How a Tsunami Forms, Behaves: Simulation in a Wave Tank

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Description

A researcher at Oregon State University's Tsunami Research Lab demonstrates a simulated tsunami in a wave tank on the TODAY show in 2004, days after a massive tsunami devastated South Asia.

Keywords

Transcript

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MATT LAUER, co-host:
Now to the science of tsunamis. Those walls of water that can race across the ocean at more than 500 miles per hour before crashing into shore. Researchers can create miniature tsunami conditions in the lab, and they hope that what they learn could save thousands of lives down the road. Dan Cox is the director of the world's largest tsunami research lab at Oregon State University. He's going to give us a live tsunami demonstration this morning.

Professor Cox, good morning to you.

Mr. DAN COX (Oregon State University): Good morning, Matt.

LAUER: Before we get to what you can create in that tank behind you, let me just ask you some general questions. I understand that not all earthquakes that occur under the surface of the ocean create tsunami conditions. So what exactly happened in this case in the Indian Ocean that did create the tsunami?

Mr. COX: Well, in this case, the plates move up and down relative to each other, and that's what displaces the water. And then the water moves, as you said, about 500 miles an hour across the ocean.

LAUER: So in other words...

Mr. COX: So there's some other time...

LAUER: So in other words it's the shifting of these massive plates as opposed to say what some people may envision, for example, if a giant section of an iceberg were to fall off and drop into the ocean, would that create a tsunami condition as well?

Mr. COX: Yes, that's called a near-field tsunami. And that's happened in the past where the earthquake shakes the land loose and then the tsunami fills in the void and then rushes into the coastal area. And in
those cases you have a much shorter warning time, usually about three or four minutes.

LAUER: This--this earthquake was huge, 9.0 on the Richter scale. It was six miles below the floor of the ocean. How soon would those walls of water that you talk about racing 500 miles across the ocean, how soon would they form and move outward? Instantly?

Mr. COX: Yeah, nearly instantly.

LAUER: And do they lose force as they--as they get further from the center of the earthquake?

Mr. COX: No. In fact, they move without losing hardly any energy at all. And it's when that energy hits the coast that it has to be released, and that's what causes the devastation.

LAUER: Let's get to the tank behind you, the lab setting there. What do you use in that tank to simulate the actual earthquake?

Mr. COX: Well, what we have at the far end of the wave tank, it's called a wavemaker. It's a wave board, if you will, that's driven by a series of motors. And that pushes a giant wall of water. And you should see that any minute behind me. And so we--what we are really looking at now is what's the impact of that wave when it gets to the coast?

LAUER: And we are watching the blue blocks representing a village there.

And as we can see, the impact is fairly devastating. Is this a little bit like dropping a pebble in the water, professor Cox? In other words, is the energy displaced equally on all sides, or does it change depending on topography?

Mr. COX: Yeah, that's exactly right. It changes based on the--the wave will change based on the topography or the symmetry of the ocean. And as strange as it may seem, waves like to go uphill. And so if there's some topography under the water that the waves are attracted to it, it will move on to it and then you will create certain hot spots along the coast where the waves are much higher than in other locations.

LAUER: And professor, someone told me in the open ocean the waves of a tsunami, which may be a little redundant, can only be a foot high in some places. How is that possible?

Mr. COX: Well, it's really related to how much the plate moves at the bottom of the sea floor. And so if it's only moving up about two or three feet, then it's only going to--then the wave height is only going to be about that high.

LAUER: And--and what...

Mr. COX: So once it reaches the...

LAUER: Go ahead.

Mr. COX: Go ahead.

LAUER: I was going to say what's...

Mr. COX: I was going to say once it's...

LAUER: We are having one of those great satellite moments here. What can you learn from eyewitness accounts when you finally--or researchers finally get to talk to people who witnessed these conditions in south Asia that might help you in the future?

Mr. COX: Yeah. Well, the eyewitness accounts are extremely important, because there's usually very little recording of the wave itself and what had come in, you know, during the initial attack from the tsunami. So usually what we are learning is how high the wave was, what direction it came from, and ultimately
where it went along the coast.

LAUER: And professor, while thoughts and prayers are certainly with the people of southeast Asia, there are people living in the United States who are now thinking could this happen here along the East Coast or the West Coast? What--what is the likelihood of something like that occurring in the United States?

Mr. COX: Well, we have a lot of historical records that have shown that we've--we had the last--there was a huge tsunami was in the early 1700s, and as recent as 1964, we had another very large tsunami that hit certain sections of the Pacific Coast.

LAUER: So it's not out of the question?

Mr. COX: Yeah. We--and there is a lot of research being done now to develop warning systems especially in the Pacific Northwest and the Gulf of Alaska, for example. And so we're--that's one of the main reasons we have this facility is to work with those researchers to help fine-tune the warning systems and plan the evacuation scenarios in the event of a tsunami attack.

LAUER: Professor Dan Cox. Professor, thanks for your time and expertise. I appreciate it.

Mr. COX: Thank you, Matt.