Plate Tectonic Processes and Earthquake Dynamics

Tsunamis and Storm Surges

Recent advances in earthquake and ocean modelling make it possible to generate timely forecasts of tsunamis and storm surges along the West Coast of Canada. These advances motivate us to propose the deployment of bottom-mounted instruments with concurrent high-speed computing for tsunami, storm surge and earthquake modelling. Devastating earthquakes and tsunamis from the Cascadia Subduction Zone are expected to cause significant damage and loss of life on the West Coast sometime during the next 200 years. The generation and local amplification of tsunami waves from more frequent distant earthquakes and local submarine slope failures also pose a tsunami hazard for the coast. A recent example is the 1964 tsunami from an 8.4-magnitude earthquake in Alaska which destroyed a native village in Hot Springs Cove and amplified up to 7 meters height in the Alberni Inlet, causing $5 million damage. Understanding the dynamics of the tsunami wave propagation and amplification requires continuous seafloor observation. Some tsunami models can be adapted to forecast storm surges generated by severe wind events associated with meteorological “bombs”. Real-time sea level and ocean current data will be supplied to these models by instruments deployed for the NEPTUNE observatory, while high-speed computers will use these data to create near-real-time regional displays of moving waves and run-up, for research and education, as well as imminent warning.