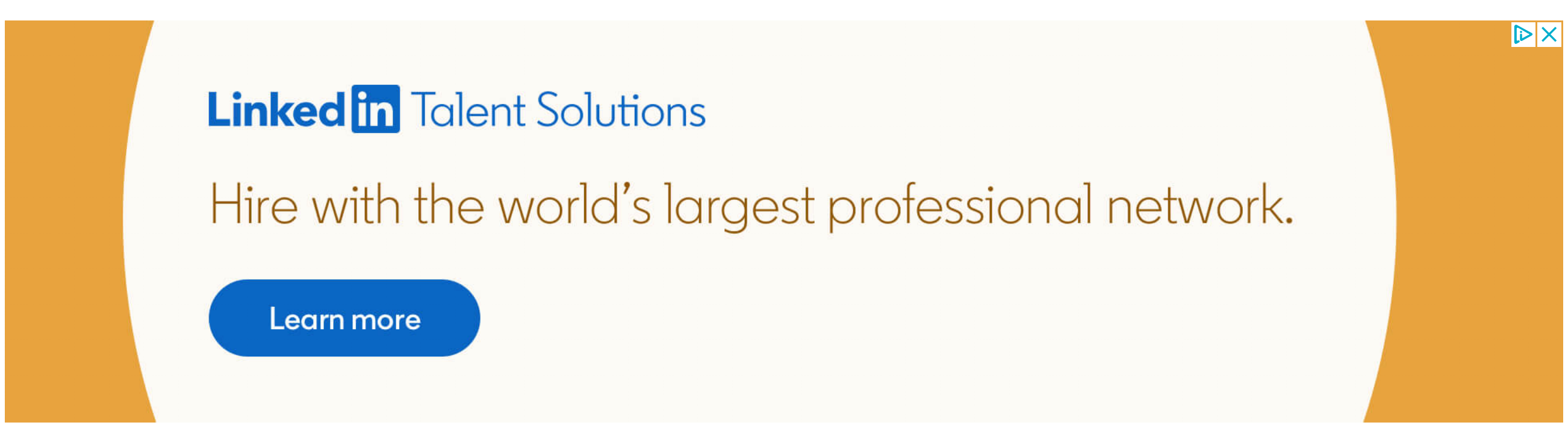

CLIMATE

NASA launches mission off San Francisco coast to study ocean's relationship to climate change

Tara Duggan
Oct. 29, 2021

1 of 3

R/V Oceanus at the Port of San Francisco on Oct. 26. The research vessel is taking part in a NASA mission to study ocean surface dynamics and their role in climate change.
Provided by NASA's Goddard Space Flight Center

To study the role Earth's oceans play in climate change, NASA recently launched a mission 100 miles off the San Francisco coast that involves a ship, two airplanes, and a fleet of saildrones and other robotic research vehicles.

The scientists are studying lesser-known features of the ocean surface, such as eddies and whirlpools, that they suspect play an important part in the transfer of gases and heat between the atmosphere and the ocean. The mission began Oct. 19, when the research vessel Oceanus left Newport, Oregon,and will finish up Nov. 6. It took a short break during the recent storm, when the ship had to come into port in San Francisco because waves in the study region reached 30 feet high.

Though NASA is best known for space exploration, it also operates a fleet of satellites to study the earth's surface, several which focus on the oceans. This particular mission is called the Sub-Mesoscale Ocean Dynamics Experiment or S-MODE; sub-mesoscale refers to ocean dynamics that are smaller than 10 kilometers across like ocean eddies, which swirl around the ocean's surface, stirring up the water.

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"These eddies have a really important effect on climate," said Tom Farrar of Woods Hole Oceanographic Institution, the principal investigator on the mission, in a press briefing about the mission Friday.

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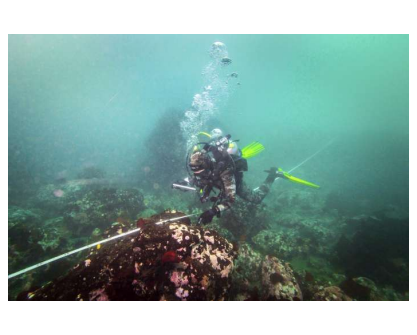

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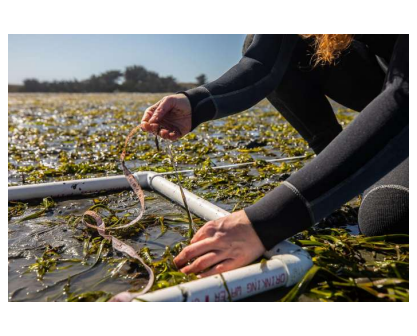

The ocean absorbs 31% of human-caused greenhouse gas emissions, according to National Oceanic and Atmospheric Administration. Farrar and others suspect that eddies have an effect on the exchange of heat and gases between the air and sea and likely play a role in moving heat, carbon and oxygen from the surface to deeper layers of the ocean. But eddies are too small and short-lived to be studied by satellite, which is why the S-MODE mission is using so many different instruments at once, closer to the source.

The site off of the San Francisco Bay was chosen because it's located on the California Current, a dynamic movement of water along the West Coast that is the site of many eddies. Two aircraft are collecting data on wind and currents on the ocean surface from different elevations, one under the clouds and one at 28,000 feet, while the Oceanus and autonomous research vehicles are collecting images and measurements in the water.

"The goal is to map out a full 3-D structure," Farrar said.

The Oceanus transported most of the ocean robots out to sea, though five saildrones, bright orange, solar-operated robotic vehicles that embarked from Alameda and made their way out to the study area. They can measure air and ocean currents along with salinity and chlorophyll content, or the amount of phytoplankton in the water. With all the instruments working together, the team hopes to study the eddies as they're happening to learn more about how the ocean slows the impact of climate change.

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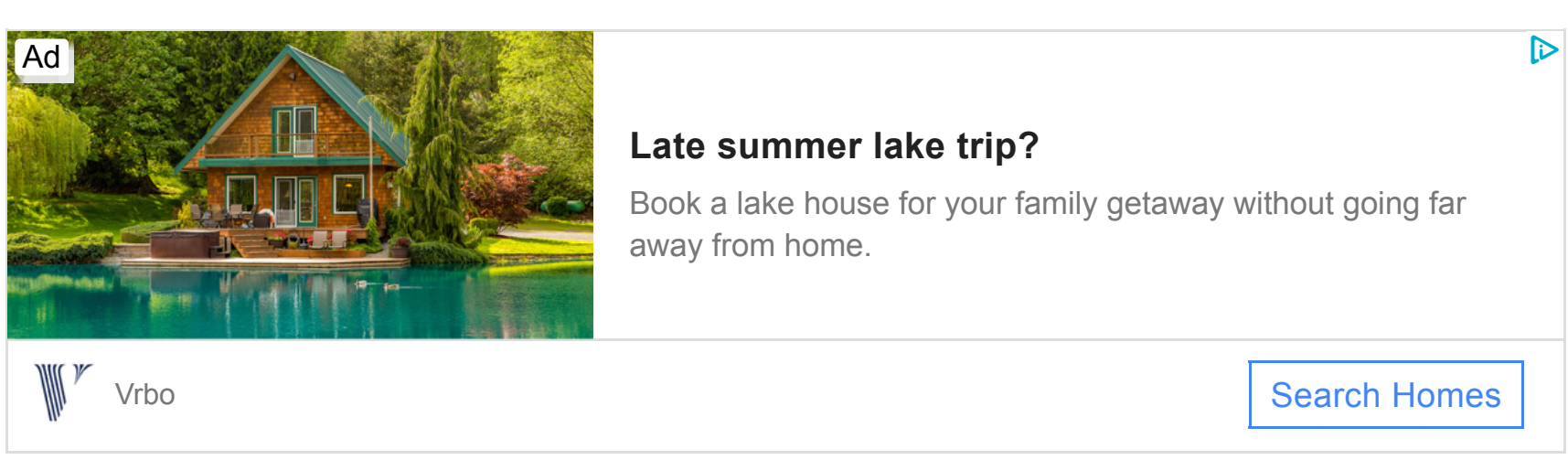

What they find can be used to support an international project NASA is taking part in next year using satellites to take the first global survey of all bodies of water on the planet, from oceans to lakes, said Nadya Vinogradova-Shiffer, program scientist from NASA's Earth Science Division, at the briefing.

"Observing ocean circulation directly from space would be a huge leap forward for science," she said.

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Tara Duggan has written for The San Francisco Chronicle since 1999. Previously part of the Food+Wine department, she currently is on the Climate desk covering environmental aspects of agriculture, food and the ocean, among other topics. She is also coauthor of the upcoming "Steamed: A Catharsis Cookbook" (April 2021) along with other cookbooks including "The Working Cook," "Root to Stalk Cooking" and "The Blue Bottle Craft of Coffee." Her writing and recipes have also appeared in the New York Times, Food & Wine Magazine and the Wall Street Journal.

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