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Citizen Science Will Help Assess Effects of El Niño

Scientists enlist the public to help document anticipated major climate event

Waves reach Highway 101 north of Solana Beach, Calif. in 2010.

As one of the largest El Niños in recent years continues to develop in the Pacific Ocean, Scripps Institution of Oceanography at UC San Diego is calling on the public to help document a historic climate event.

Scripps Oceanography's "citizen science" projects will focus on data collection to document the impact of large waves on beach erosion and coastal flooding. Citizen science contributions may range from photographs to measurements of water temperatures and other environmental variables that are important to ongoing scientific research. Researchers are working with citizens and municipalities to expand their capabilities and engage amateur scientists, students, and teachers.

The citizen science surveys are part of an ongoing evolution of El Niño research at which Scripps Oceanography has been at the forefront for several decades. The research community's ability to forecast and understand El Niño events has progressed considerably since 1982, when one of the largest El Niños of the last century arrived almost undetected, and through 1997-98, the year of the strongest El Niño of recent times in which Scripps scientists made their first public calls for preparedness ahead of the event.

Project leaders anticipate that beneficiaries of this crowdsourced data will not be just scientists but a host of end-users ranging from fire departments to transportation managers, urban planners, and major Southern California port occupants including the U.S. Navy.

“The Navy is concerned about impacts of sea-level rise on its coastal bases. Taking additional measurements of regional impacts during this winter’s El Niño storm events is an opportunity not to be missed,” said Dennis McGinn, assistant secretary of the Navy for Energy, Installations and Environment. “More needs to be done to accurately characterize and predict the strength and frequency of regional sea-level rise impacts.”

El Niño, a climate phenomenon that is characterized by warmer waters in the eastern Pacific Ocean among other conditions, could amplify the number and strength of winter storms along the Southern California coast. Researchers say the event presents an opportunity for the public to help monitor coastal erosion, and to use the record of these events as a predictor for the effects of longer-term sea-level rise along the coast. What happens this season could simulate the effects of sea-level rise that is projected over the next 30-40 years.

In August, a gift from Del Mar, Calif. residents Carol Dean and Richard Hertzberg established the Scripps Center for Climate Change Impacts and Adaptation. The Center will provide science-based strategies for adapting to climate change and public involvement in creating these strategies is among its missions.

“What we learn about the effects of an El Niño on our coastline is not limited to this weather event. And after the El Niño, we will continue to monitor sea-level rise and erosion along the coast due to climate change,” said Scripps Oceanography Director Margaret Leinen. “Engaging our researchers with community volunteers will provide access to more information and help us assess the changes to our coastal environment.”

Scripps researchers Julie Thomas, Sarah Giddings, and Timu Gallien are spearheading the efforts to recruit the public to collect data during El Niño.

Thomas, executive director of the Southern California Coastal Ocean Observing System (SCCOOS) and the Coastal Data Information Program (CDIP) is hoping that members of the public will send in high-resolution photographs of damage along the Southern California coastline caused by storms or of wave impacts on beaches. The photo record can validate the simulations that are part of ongoing research to measure the impact of waves on the shoreline.

“Geo-referenced, high-resolution photographs of coastal flooding and inundation during energetic wave events can be used to correlate wave heights collected by the CDIP buoys,” Thomas said.

Funded by the California Department of Boating and Waterways and the U.S. Army Corps of Engineers, CDIP real-time wave information can be found at cdip.ucsd.edu.

Thomas is also looking for repeatability of photos over time.

“If someone takes photos from the exact same location during high tide everyday for a specified period of time, this could also help us quantify the effects of large waves causing seawall damage or damage to the shoreline,” said Thomas.

Scripps oceanographer Sarah Giddings, who studies nearshore and surf zone processes, will be observing how physics impacts important biological and chemical processes in the coastal environment. Giddings is interested in monitoring the effects of an El Niño on estuaries (bays, lagoons, harbors, or marshes) along the Southern California coast.

Giddings will be working with a high school environmental science class to monitor the salinity, temperature, and depth of estuaries to better understand the characteristics of estuaries, and how an estuary responds to El Niño.

“This experiment will help us understand how the water circulates in the estuary and how oxygen levels increase or decrease after a big storm, and, how this affects marine ecology in the estuary,” she said.

Giddings will partner with the Southern California Coastal Water Research Project (SCCWRP) to engage with cities and counties to study smaller estuaries. Specifically, the researchers hope to obtain before-and-after photos of high-tide events along as much of the California coastline as possible.

“These before-and-after photos will be a good indicator of future sea-level conditions. Extreme sea events are likely to occur more often as the ocean responds to climate change,” said Giddings.

Timu Gallien, a postdoctoral researcher at Scripps Oceanography, is an expert on urban coastal flooding, sea-level rise mitigation, and regional flood risk forecasting. Gallien has partnered with municipal entities to collect high-quality data to accurately measure topographic structure of beaches.

“We are looking for data that will be within two centimeters of accuracy,” said Gallien.

Gallien says that these data sets will help with flood mapping, observing morphological change along the shoreline, estuaries, and other habitats.

“The size of the beach matters, and we will watch the coastline closely if this El Niño happens,” said Gallien.

Those wishing to contribute photos of storm events along the coast or to obtain more information on how to help document this year’s El Niño can e-mail researchers at stormphoto@sccoos.org.