Ocean Networks Canada: Update on the NEPTUNE and VENUS Observatories

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Oceanology International – China 2013
OCEAN NETWORKS CANADA
Discover the ocean. Understand the planet.

NEPTUNE OBSERVATORY
Clayoquot Slope
2500 m
Folger Passage
20-100 m
Saanich Inlet
100 m

Endeavour
2300 m

Cascadia Basin
2660 m

Juan de Fuca Plate

NEPTUNE Canada

VENUS

ONC Centre for Enterprise & Engagement

Ocean Networks Canada

Bathymetry Data Sources: Saanich Inlet and Strait of Georgia bathymetry from Canadian Hydrographic Service; USGS Cascadia DEM report 98-368; University of Washington (UW), School of Oceanography, K. W. Thomas, K. Thompson, Multibeam cruise data; funding provided by NERC Foundation and UW; Plate Boundaries: Adapted from Dragert et al., Science May 2001;
Map Credits: Center for Environmental Visualization, UW School of Oceanography

An Initiative of the University of Victoria
ONC - Enabling Science

Climate & Marine Biota

Coastal Processes

Ecosystems

Seafloor processes

Technology

Earthquake dynamics

Cascadia earthquake sources

Technology

Earthquake dynamics

Cascadia earthquake sources
Cabled Observatories

- Hierarchical layering of infrastructure to extend the Internet from coast to the deep sea
- Electro-optic cable
- High bandwidth data communications
- Over 100kW of power, distances over 1000km
- Real time access to network of hundreds of sensors
- High temporal sampling over long time periods
- Unprecedented understanding of marine environment
Cabled Observatories

- Typical Elements
  - Shore station
  - Primary subsea infrastructure
  - Secondary subsea infrastructure
  - Instrumentation systems
  - Data management and archiving
Cabled Observatories

- Typical Applications
  - Ecosystem monitoring – biodiversity
  - Coastal monitoring – vessels traffic, conditions
  - Hazards – tsunami, seismic events, storm surge
  - Gas hydrates and crustal fluids
  - Climate change
Operational since 2009
- 800km electro-optic cable
- 32Gbit data
- 160kW power
- 300 sensors
- 5 Primary Science Sites
- 10-2700m

Major research themes
- Climate change
- Plate tectonics
- Gas hydrates & crustal fluids
- Deep sea ecosystems
- Engineering & computational science
Methane Hydrate
Methane Hydrate
Earthquakes
Crustal Fluids

- CORX temperature instrument connector
- Cables to instrument platform
- ODP 10268 landing platform
- Mid-plate
- 500 m
Bottom Pressure Waves

Tides: 12-25 hr period

Infragravity waves: 2 min period

Ocean surface waves: 7 s period

Tsunamis: 15 min period

NRCan developed new pressure technology 100x more sensitive than existing systems
Tsunami

Magnitude 8.1 SAMOA ISLANDS REGION

Tuesday, September 29, 2009 at 17:48:10 UTC

Earthquake Location

Ocean Networks Canada
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Marine Mammals

Listening to the Deep Ocean Environment

Counts

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ONC Centre for Enterprise & Engagement
• Designed by IFREMER (France)
• Designed for study of hydrothermal vent communities
• Video, temperature, oxygen, and iron sensors
• Active antifouling system
VENUS

- Operational since 2006
- 44km electro-optic cable
- 2Gbit data
- 6kW power
- 80 sensors
- 4 Primary Science Sites
- 40-300m

Major research themes
- Tracking events
- Zooplankton & fish behaviour
- Marine mammal communications
- Water currents & ocean renewal
- Sediment dynamics
Shore Station
Surface Vessel Instrumentation
Coastal HF RADAR

VENUS, Strait of Georgia
Seafloor Measurements

3:00 PM, Tuesday, February 19, 2013
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Hydrophone Array
Krill, copepods, etc migrate to surface every night to feed
Acoustic Profiler – Fish Detections

Sept 1
Number of Targets: 3158
Fish Water
East 61 10 cm/s
North -60 -12 cm/s

Sept 2
Number of Targets: 3197
Fish Water
East 63 34 cm/s
North -66 -15 cm/s

Sept 3
Number of Targets: 2366
Fish Water
East 49 34 cm/s
North -53 -20 cm/s
Saanich Inlet Central Node VIP Temperature, Salinity, Oxygen and Sigma-t

- Oxygen
- Density
- Salinity
- Temperature

10 Feb 2006 00:00:00 to 16 Jan 2011 23:30:00 UTC
Thank you!

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