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Monitoring Tsunamis through Underwater Communication Network

A novel study reveals that tsunamis send electric signals through the ocean, which could be sensed by the vast network of communication cables on the seabed.

C. Manoj Nair and T. Harinarayana of the National Geophysical Research Institute, Hyderabad; Alexei Kuvshinov of the Swiss Federal Institute of Technology, Zürich; and S. Neetu of the National Institute of Oceanography, Goa used computer models to estimate the size of an electric field created by the force of the 2004 Indian Ocean tsunami as it traveled over major submarine cables.

Salty seawater, a good conductor of electricity, generates an electric field as it moves through Earth's geomagnetic field. "We estimate that the 2004 tsunami induced voltages of about 500 millivolts (mV) in the cables. This is very small compared to a 9-volt battery, but still large enough to be distinguished from background noise on a magnetically quiet day. By monitoring voltages across this network of ocean cables, we may be able to enhance the current tsunami warning system", said the researchers.

Tsunamis are created by a large displacement of water resulting from earthquakes, landslides, volcanic eruptions, and even meteors hitting the ocean. Vessels far out at sea may not notice the waves passing underneath at the speed of a jetliner, because the wave heights are very small in the deep ocean. This makes their detection and monitoring a challenge.

The current tsunami warning system relies on a global seismometer network to detect earthquakes that may indicate an impending tsunami. Deep-ocean pressure sensors and coastal tide gauges are the only tools available to detect and measure an actual tsunami. The electric current induced in submarine cables may provide an additional way to confirm and track a tsunami.

Since the 2004 tsunami, the international warning system has expanded to include 47 deep-ocean pressure sensors, most of them in the Pacific area. After an investment of more than \$100 million and strong support of Congress, National Oceanic and Atmospheric Administration (NOAA) has made tsunami warnings and education a priority. Within the United States, real-time data from these deep ocean sensors are used to forecast the impact of the tsunami on U.S. shorelines.