Extending the Reach of Cabled Networks: Prospects for Acoustically Linked Undersea Sensing

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Cabled networks provide real-time, high-bandwidth connections to seafloor sensing for seismic monitoring and tsunami detection. The cables and subsea nodes also allow for addition of acoustic base stations for adding additional remote sensors. In cases where streaming data is not required, it may be possible to add acoustically-linked sensors which can send small amounts of episodic data on command or via an event detector. This low-bandwidth link will never replace a complete data set, or fiber-optic cable, but may be able to provide additional data records in near real-time.

A feasibility study for an acoustic link for a tsunami-warning system was conducted in the Mentawai Basin, south of the Indonesian island of Sumatra in 2016. The test showed that acoustic links from a seafloor sensor to a bottom node could be achieved at 20-30 km, at low data rates (hundreds of bits per second maximum). This link relies upon specific features of the sound-speed profile, which allows for a direct path from source to receiver via refracted rays that bend away from the surface. The surface-refracted path is not present everywhere, but exists in several sensor-to-node geometries of interest, including portions of the NSF OOI cabled system.

In this talk the results of the work in Indonesia are presented, and ideas for similar networks in other locations discussed.