

How commercial vessels could become tsunami early-warning systems

December 10 2020, by Daniel Strain



A stretch of the Oregon coast near the town of Cannon Beach. Credit: CC Photo by Abhinaba Basu via Wikimedia Commons

Scientists may have discovered a new ally in efforts to keep coastal communities in the Pacific Northwest safe from future tsunamis,

according to a new study: Fleets of commercial shipping vessels.

The research taps into an urgent need for communities like Newport, Oregon, a seaside town that is home to more than 10,000 people. If a tsunami formed along a fault line in the Pacific called the Cascadia Subduction Zone, residents there might have just minutes to get to safety, said study coauthor Anne Sheehan.

"A tsunami can take 20 or 30 minutes to reach the coastline, so the time is very short," said Sheehan, a fellow at the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado Boulder.

In a study now under review in the journal *Earth and Space Science*, she and her colleagues think that they may have stumbled upon a possible solution. Drawing on [computer simulations](#), the group reports that networks of cargo ships carrying special GPS sensors could, theoretically, work together to automatically monitor a shoreline for possible tsunami waves—spotting these dangerous surges in less than 10 minutes in some cases.

The team will [present its findings](#) Thursday at the 2020 virtual fall meeting of the American Geophysical Union (AGU).

Lead author M. Jakir Hossen added that this early warning system would be much less expensive to put in place than current tsunami forecasting tools.

"There are so many ships that are already traveling in the Cascadia Subduction Zone area," said Hossen, a visiting fellow at CIRES. "We're thinking about how we can use those existing facilities for tsunami forecasts."

When not if

In a geologic sense, the Cascadia Subduction Zone is a bomb waiting to go off. Over the last few decades, scientists have discovered that intense energy seems to be building in the tectonic plates that lie miles below the Pacific Ocean from Northern California to British Columbia.

"They could release this energy anytime and trigger a huge earthquake. The tsunami size could be as big as the 2004 Indian Ocean tsunami," Hossen said.

But as big as such a wave could be, if you were swimming in the open ocean, you might not even know that you were in the middle of a tsunami. That can make these disasters hard to predict ahead of time, said Sheehan, also a professor in the Department of Geological Sciences.



Fallout from the 2004 Indian Ocean tsunami along the Sumatra coast. (Credit: U.S. Navy)

"Even a really big tsunami wave would be only a meter tall in the open ocean, and it would take 15 minutes to pass you," she said.

Scientists currently use seafloor sensors to record when a possible tsunami might be passing overhead. But these gauges are costly to install and maintain. Sheehan and her colleagues had a different idea: Why not take advantage of all of the ships that are already out there in the ocean, delivering goods like cars and produce to towns up and down the Pacific Coast?

Global warning system

To see if that might be feasible, the team ran a mock scenario: They built computer simulations that drew on the locations of real ships near the Cascadia Subduction Zone. The researchers also imagined that each of the digitized ships was carrying a GPS sensor that could precisely measure its elevation, or how it bobbed up and down in the waves. Sheehan explained that such vessels already use satellite systems to transmit their exact locations in the ocean—so the new sensors might only be a modest upgrade.

The team then ran a synthetic experiment to see if those ships might be able to forecast a tsunami.

The test was a success. The findings show that similar networks of ships could be used to identify tsunami waves long before they ever reached shore, and all without needing to diverge from their normal routes.

"A single ship couldn't do this," Sheehan said. "The power comes from having 100 ships in the same area that are all going up and down at the same time."

Scientists at the U.S. National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information based in Boulder collaborated with the team to provide information on current tsunami warning systems and Cascadia tsunami hazards.

The researchers calculated that, at a minimum, you'd need a web of ships traveling about 12 miles, or 20 kilometers, apart to make accurate tsunami forecasts using their method. Just how much of an advanced warning such a fleet could provide to people onshore isn't clear. It may depend on where the ships happen to be at that moment.

But Hossen noted that team's method could, theoretically, be applied in any ocean in the world as long as it had enough shipping traffic—even in regions like the Indian Ocean where the [tsunami](#) risk is high but disaster preparedness resources are often scant.

"If we can use these ships, then it would probably be much more affordable for any country, not just developed ones," he said.

Provided by University of Colorado at Boulder

Citation: How commercial vessels could become tsunami early-warning systems (2020, December 10) retrieved 24 June 2024 from <https://phys.org/news/2020-12-commercial-vessels-tsunami-early-warning.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.