

Continuous long-term observation of vent ecosystems and biogeochemical interactions using NEPTUNE Canada

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In the Fall of 2007, NEPTUNE Canada (North-East Pacific Undersea Networked Experiments) is beginning the installation of an \$80 million networked ocean observatory across the Juan de Fuca Plate. This innovative network of realtime sub-sea laboratories, linked by over 800 km of electro-optic cables, will be the first of its kind. At each of 5 sites, a node, providing 10kW power and 4Gb/sec data transmission, will host interactive scientific instruments below, on, and above the seafloor. The entire observatory is designed for at least 25-30 years, individual instruments are expected to be deployed for at least 5 years. Continuous real-time multidisciplinary measurement series from instruments will be delivered to a Data Management and Archiving System (DMAS) and from there, through the Internet, to researchers, decision-makers and the public throughout the world.

At Endeavour Ridge, complex interactions among volcanic, tectonic, hydrothermal and biological processes will be quantified where new volcanic seafloor is created at the western edge of the Juan de Fuca plate. The region (approximately 300 km off British Columbia), has been the site of intensive investigation for more than 20 years, for example of the chemical-biological linkages of blacksmoker chimneys and their chemosynthetic biotas. NEPTUNE Canada will benefit both ongoing and new experiments with the real-time monitoring capability of the network: coordinated continuous data in response to episodic events such as earthquakes and intrusions will be recorded across a suite of instruments. These instruments include temperature-resistivity-hydrogen probes, microbial incubators, seismometers, digital cameras and a fluid sampler. A regional circulation experiment extending 250 m up into the 2200m water column will characterize hydrothermally driven water mass movement; 4 arrays will consist of current sensors, temperature and salinity sensors, and an Acoustic Doppler Current Profiler (ADCP).

NEPTUNE Canada provides scientists from Canada and worldwide with their first opportunity to gather and analyse integrated multidisciplinary time series datasets, and to perform interactive experiments in real time. This facility will transform our understanding of biological, chemical, physical, and geological processes across an entire tectonic plate from the shelf to the deep sea. Real-time continuous monitoring allows scientists to capture the variation and episodic nature of these complex systems in a way never before possible.

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