Tiny tremors can track extreme storms in a warming planet

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Data from faint earth tremors caused by wind-driven ocean waves—often dismissed as "background noise" at seismographic stations around the world—suggest extreme ocean storms have become more frequent over the past three decades, according to research presented at the annual meeting of the Seismological Society of America.

The International Panel on Climate Change (IPCC) and other prominent researchers have predicted that stronger and more frequent storms may occur as a result of global warming trends. The tiny tremors, or microseisms, offer a new way to discover whether these predictions are already coming true, said Richard Aster, a geophysics professor at the New Mexico Institute of Mining and Technology.

Unceasing as the ocean waves that trigger them, the microseisms show up as five- to 30-second oscillations of Earth's surface at seismographic stations around the world. Even seismic monitoring stations "in the middle of a continent are sensitive to the waves crashing all around the continent," Aster said.

As storm winds drive ocean waves higher, the microseism signals increase their amplitude as well, offering a unique way to track storm intensities across seasons, over time, and at different geographical locations. For instance, Aster and colleagues Daniel McNamara from the U.S. Geological Survey and Peter Bromirski of the Scripps Institution of Oceanography recently published analysis in the Seismological Society of America journal Seismological Research Letters showing that

microseism data collected around the Pacific Basin and throughout the world could be used to detect and quantify wave activity from multi-year events such as the El Niño and La Niña ocean disruptions.

The findings spurred them to look for a microseism signal that would reveal whether extreme storms were becoming more common in a warming world. In fact, they saw “a remarkable thing,” among the worldwide microseism data collected from 1972 to 2008, Aster recalled. In 22 of the 22 stations included in the study, the number of extreme storm events had increased over time, they found.

While the work on evaluating changes in extreme storms is “still very much in its early stages”, Aster is “hoping that the study will offer a much more global look” at the effects of climate change on extreme storms and the wind-driven waves that they produce. At the moment, most of the evidence linking the two comes from studies of hurricane intensity and shoreline erosion in specific regions such as the Pacific Northwest Gulf of Mexico, he noted.

The researchers are also working on recovering and digitizing older microseism records, potentially creating a data set that stretches back to the 1930s. Aster praised the work of the long-term observatories that have collected the records, calling them a good example of the “Cinderella science”—unloved and overlooked—that often support significant discoveries.

“It’s absolutely great data on the state of the planet. We took a prosaic time series, and found something very interesting in it,” he said.

Source: Seismological Society of America