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GEOFORCE MONTHLY

Changing lives since 2005

L- Sean Santellanes as a GeoFORCE Student in 2011, R- Sean Santellanes as an Alumni Mentor in 2023, both at Crater Lake, OR.

ALUMNI SPOTLIGHT: SEAN SANTELLANES

How did Sean Santellanes go from the landlocked town of Uvalde, Texas to studying tsunamis at the University of Oregon? It's far from a typical path for natural disaster scientists.

"The vast majority of people who study natural disasters have some sort of connection to their disaster of choice. Either they were affected by it as a youth or they were affected by the knock-on effects," Santellanes said.

Indeed, Santellanes did not set out to study tsunamis. He participated in GeoFOCE Texas as a high school student and went on to pursue a bachelor's degree in physics at The University of Texas at Austin. His career trajectory changed when he interned with the United States Geological Survey (USGS) in Menlo Park, California.

"I had been working on doing geolocations of videos the USGS did in the immediate aftermath of the 2015 Nepal Earthquake," Santellanes said. "It was depressing! X amount of people died in this village. Y amount in this one. Z amount in another. I was very close to deciding to do exploration geophysics instead."

The USGS interns at Menlo Park were given the opportunity to attend seminars. Two of those seminars changed the course of his career. The first was on the Great Tohoku Earthquake and Tsunami and the second was on the 1700 Cascadia Earthquake and Tsunami.

Santellanes was fascinated and returned to UT anxious to learn more. Learning about geophysical fluid dynamics is vital for understanding the movement of tsunamis, but at the time no such course was offered at the Jackson School of Geosciences. So, Santellanes chose to pursue a master's degree in Meteorology at Pennsylvania State University. There, he networked with researchers studying climate, hurricanes, and tornadoes. Santellanes's research focused on the lowest two kilometers of the atmosphere.

Santellanes is proud that his Master's work is used to understand the state of the atmosphere prior to severe weather events in the Great Plains. However, he never forgot his interest in tsunami disasters sparked all those years ago in Menlo Park. This is passion led him to moving to Eugene to pursue a doctorate in geophysics and seismology at the University of Oregon.

"My research has been used to measure the open ocean background state, using Deep-ocean Assessment and Reporting of Tsunamis (DART) stations, so that we can make more accurate assessments of tsunami threats," Santellanes explained. "That research has been used to evaluate the 2022 Hunga Tonga Hunga Ha'apai Tsunami and the strange tsunami of the 2020 Sand Point Earthquake. The hope is that one day soon my research can help bridge the regional tsunami alert gap."

Photos: GeoFORCE

Sean Santellanes at Horse Rock Ridge, OR.

THE BIGGEST NATURAL DISASTER

We asked tsunami scientist Sean Santellanes which of the many types of natural disasters was the most worrying.

“Climate change,” Santellanes said. “It makes every natural disaster worse. Yes, even tsunamis and earthquakes! Whether an earthquake occurs has little to do with climate change, but its knock on effects do. The 1700 Cascadia Earthquake occurred on January 26, 1700, when the Pacific Northwest was in the middle of the wet season. If it occurred today, we would have to be worried about the time of year. An earthquake that occurs in fire season could cause wildfires at a time when the region would not have the resources to support fire suppression. That’s without considering the tsunami, the bridge collapses, the oil spills, etcetera. It’ll be a bad day.”

So how does climate change affect natural disaster research? Scientists who study natural disasters typically focus on a single type of disaster. There’s a vast difference between earthquake dynamics and tornado physics. Most researchers specialize in one area over the course of their career. However, across all fields, there’s a greater effort to include the changes in Earth’s climate into predictive models.

“In tsunami research, we are beginning to factor in rising sea levels to our models,” Santellanes explained. “A hazardous tsunami is defined as anything over 30 cm, or about 1 ft. The typical tidal range for Long Beach, CA can be up to 100 cm, or about 3 ft. By 2050, it is forecasted that sea level will rise 60 cm, about 2 ft. So, we must take into account sea level rise. And it’s not just Long Beach. Every coastal community is more at risk. How much more? We’re working on it. It’s a big challenge in my field.”

2050 may seem far away but the infrastructure being built today needs to contend with the knowledge of what might come. There are many scientific challenges to factoring climate change into models, but scientists across disciplines are coming together to create more accurate models.

In order to better use sea level predictions in tsunami science, we need the sea level models to be accurate. In order for sea level models to be accurate, we need to understand the various ways warmer temperatures affect the ice caps. In order for us to understand the global rise in temperature, we need to understand the intricacies of our atmosphere. The United Nation’s Intergovernmental Panel on Climate Change (IPCC) synthesizes research and reports from all types of scientists to provide their assessment reports. These reports are then used by organizations like NASA to generate climate change predictions. It takes a village: from glaciologists, ecologists, meteorologists, hydrologists, and every field of geoscience, natural science, and more. Everyone is working together to protect people from the biggest natural disaster to threaten humanity since our evolution on Earth. This unprecedented collaboration has positively impacted the entire community.

“As we understand how sea levels rise, we can understand what the past was like when tsunamis occurred when sea levels were lower,” Santellanes added. “Big tsunamis are rare, and records go back hundreds of years. However, tsunami scientists did not have a great understanding of past sea levels, especially across the whole Pacific. We were stuck in our little box, trying to figure out how and why tsunamis generate. By combining our research with that of geologists, we can make more accurate inundation maps for past tsunamis at a local and regional scale. So, it’s something exciting that came by way of considering climate change effects.”

References: Intergovernmental Panel on Climate Change and NASA Rising Sea Level Tools

IMPORTANT DATES

Here are a list of dates to keep in mind for **April** and **May**:

APRIL

Sun	Mon	Tues	Wed	Thur	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

MAY

Sun	Mon	Tues	Wed	Thur	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Future Students **Alumni** **Current Students**

Apr 6th Southwest Orientation

Apr 13th Austin Orientation

Apr 20th Houston Orientation

Apr 27th Virtual Orientation/Makeup Orientation

May 2nd Educational Staff Training

May 11th UT Austin Graduation!

May 21st & 22nd Logistical Staff Training

LOOKING FOR AN INTERNSHIP THIS SUMMER? CLICK HERE TO CHECK OUT OUR JOB BOARD!

Make sure you don't miss out on any of the events going on next summer, internship opportunities, or school year events!

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