UC **SANTA BARBARA**

Department of Earth Science

Speakers Club

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Seismicity and Severe Weather: Excitation of Seismic Waves by the Atmosphere

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The application of seismic techniques to study processes on Earth's surface is a relatively new and growing field. Seismic instruments and arrays around the world are being used to study a wide range of phenomena, such as mass wasting, rivers, glaciers, wind and weather. While there are many applications for seismic methods in this way, we will be focusing on one in particular: the interaction between the atmosphere and the solid Earth. To accomplish this, we have looked at two types of severe weather events, hurricanes and tornadoes.

When sufficiently strong, hurricanes and tornadoes generate significant observable ground motions through pressure changes at the surface. Under the proper circumstances, these signals are recorded by seismometers and can provide insight into the storm events. First, we used two dense seismic arrays, Earthscope's Transportable Array (TA) and the Southern California Seismic Network (SCSN) to (a) examine the case of landfallen hurricanes through the TA and (b) perform a backprojection of hurricanes over the Atlantic Ocean. Through the study of Hurricane Isaac, which made landfall through the TA in 2012, we can observe its decay as it weakened and dissipated over time in the seismic data within the frequency range of 0.01-0.02 Hz. While a novel result, this observation does not hold many practical applications towards hurricane monitoring. So, using the SCSN, we then performed a backprojection of 0.2 Hz P-waves of hurricanes over the ocean between 2011-2016, in order to see if it is possible to track them using seismic data. We find that for many strong hurricanes, the backprojection results in a P-wave amplitude peak that can be associated with the storm, however, more work is required to refine these results. Second, in regards to tornadoes, we identified seismic signals corresponding to an EF5 tornado that occurred on May 22, 2011 in Joplin, Missouri. This signal was recorded by the TA station that was closest to the tornado track. We modeled this seismic signal at low frequencies (below 0.1 Hz) and found that the amplitude of the seismic signal corresponds to the reported intensity of the storm. Further analysis of tornadoes in this way could provide a quantitative method of measuring tornado strength using seismic data.