

RESEARCH highlights

Scripps Oceanography is one of the most important centers for global science and education in the world. Hundreds of research programs covering a wide range of scientific areas are underway on every continent and in every ocean.

THE OCEANS

ARE RECOGNIZED IN CLIMATE TALKS



The science community and advocates for improved study and management of the world's oceans scored a victory in Paris in December 2015 when negotiators at the 21st Conference of the Parties (COP21) climate talks made mention of the oceans in the final approved agreement from the conference.

It was the first time in the history of the talks that the importance of ocean protections had been explicitly mentioned. Observers of the negotiation process said the inclusion opens the door to more ocean-focused climate mitigation actions as countries around the world pledge to take steps to reduce their contributions to climate change. Scripps scientists and students were among those who had sought to raise the profile of the oceans through presentations and direct interactions with COP21 negotiators.

“Although two-thirds of the ocean falls outside national jurisdiction and thus doesn't have its own negotiator within the United Nations climate talks, here were unified voices reminding us that the ocean is a great and essential climate mitigator whose ecosystems we depend on for food, protection, livelihoods, and climate adaptation, and that it is vulnerable to the impacts of our CO₂ emissions,” said Scripps biological oceanographer Lisa Levin, who delivered several talks highlighting ocean stresses at COP21.

Scripps climate and atmospheric scientist Veerabhadran Ramanathan advanced the concept of limiting global warming agents besides the chief anthropogenic source of climate change, carbon dioxide. Ramanathan spearheaded University of California efforts to make the university system carbon neutral in 25 years and has studied the climate benefits of reducing emissions of refrigerants, soot and other forms of black carbon, methane, and other pollutants.



SEAFLOOR IMAGING SYSTEM CAPTURES A MICROSCOPIC VIEW OF A CORAL'S LIFE

Scripps Oceanography researchers developed an innovative underwater tool to study the minute ocean world. The Benthic Underwater Microscope, or BUM, has captured a never-before-seen microscopic view of a coral's life, including coral turf wars, a previously unknown behavior being called coral polyp “kissing,” and a unique algae settlement pattern on recently bleached corals.

The BUM is a two-part system—an underwater computer with a diver interface tethered to a microscopic imaging unit—to study marine subjects at nearly micron resolution. The instrument has a high magnification lens, a ring of focused LED lights for fast exposures, fluorescence imaging capabilities, and a flexible tunable lens, similar to the human eye, to change focus for viewing structures in 3-D.

In an effort to better understand the many ecological processes taking place on a microscopic scale in the ocean, Scripps researcher Jules Jaffe and graduate student Andrew Mullen built the seafloor system to image marine microorganisms in their natural settings without disturbing them.

In field tests, the researchers used the imaging system to view millimeter-sized coral polyps off the coast of Israel in the Red Sea, and off Maui, Hawaii. They are now preparing the instrument to take pictures of microscopic particles in water near the coral's surface to study how the flow of water over corals allows them to exchange the necessary gases to breathe.



OMINOUS CLOUD FORECASTS CONFIRMED

Computer climate models had for several years predicted that the accumulation of greenhouse gases in the atmosphere generated by human populations would cause cloud tracks to retreat toward Earth's poles and expand subtropical dry zones.

In July, a team led by Scripps climate researcher Joel Norris reported that its analysis of satellite cloud data confirmed those predictions. These cloud changes enhance absorption of solar radiation by the earth and reduce emission of thermal radiation to space. They exacerbate global warming caused by increasing greenhouse gas concentrations.

"What this paper brings to the table is the first credible demonstration that the cloud changes we expect from climate models and theory are really happening," said Norris.

The researchers reached their conclusion after reconciling inconsistent satellite records of cloud cover beginning in the 1980s and compensating for inaccuracies caused by changes in satellite orbit, the degradation of satellite-borne instruments, and other factors.



NEW TECHNOLOGY

A new technology is giving firefighters the upper hand in the battle against wildfires. The network of mountaintop cameras operated by researchers at Scripps offers a new opportunity for early detection of fire hazards in some of the most remote locations in Southern California, and within the wildland-urban interface.

The AlertSoCal system, developed in collaboration with the Scripps-based High Performance Wireless Research and Education Network (HPWREN), headed by Scripps geophysicist Frank Vernon, and the Nevada Seismological Laboratory, expands Southern California's state-of-the-art earthquake and weather monitoring system to better detect fires in real time before they spread.

AlertSoCal provides firefighters and the public with a virtual fire lookout tower equipped with real-time and on-demand time-lapse imagery up to 12 hours in the past to spot the first signs of fire ignition. The unprecedented view in these remote regions and within the wildland-urban interface can aid fire crews with critical information on fire evolution in its early stages to support safer operations, and more timely evacuations of residents from harm's way.

The web-based technology is designed to help incident command centers quickly pinpoint the initial source location of a wildfire in regions that are difficult to reach, operating in critical fire-prone regions including Toro Peak, the highest peak in the Santa Rosa Mountains located in Riverside County, and Lyons Peak in southern San Diego County.

The HPWREN network currently includes more than 64 fixed mountaintop cameras positioned in 16 remote locations across San Diego, Riverside, and Imperial counties to support public safety operations. New AlertSoCal 4K high-definition pan, tilt, and zoom cameras will augment the existing HPWREN cameras.

The online hazard alert system is also accessible to the public, who can use it to view weather conditions at these often-inaccessible locations of Southern California, and which provides an opportunity to crowd source early fire detection through public participation.



provides early fire hazard detection