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Description
The massive wave of a tsunami can start thousands of miles offshore, but travel quickly across the ocean and devastate coastal communities. Anne Trehu and Dan Cox of Oregon State University are studying how tsunamis form and behave in order to prepare people for their potential devastation. "When Nature Strikes" is produced by NBC Learn in partnership with the National Science Foundation and The Weather Channel. For a classroom activity related to this video, please click the Links section below.

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When Nature Strikes -- Tsunamis

MARSHALL SHEPHERD reporting:

With waves sometimes reaching 100 feet high, tsunamis have the power to wipe out entire coastal regions, and their impact could affect millions. That's why scientists funded by the National Science Foundation are working to better understand how tsunamis are formed, and how to survive them when the surf hits the turf.

On March 11, 2011, the east coast of Japan was rocked by a 9.0 magnitude earthquake. Many had thought the worst was over, when no less than an hour later 30-foot ocean waves struck the shore, destroying nearly everything in their way. In the end, this "tsunami" - Japanese for "harbor wave" - caused over $300 billion in property damage, and about 16,000 human casualties. Though one of the less common natural hazards, tsunamis can start thousands of miles away, traverse an entire ocean, and devastate shoreline communities without much notice.

ANNE TREHU (Oregon State University): What you see here is the sea floor; this is the plate going into Japan.

SHEPHERD: Anne Trehu is a seismologist at Oregon State University who's looking deep below the Earth's surface to study one of the main causes of tsunamis - earthquakes.

TREHU: Most tsunamis, by far, the large majority are caused by earthquakes, either directly from the motion of the sea floor during the earthquake or by landslides triggered by the earthquake.

SHEPHERD: When an earthquake or similar event occurs beneath the ocean, its energy rises to the surface, displacing the water and creating long waves, moving at speeds approaching 500 miles per hour. As the waves traverse the open water, they may only be a foot high. But when they enter shallow water near the shore, the waves slow down and catch up with each other, causing towering waves to form and strike with immense force. Because most tsunamis are triggered by earthquakes, Trehu is looking
specifically at regions called subduction zones.

TREHU: A subduction zone is where one tectonic plate is going underneath another tectonic plate, like that.

SHEPHERD: After gathering seismic data from large subduction zone earthquakes, Trehu and her team generates 3-D images of earth's structure beneath its surface. When they combine this information from past earthquakes with the computer generated information, it helps to shed light on the behavior of earthquakes in certain regions.

TREHU: The size of the earthquake is not a very good predictor of the size of the tsunami. There've been a number of cases of earthquakes, kind of mid-magnitude sevens that have had unusually large tsunamis.

SHEPHERD: One zone that scientists are paying close attention to is the "Cascadia Subduction Zone," which extends from Northern California to Vancouver.

DAN COX (Oregon State University): The Cascadia Subduction Zone is the multi hazard. There's not just the tsunami but also the earthquake that precedes it and that earthquake is going to damage the buildings in the area as well.

SHEPHERD: Dan Cox is the director of the O.H. Hinsdale Wave Research Laboratory at Oregon State University. It is home to one of the biggest tsunami test facilities in the world. What Cox and his team are studying is the amount of damage a tsunami might cause if it strikes land and what can be done to minimize such damage.

COX: What the laboratory provides is a very careful controlled environment that we can look at the force by the water on a structure.

SHEPHERD: The facility is outfitted with large pools that generate scaled-down versions of tsunami waves. When these waves are released, they collide with scale models of buildings to see how these structures would react to a tsunami if it were to strike a coastal city. The facility also looks at patterns of flooding that would make evacuation difficult.

COX: We could model just a single building and we could also look at a whole bunch of buildings at a smaller scale and look at the interaction of the water and how the flow between buildings, for example, might increase the flow and impact a building that's further inland from the shoreline.

SHEPHERD: Cox's research aims to help engineers and city planners prepare for a possible tsunami by not only identifying which structures will be most at risk, but informing them which designs stand up better to the force of massive waves. This is critical for preparing and protecting people living along coastlines.

COX: What we want is everybody to have a good understanding of science and engineering and really to be tsunami literate.

TREHU: By understanding the earthquakes better, then you can improve your models of what's going to happen.

SHEPHERD: Though the exact timing and the size of a tsunami can't be predicted, scientists and engineers like Trehu and Cox are helping communities prepare for the next major wave.