

Tsunami monitoring based on seafloor observations of the electric and magnetic fields

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Electromagnetic field variations due to tsunami wave propagation from the two large Kuril islands earthquakes (Sept. 15, 2006 and Marth 13, 2007) were observed at the North-West Pacific seafloor station (NWP: 41.1N, 160.0E, water depth=5600m).

The seafloor apparatus of the observatory measures and records the absolute geomagnetic total force, 3-component geomagnetic fields, and two horizontal components of the geoelectric fields along with the instruments orientation and tilts.

The tsunami signals were observed in all of the above components.

It is generally known that electric and magnetic fields are generated within ocean currents moving through the earths magnetic field due to electromagnetic induction.

Theory of the electromagnetic induction indicates that the observation of the motionally induced electric and magnetic fields can reveal large scale flow structures that is difficult to obtain by other method. Hence, the observation of the electric and magnetic fields related with tsunami waves in off-shore areas might be very useful to obtain information about the properties of tsunami and to predict the arrival times and tsunami heights at the sea shore. Analyses of the presently observed electromagnetic tsunami signals revealed several distinctive characteristics of the seafloor electromagnetic observations as a tsunami meter compared with the standard tsunami meter which is generally consist of bottom pressure gauge. Capability of detecting the propagation direction and the two horizontal fluid motions associated with tsunami propagation from a single station are the most important advantages of the electromagnetic tsunami meter.