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SeaSondes® Part of India National Tsunami Early Warning System

The India National Institute of Ocean Technology (NIOT) is acquiring 10 additional SeaSondes as part of a newly forming national Tsunami Early Warning System. These instruments will be installed along the country's mainland coast and Andaman Islands.

The SeaSonde network is intended to provide continuous surface current circulation data during both normal and storm conditions with a parallel processing track that will work to isolate tsunami wave train signatures from the ambient ocean current regime. The information collected from HF radar not only has the potential to detect the tsunami wave train presence prior to its run-up at shore, but also to quantify the tsunami wave parameters that can be useful for refining tsunami model forecasts.

SeaSondes deployed will have power sources both "on-the-grid", as well as "off-the-grid" stand-alone power that will automatically self-start and keep systems operational during a crisis situation. Communication links for data retrieval are also designed with standard connections as well as emergency backup satellite. Data collected by these systems will be automatically sent to NIOT and Indian National Centre for Ocean Information Services (INCOIS) offices.

System delivery and installation will take place during this year. ASB Systems Pvt. Ltd., based in Mumbai, has been contracted for handling critical services such as site preparation and providing ongoing local service support. Company founder Mr. Arvind Buchar and his technical team have worked with HF radar systems and CODAR Ocean Sensors starting from 1995.

HOW AN HF RADAR "SEES" A TSUNAMI WAVE

The most sensitive measurement the HF radar makes is velocity, from the Doppler shift of the echo. However, what the HF radar sees is not the very fast propagation speed of the tsunami wave (e.g., 150 km/hr at 180 m depth), but the "current speed" of the orbital velocity at the crests and troughs, which may be 30 km apart for a tsunami at this depth.

The HF signal is scattering from resonant Bragg waves that are 6 to 30 meters long, depending on the radar transmitted frequency. These, in turn, are shifted by any underlying currents. Near the crest and trough of any wave (including a tsunami wave), the water undergoes an orbital motion: forward at the crest and backward at the trough. As the tsunami moves into shallower water, this orbital velocity will increase, while the spatial period decreases (between crest and trough). So, as the tsunami wave gets closer to shore, into shallower water even stronger currents with shorter spatial periods begin to emerge, presenting an increasingly robust signal for the HF radar to detect.

FOR FURTHER READING

An investigation on using the early HF CODAR radars to detect or measure the strength of tsunami surface signatures was conducted and published in the late 1970s [Barrick, D. E. (1979), A coastal radar system for tsunami warning, Remote Sensing of Environment , vol. 8, pp. 353-358]. More recently, additional studies of the utility of SeaSondes in tsunami detection have been published, also in peer-reviewed journals. The latest is B.J. Lipa et al. (2006), HF Radar Detection of Tsunamis, Journal of Oceanography, vol. 62, pp. 705-716. These and other papers are available for download as PDFs at the publications section of CODAR Ocean Sensors' website http://www.codaros.com/bib_00-04.htm.

POINTS OF CONTACT

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