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Ocean Networks Canada: Live Sensing of a Dynamic Ocean System

Martin Heesemann (1), Kim Juniper (1), Maia Hoeberechts (1), Marjolaine Matabos (1), Steven Mihaly (1), Martin Scherwath (1), and Richard Dewey (2)

(1) NEPTUNE Canada, University of Victoria, Victoria, Canada (mheesema@uvic.ca), (2) VENUS, University of Victoria, Victoria, Canada

Ocean Networks Canada operates two advanced cabled networks on the west coast of British Columbia. VENUS, the coastal network consisting of two cabled arrays with four Nodes reaching an isolated fjord (Saanich Inlet) and a busy shipping corridor near Vancouver (the Strait of Georgia) went into operation in February 2006. NEPTUNE Canada is the first operational deep-sea regional cabled ocean observatory worldwide. Since the first data began streaming to the public in 2009, instruments on the five active nodes along the 800 km cable loop have gathered a time-series documenting three years in the northeastern Pacific. Observations cover the northern Juan de Fuca tectonic plate from ridge to trench and the continental shelf and slope off Vancouver Island. The cabled systems provide power and high bandwidth communications to a wide range of oceanographic instrument systems which measure the physical, chemical, geological, and biological conditions of the dynamic earth-ocean system.

Over the years significant challenges have been overcome and currently we have more than 100 instruments with hundreds of sensors reporting data in real-time. Salient successes are the first open-ocean seafloor to sea-surface vertical profiling system, three years of operation of Wally—a seafloor crawler that explores a hydrate mound, and a proven resilient cable design that can recover from trawler hits and major equipment meltdown with minimal loss of data. A network wide array of bottom mounted pressure recorders and seismometers recorded the passage of three major tsunamis, numerous earthquakes and frequent whale calls. At the Endeavour segment of the Juan de Fuca ridge high temperature and diffuse vent fluids were monitored and sampled using novel equipment, including high resolution active acoustics instrumentation to study plume dynamics at a massive sulfide hydrothermal vent. Also, four deep sea cabled moorings (300 m high) were placed in the precipitous bathymetry of the 2200 m deep axial valley. Close to shore, a three-dimensional imaging system monitors the growth of a sponge complex on the 20 m deep Folger pinnacle in the wave zone offshore Vancouver Island. Instruments monitoring the delta and estuarine dynamics of the Fraser River that empties into the eastern edge of the Strait of Georgia complete the picture of this northeast Pacific dynamic ocean system from an active spreading ridge, down to the abyss, along the hydrate-rich slope, and up to the coast.

While the installation of the first phase of experiments is nearing completion, the cabled networks still provide ample opportunity for expansion and scientists from all over the world are invited to join our community and advance science by using the data that is publicly available at http://www.oceannetworks.ca/.