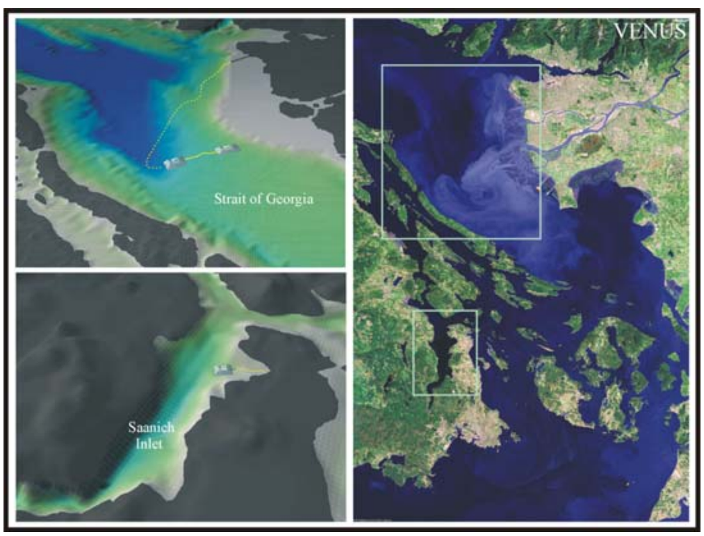
Your link into
Saanich Inlet
and
Strait of Georgia
British Columbia

Spring 2005 Newsletter



VENUS Node Locations.

Project Overview

The Victoria Experimental Network Under the Sea (VENUS) is a facility to support coastal oceanography in British Columbia waters. The VENUS network of instruments is dedicated to observing oceanographic processes in our marine environment. The VENUS Data Archive will support data mining and communication among users. Measurements, images, and sound will be delivered to scientists, managers, the public, and a data archive via seafloor fibre-optic cables laid from two separate landfall sites. These cables will deliver power for instruments, lights, and robots, transmit commands from project scientists, and deliver information back on the state of our oceans. The VENUS Project will install interactive laboratories in Saanich Inlet and the Strait of Georgia to support new oceanographic experiments for long-term studies of our coastal waters.

Keeping Current

Saanich Inlet Update

The University has now signed the contract with Global Marine Systems Limited for the design, development and deployment of the Saanich Inlet Array. This event marks a major milestone for the Project. The contract incorporates several enhancements over the initial VENUS design concept. The Saanich Node will now be identical to the other nodes in the system, will be easily removed from the fibre optic cable for maintenance and upgrades, and will have the ability to support an increased number of scientific instruments. These enhancements will result in a system that provides better support to the user community, enhanced availability, reduced maintenance costs over the life of the system and better interaction with NEPTUNE Canada. We will be well positioned to grow with the needs of future users.

Operating within a fixed budget that was based on the initial design, the engineering and capital costs associated with the system enhancements have had to come from within the Project. After careful consideration of the benefits of the design changes, a decision was taken not to deploy the Juan de Fuca Strait array at this time. The remaining two arrays are located in the areas of greatest scientific interest and will provide significantly better support to the science community over the life of the system.

this notice was delivered to the VENUS community

VENUS Project Information Bulletin
May 20, 2005

The VENUS Project is pleased to announce the signing of a major contract for the installation of a cabled seafloor observatory in Saanich Inlet. The University of Victoria, on behalf of the VENUS Project, and Global Marine Systems Limited, representing its Canadian partner Ocean Works International Inc., signed the contract agreement on May 20, 2005. The partners have agreed that the Saanich Inlet cable and node will be installed in October 2005 with landfall at the Institute of Ocean Sciences, Pat Bay. The VENUS Project appreciates the support of both Fisheries and Oceans Canada and Department of National Defence for this installation.

The seafloor node will offer many improvements over the initial plans including higher communication rates and higher instrument capacity. The VENUS Team and its partners conducted a detailed examination of the advantages, disadvantages and consequences of several engineering designs. Design changes will ensure a more reliable system, lower maintenance costs, and will incorporate detachable nodes with optical connectors. Communication capacity is increased to full 100base T Ethernet capability, with more instrument ports that allow for daisy-chaining to increase instrument numbers. Connection capacity at Gigabit levels will be possible. The Strait of Georgia array will be deployed in the fall of 2006 and will incorporate the Saanich system enhancements. To meet the project budget, the cable array proposed for the Juan de Fuca Strait will not be deployed at this time. After recommendation from the VENUS Advisory Group, the decision was taken to sponsor the node re-design and to provide a more reliable and maintainable system.

The VENUS Team looks forward to the next phase of the Project in collaboration with our user community.

VENUS Infrastructure Components

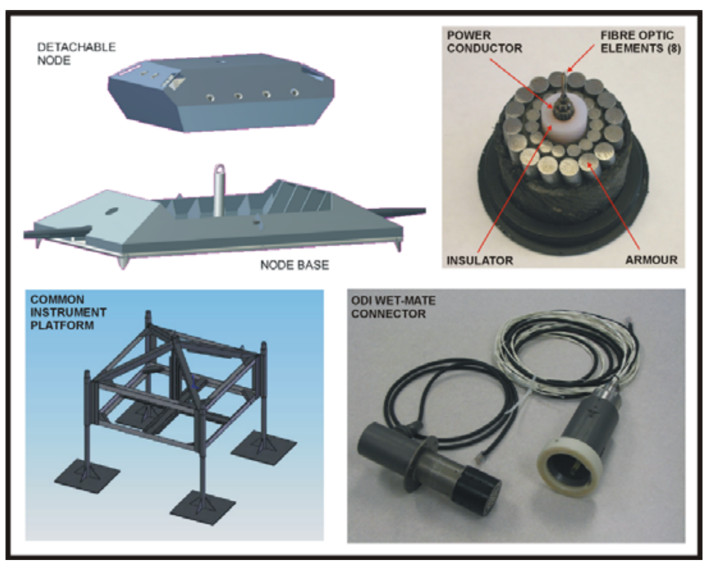
The image below highlights some of the infrastructure components to be deployed in Saanich Inlet and the Strait of Georgia.

The drawing in the top-left corner depicts the principal components associated with the Node. Power and communications reach the detachable Node module through the main (or backbone) cable. These services are then routed to the scientific instrument packages through electrical wet-mate connectors mounted on the Node. Should a malfunction in the Node electronics occur, the ability to detach the Node components from the backbone cable using an ROV negates the need for a cable ship.

To the right of the Node picture is a cross-sectional view of the backbone fibre optic cable. Main components of the cable are: 8 fibres for optical data transmission, a single power conductor surrounded by an insulator, and several layers of coiled steel wire (armouring) that serve to protect the inner cable from external aggression.

Below the fibre optic cable image is a picture of the 12 pin ODI wet-mate connector that will provide power and communication to the scientific instrument packages. This connector requires approximately 70 lbs of force to connect and only a few pounds of force to disconnect.

To the left of the connector image is an engineering drawing of the common instrument platform for Saanich Inlet. The platform has been designed to provide sufficient space for a number of instruments. Expecting the platform to settle up to half a meter into the seabed mud in Saanich inlet, the legs have been designed to be detachable and are a full meter in length.



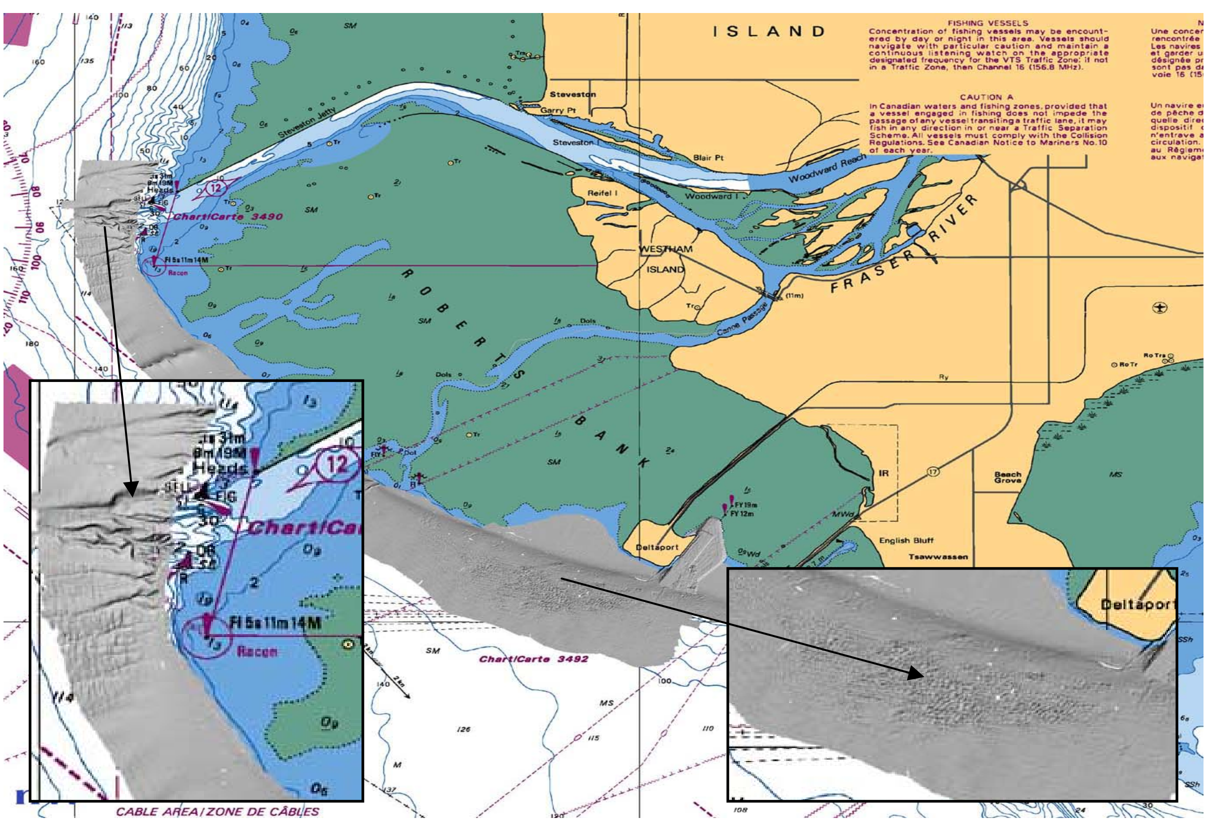
Submarine Slope Failure and Tsunami Risk, Fraser River Delta

By Gwyn Lintern and Phil Hill, Geological Survey of Canada

Coastal communities and infrastructure surrounding the southern Strait of Georgia would be at risk in the case of a submarine slope failure on the foreslope of the Fraser River delta (Figure below). Small slope failures on Roberts Bank could rupture power transmission cables that supply electricity to Vancouver Island, while large failures could damage or even destroy important infrastructure such as the Deltaport and Tsawwassen ferry terminal. Furthermore, the tsunami generated by such a failure would propagate across the Strait of Georgia and impact the shorelines of the Gulf and San Juan Islands, as well as mainland British Columbia. Previous research on the stability on the Fraser Delta foreslope focused on mapping the surface and sub-bottom manifestations of previous slide deposits and on identifying failure mechanisms. Five mass wasting events were documented between 1970 and 1986, with the most recent one in 1985 involving 1 million m^3 of sediment. It is therefore essential to evaluate the probability of slope failure at different scales and determine the conditions under which such a failure might occur.

Several potential failure mechanisms have been identified:

· Shallow failures at Sand Heads have been attributed to spontaneous liquefaction as a result of rapid deposition and the development of excess pore pressures during tidal "drawdown" and storm-generated waves.
· The larger-scale Roberts Bank failure complex has been interpreted as the product of multiple small-scale failures dating from a time when the active river mouth was located in the area.
· Irregular seafloor topography, just to the south of Sand Heads has been interpreted to be either the result of slow sediment creep or of slow rotational sliding.
· Strong tidal currents in depths of 60 m or more may be causing net erosion and undercutting of slope sediments off Roberts Bank.
· Groundwater seepage may be occurring at depth on the foreslope; locally increasing pore pressures, reducing effective stress and contributing to slope failure.
· Methane in the sediments alters sediment strength.



Multibeam survey of the upper foreslope of Roberts Bank.

Monitoring Network: A network of slope stability monitoring stations will be built comprising six seismic pore pressure probes. The monitoring stations will contain the following instruments:

- Pore pressure and water pressure transducers to measure waves, tides, groundwater and liquefaction;
- Seismic geophones to enable shear wave velocity measurements for gas content determination;
- Inclinometers to measure strain and deformation;
- Thermistors to measure ground water flow;
- Accelerometers to measure seismic events leading to liquefaction.

Whatever the mechanism, this area shows incipient instability. The potential for an earthquake-triggered failure to occur is high. Real-time pore fluid monitoring provided by the VENUS network has great potential as both a method to study slope stability in great detail and as an early-warning system of liquefaction events.

A VENUS Retrospective from Verena – Five Years and Counting

Sometimes as I consider the current VENUS challenges – liability issues, budget overruns, legal hassles, missed deadlines – I find it important to contemplate how far we have come. It has been five years since a meeting in Vancouver during which the concept of VENUS arose. NEPTUNE was tantalizing but I did not believe it was possible in the prevailing funding climate. What about a smaller project to prove the concept? A project to give Canadian scientists a head start and to explore some fascinating features of British Columbia's waters. Richard Dewey – always willing to take on a challenge – and I secured a bit of money to hold a workshop to see if enough scientists were willing to support the idea. A memorable moment at that meeting at the Herzberg Institute of Astrophysics was an intense discussion about "capturing unusual events" when the building started to rattle. The geophysicists immediately departed as the Nisqually earthquake made itself felt. The rest of us wondered what was happening on the seafloor.

Richard and I corralled the ideas and forged the proposal that went to the Canadian Foundation for Innovation in 2001. At times like that, you really value the faith and commitment shown by special colleagues who put in a lot of time to produce the great science ideas that finally sold the proposal. We began the VENUS design in January 2003 with a team of two. Two years later, we are not in the water yet, but we have a CTD in a bucket of water sending data to a processor next door and a Co-op student generating fancy graphs for on-line display (and seven of us watching). That may not seem so special but the diagrams behind the concept all over the whiteboard are … as are the NEPTUNE Canada data guys who keep wanting more information. The phones are always ringing – a new Ethernet instrument design, rating tests for optical connectors, biofouling arguments (the one about insurance costs is for you, Adrian). Those first ideas of 2001 have grown, morphed and are bursting out. We have an observatory by the cable and sometimes I wonder if we can hang on but, whatever else happens, it is not dull here. Maybe by December 2006, this marine biologist will finally figure out what TCP/IP* means!

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Also visit our sister project NEPTUNE Canada at www.neptunecanada.ca

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*Note from Project Manager:
Transmission Control Protocol/Internet Protocol