RESEARCH HIGHLIGHTS

RESILIENCE TO HAZARDS
WILDFIRE WATCH

As wildfire danger grows in the West, an early warning camera network administered by a consortium of academic centers that includes Scripps is growing as well. ALERTWildfire cameras were credited for confirming and detecting wildfires in Orange County and San Diego County and providing real-time situational awareness that allows first responders to scale up or down their response. The network covers wilderness areas in several western states and in August expanded to Sonoma County, where 13 cameras were added to the ALERT North Bay cluster. ALERTWildfire leaders plan to add several hundred more cameras throughout the West in the next three years. The cameras are accessible to the public at www.alertwildfire.org.
CLIMATE CHANGE CALCULATING IMPACTS

The research team that maintains the Keeling Curve, which tracks carbon dioxide levels in the atmosphere, reported that CO₂ levels reached 411.31 parts per million of air in May. That made it the highest monthly reading in history. Nearly every year since the Keeling Curve was established in 1958, each annual peak has broken the previous year’s record as fossil fuel use escalates.

Scripps researchers coordinated California’s Fourth Climate Change Assessment, released in August. The report included projections of longer heat waves and fire seasons and more rapid sea-level rise than previously thought. New to the Fourth Assessment was the inclusion of regionally specific forecasts, which noted, among other things, a likelihood that there will be more dry years in the San Diego region but that rainy years will bring an increased chance for flooding.

THE NEXT LEVEL IN AEROSOL RESEARCH

The largest federally funded lab at UC San Diego received a $20 million grant extension in May to support five more years of aerosol research.

The National Science Foundation award to the Center for Aerosol Impacts on Chemistry of the Environment (CAICE) will support unprecedented work on atmospheric dynamics. CAICE researchers are trying to understand the complex process through which aerosols travel through the sky and how their chemistry and structure change along the way. In the first phase of the program, they had examined the role that natural aerosols including microbes and other organic matter play in cloud formation.

For the second phase, CAICE is designing experiments to determine how pollution from human activities interacts with natural ocean emissions and changes the chemical composition of the atmosphere. The research could provide insights into how these sources are influencing atmospheric temperatures which are leading to heat waves, as well as intense weather extremes leading to drought and flooding. Read more at: scripps.ucsd.edu/caice.
TECHNOLOGY TRACKING HURRICANES

Scientists from the Lagrangian Drifter Laboratory tracked hurricanes Michael and Florence as the storms traveled through the Gulf of Mexico and Atlantic Ocean with specialized drifting buoys built at Scripps. Managed by scientist Scripps Luca Centurioni as part of the NOAA Global Drifter program with additional support from the Office of Naval Research, this network of 1,500 drifters measures sea surface temperature, currents, and atmospheric pressure and transmits the data in real time. The data is used by NOAA and the international community to validate forecasts of the path and intensity of hurricanes, calibrate and validate satellites measuring the temperature at the ocean surface, as well as for weather prediction, ocean circulation, and climate studies.

During Hurricane Michael, ten drifter buoys were deployed into the Gulf of Mexico from a U.S. Air Force Hurricane Hunter, including five Directional Wave Spectra Drifters. These new drifters detect height, period, and direction of surface waves, which can provide important data to assess the danger of high seas and storm surges.

HUMAN HEALTH DOMOIC ACID DECODED

A team led by scientists from Scripps Oceanography and the J. Craig Venter Institute uncovered the genetic basis for the production of domoic acid, a potent neurotoxin produced by harmful algal blooms. Studying the phytoplankton Pseudo-nitzschia, they discovered that three genes contain the biological instructions for how to make the toxin and are subsequently “turned on” when Pseudo-nitzschia is producing domoic acid. This finding offers hope for increased understanding of harmful algal blooms and the ability to help better project domoic acid events in response to future climate change. Read more at: scripps.ucsd.edu/domoicacid.

NATIONAL SECURITY SCRIPPS ADVISES TASK FORCE OCEAN

Recognizing the U.S. Navy is losing its competitive advantage in the undersea domain and that competitors have a growing capacity for surprise, Chief of Naval Operations John Richardson launched Task Force Ocean (TFO). TFO’s goal is to improve understanding of the current state of ocean science and how collaborations can be strengthened to help maintain competitive advantage undersea.

Due to Scripps’ longstanding partnership with the U.S. Navy, Director Margaret Leinen and several Scripps scientists were asked to provide input to the TFO Roadmap. Key Scripps personnel advised on increasing the connection between ocean science enterprise and the Navy’s operational challenges; improving transition of research into operation for warfighter efficiency; capitalizing existing science and technology strengths and supporting new technology development; and training tomorrow’s workforce with proper skillset to meet future needs.

In October 2018, Scripps sent a delegation to the first TFO Tactical Oceanography symposium. At the meeting, the Office of Naval Research committed to fund fifty additional graduate students and fifty postdoctoral scholars at institutions like Scripps to strengthen the next generation of ocean scientists. The Navy is also expected to expand investments and opportunities in basic and applied at-sea research.
Ice-Measuring Satellite Launched into Orbit In September 2018, NASA launched ICESat-2—a satellite that will measure ice with lasers that scientists say will define the next decade of Antarctic research. Several Scripps scientists contributed to the ICESat-2 mission, notably glaciologist Helen Fricker, who has served as a member of NASA’s Science Definition Team for more than a decade. The satellite will measure changes in the heights of the polar regions, helping scientists calculate future impacts on global sea level and climate.

Records Set at Scripps Pier In August 2018, water temperature readings off the Ellen Browning Scripps Memorial Pier broke a 102-year record held since readings began in 1916. Over a period of one week, the record was broken four times, with the highest reading at 79.5 degrees Fahrenheit. The Scripps Pier temperature time series ranks as one of the world’s longest ocean time series, and the longest on the Pacific Rim.

Manta Ray Nursery Found Scripps graduate student Joshua Stewart and colleagues from NOAA’s Office of National Marine Sanctuaries confirmed the world’s first known manta ray nursery in June 2018. Located in the Gulf of Mexico off Texas, the juvenile manta ray habitat is the first of its kind to be described in a peer-reviewed scientific study.

New Ocean-Atmosphere Simulator Coming to Campus In November 2017, Scripps was awarded $2.8 million from the National Science Foundation to construct a replica ocean-atmosphere system. The new Scripps Ocean Atmosphere Research Simulator (SOARS), expected to be complete in 2021, will mimic the ocean with unprecedented accuracy, capturing the interactions of wind, waves, microbial marine life, and chemistry at the sea surface in a laboratory setting.