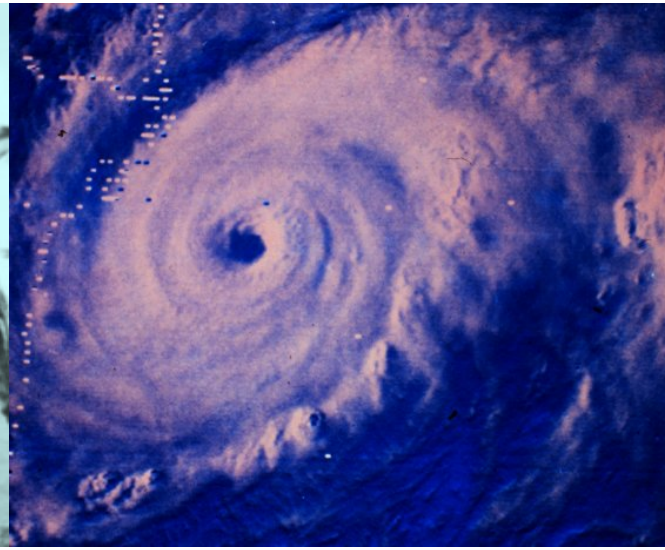
THE FLORIDA STATE UNIVERSITY

Center for Ocean-Atmospheric Prediction Studies





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About COAPS

COAPS is a center of excellence performing interdisciplinary research in ocean-atmosphere-land-ice interactions to increase our understanding of the physical, social, and economic consequences of climate variability.

Established at the Florida State University in 1996 by the Florida Board of Regents.

Core objectives include:

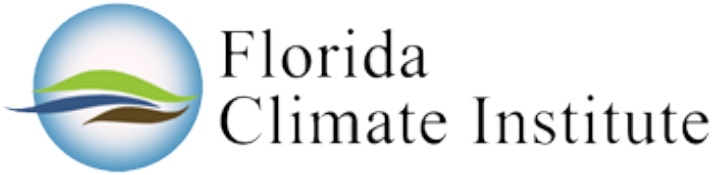
- Producing peer-reviewed scientific research.
- Graduating well-qualified students in meteorology, oceanography, statistics, and the computer and information sciences.
- Providing high-quality data products and services to the public, private, and research communities.

People

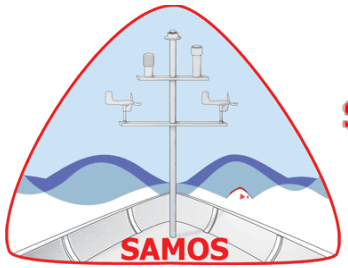
COAPS has 78 people working on research grants totaling nearly $11.6 M/year in expenditures. Current staff include:

- 6 teaching faculty (also part of the Department of Earth, Ocean and Atmospheric Science)
- 26 research scientists and post-docs
- 26 graduate students
- 7 undergraduate students
- 13 support staff

Centers/Consortia



International Ocean Vector Winds Science Team



Shipboard Automated Meteorological and Oceanographic System

Sponsors


BOEM
Bureau of Ocean Energy Management


Global Deepwater Technology Development
DEEPSTAR PROJECT


GULF OF MEXICO
RESEARCH INITIATIVE


NASA


NATIONAL
PARK
SERVICE


NOAA


NSF


NAVAL RESEARCH LABORATORY
WASHINGTON, DC


ONR
Revolutionary Research . . . Relevant Results


RPSEA
Research
Partnership to
Secure Energy
for America


GREAT SEAL OF THE STATE OF FLORIDA
IN GOD WE TRUST


USDA


DEPARTMENT OF ENERGY
UNITED STATES OF AMERICA


USGS
science for a changing world

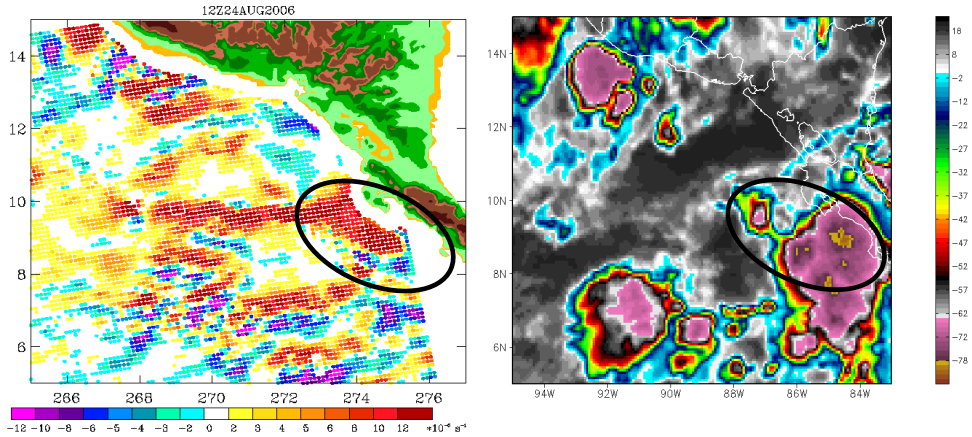
Marine Meteorology

COAPS scientists developed the Shipboard Automated Meteorological & Oceanographic System (SAMOS), a network of oceanographic research vessels collecting marine observations

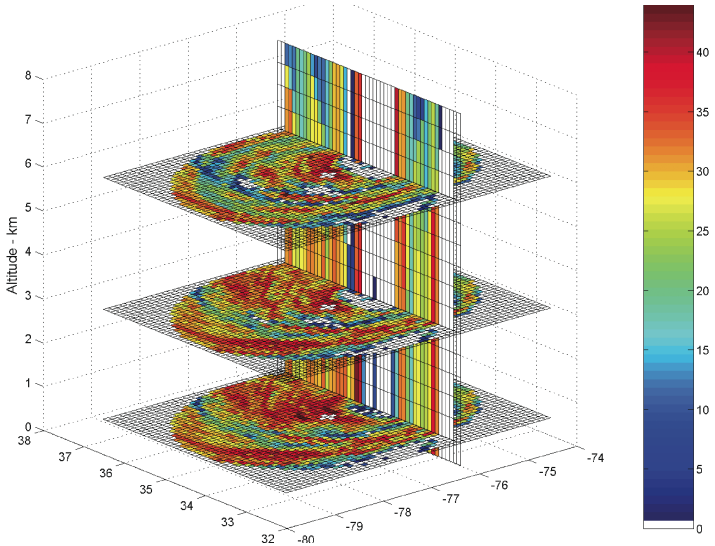
Remote Sensing

Weather and ocean surface conditions are often remotely sensed by satellite, radar, and instruments aboard research aircraft. These observations are used to help improve weather forecasting, marine safety, commercial fishing, El Niño prediction and monitoring, and long-term climate studies.

- COAPS provides national & international leadership for satellite remote sensing of ocean surface winds



- Tropical disturbances are found and tracked using surface vorticity (left) and cloud top temperatures (right). We are now able to study the very early stages of tropical genesis

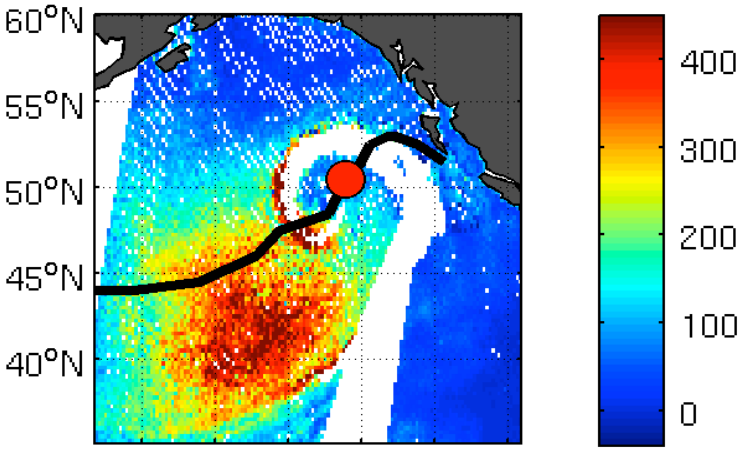


- Radar scans show precipitation intensity in Hurricane Isabel. Better estimates of energy released from condensation improve models of changes in hurricane intensity.

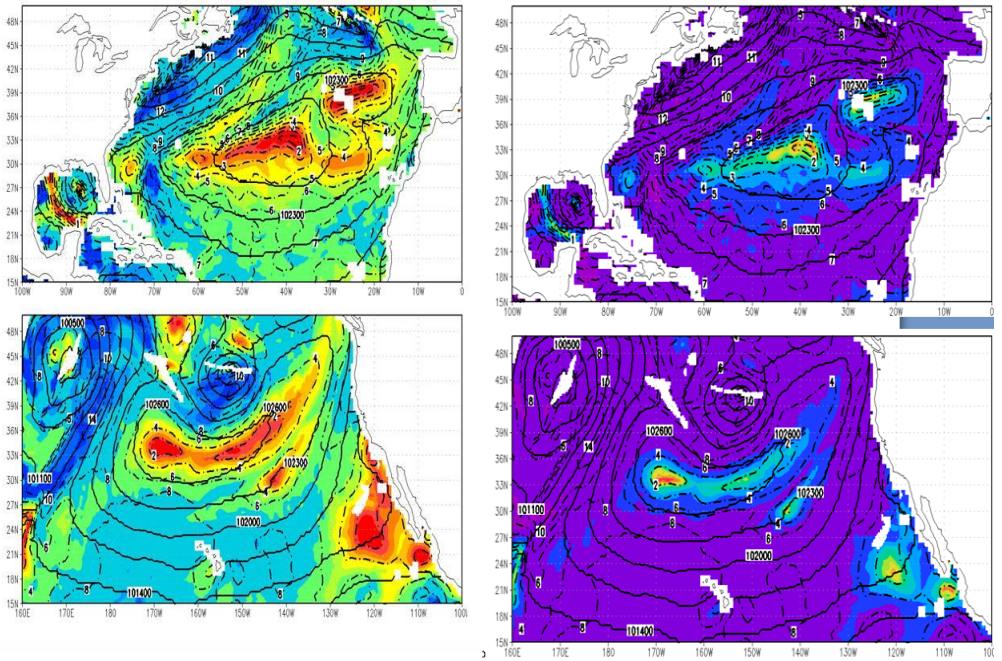
Air-Sea Interaction

Air-sea interaction focuses on the exchange (or *flux*) of quantities, such as heat or moisture, across the ocean surface. These exchanges are sensitive indicators of changes in climate, and are directly related to floods, storm surge, droughts, storm intensity, and storm tracks. We are also improving air sea fluxes in a coupled model.

- The FSU in situ and satellite flux products provide a new set of ocean surface forcing fields which are well-suited for climate prediction studies.



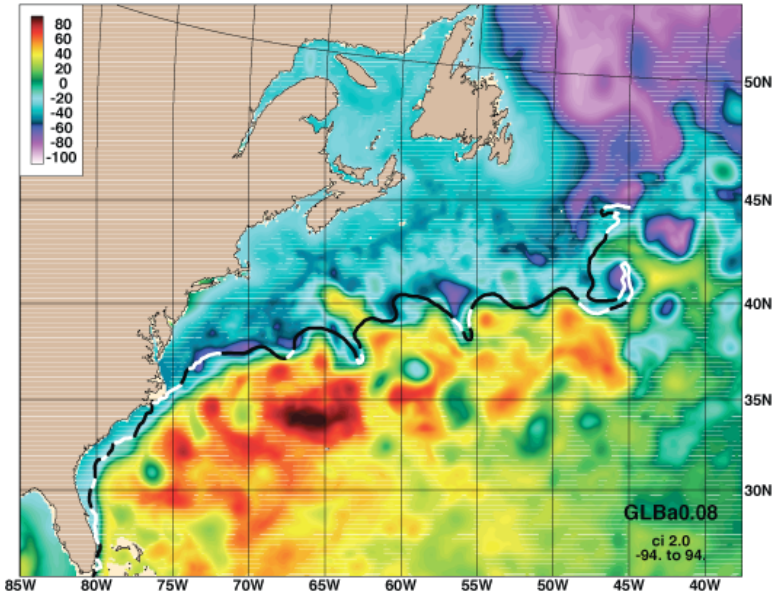
- Fluxes of sensible and latent heat from a warm core seclusion are retrieved from adjacent satellite tracks.



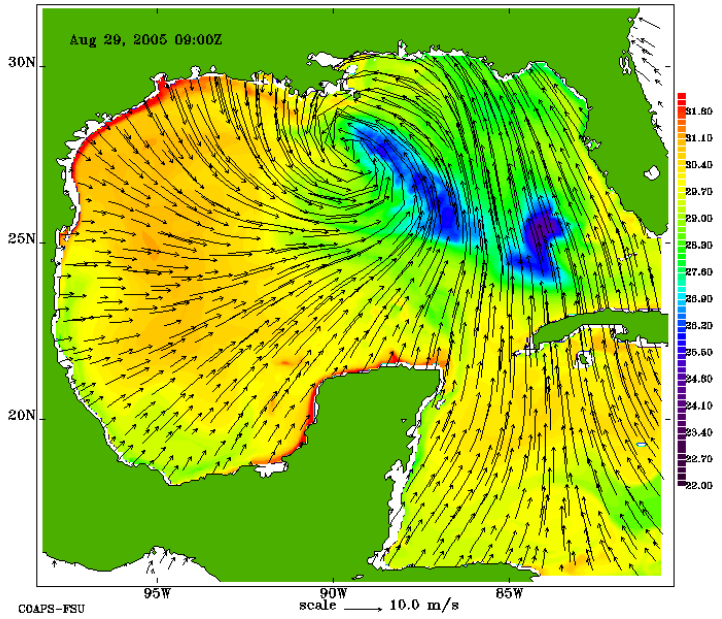
- Diurnal changes in SST (left) contribute to biases in latent heat fluxes (right). Averaged over a season, the tropical biases are typically 8-10Wm^{-2}.

Ocean Modeling

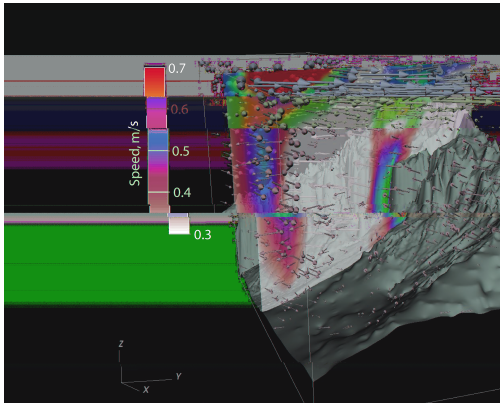
Ocean models are complex computer programs that simulate the physical state and dynamic properties of oceans. COAPS uses global and regional models to study oceanic processes, such as responses to storms, ocean circulation, and water mass formation, and to improve both short- and long-term forecasts.



- Analysis of sea surface height using the HYbrid Coordinate Ocean Model (HYCOM).

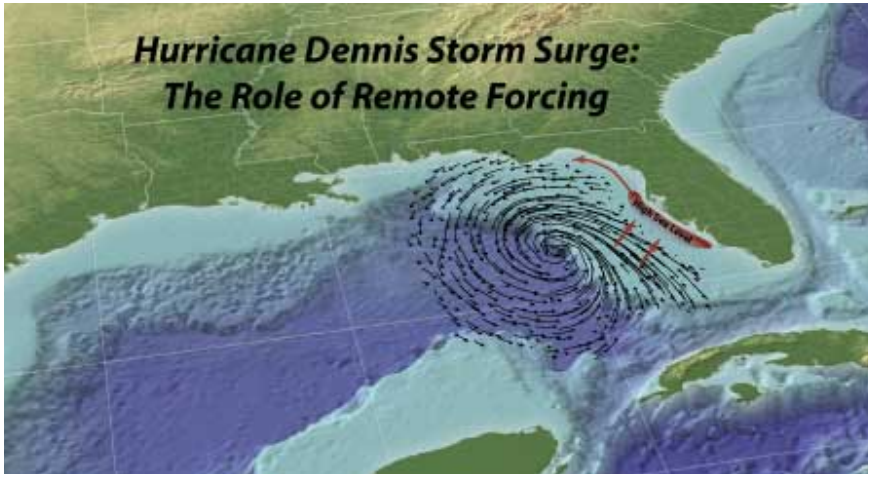


- Sea surface temperature and wind direction during Hurricane Katrina using the Navy Coastal Ocean Model NCOM .



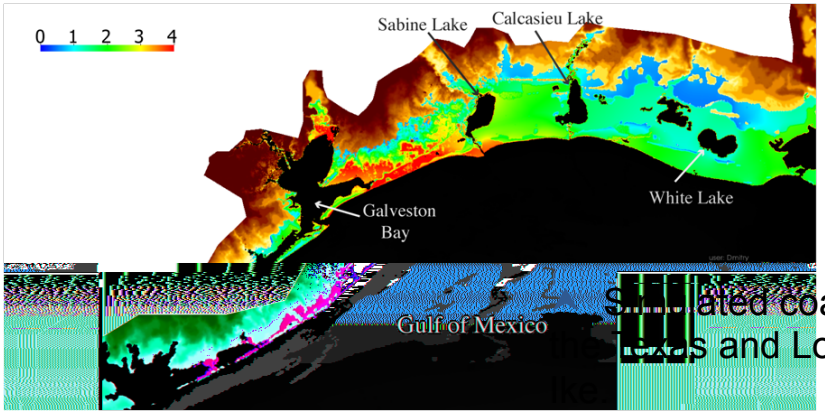
- The simulated velocity of very strong deep currents in the Sigsbee Escarpment in the northern Gulf of Mexico using NCOM.

Coastal Studies

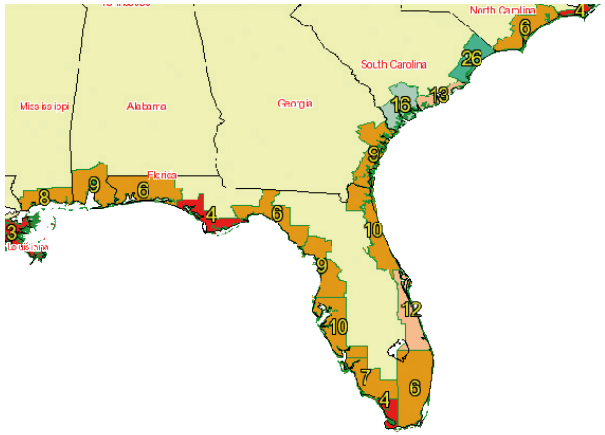


Scientists at COAPS conduct diverse studies in the terrestrial and marine coastal regions. Research topics include sea-level variability, the effects of terrestrial freshwater flux (river discharge) on the ocean and offshore environment, and coastal climate.

- Winds during Hurricane Dennis (2005) caused the sea level to rise along the Florida Peninsula, forming a coastally trapped wave. This wave was amplified by Dennis as it traveled to Apalachee Bay, and added several feet to the local wind-driven surge. New storm surge forecasting methods have been adopted to account for these remote effects.



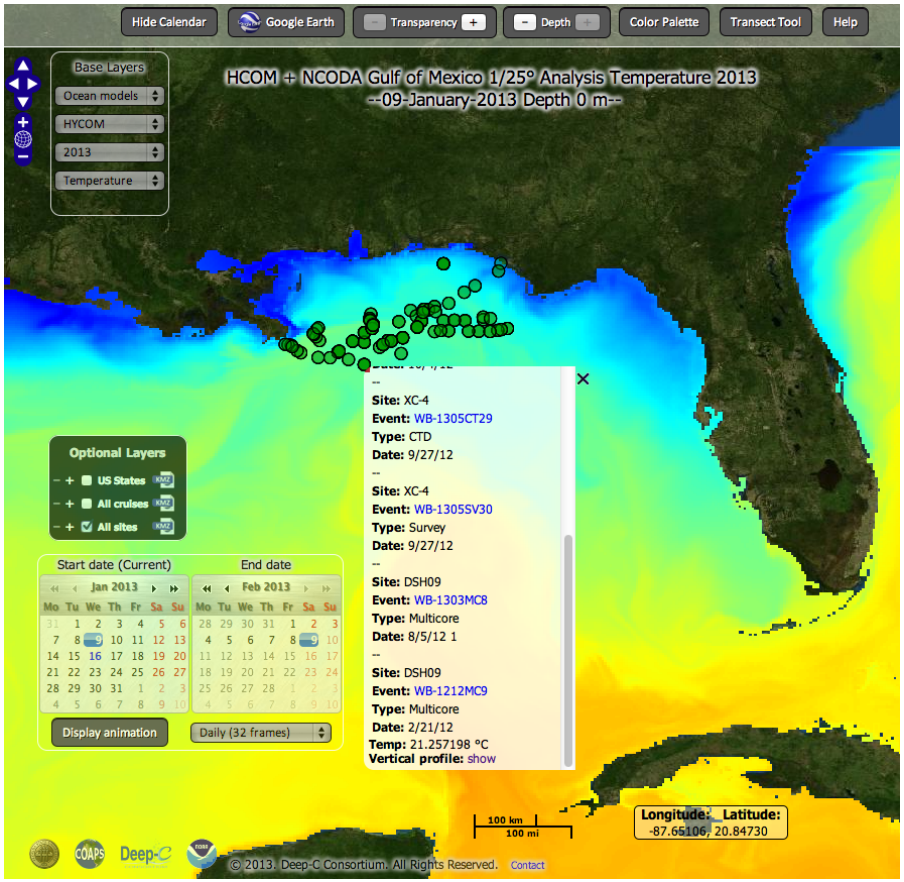
Simulated coastal inundation along the Texas and Louisiana coasts during Ike



- The return frequency of a tropical storm or hurricane landfall. A return frequency of “9” indicates that, on average, a landfall occurs once every 9 years.

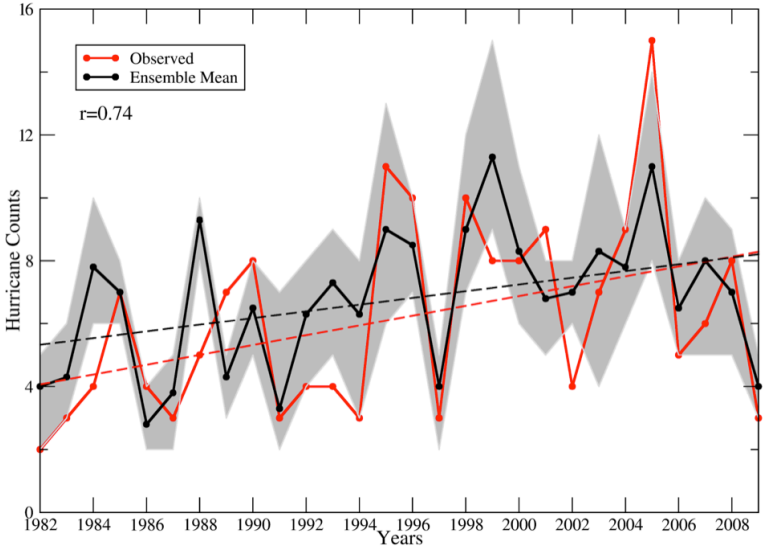
Gulf of Mexico Oil Spill

The 2010 Deepwater Horizon oil spill discharged approximately 5 million barrels of oil and gas from the ocean depth. COAPS is investigating the impact of the oil spill through the Deep-C Consortium and a grant from the Bureau of Ocean Energy Management.



A GIS tool developed at COAPS shows select base maps from ocean models; Deep-C observation sites (shown) or cruise lines; activities at sites; and dataset download links.

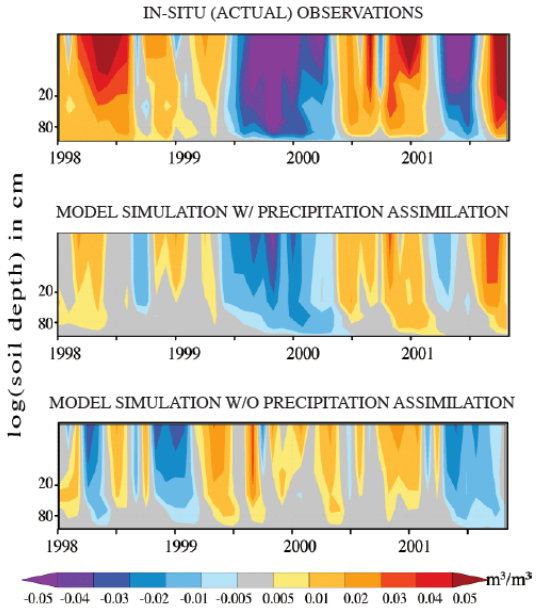
Seasonal Prediction

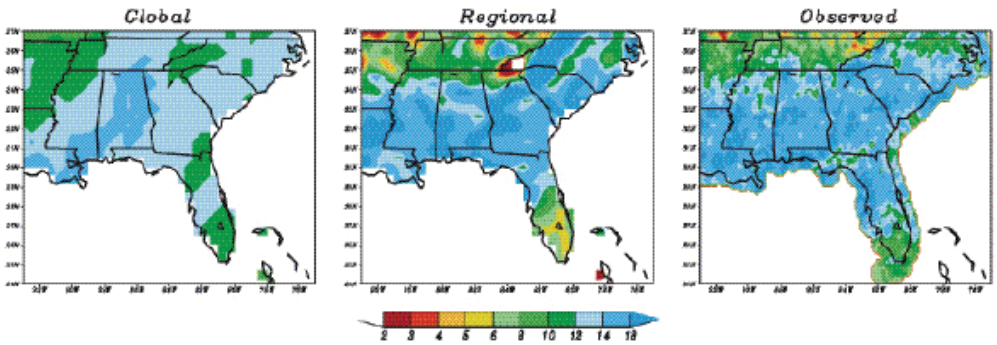


Simulated and observed numbers of tropical cyclones in the Atlantic from 1982 to 2009.

Scientists at COAPS use global and regional atmospheric climate models to make seasonal predictions about hurricane activity in the Atlantic. These models are also used to help farmers in the Southeast United States increase their crop yields.

Vertical profile of average soil moisture anomalies across Illinois.

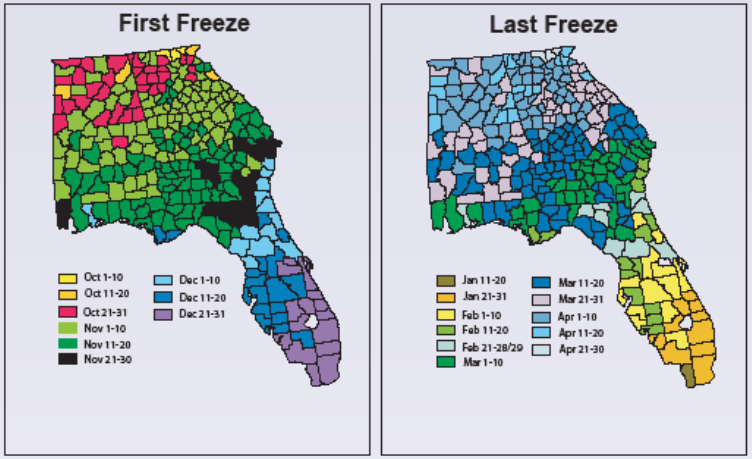




Global and regional model predictions of the number of rainfall events greater than 12 mm/day for a winter season. The regional model proved more accurate than the global model.

Southeast Climate

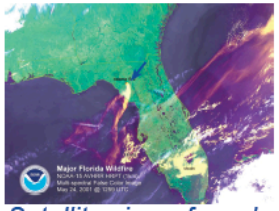
COAPS is a leader in the Southeast United States in providing climate services to agriculture, forestry, water resources, and other sectors. COAPS houses the Florida Climate Center, Office of the State Climatologist, and is also a partner in the Southeast Climate Consortium.



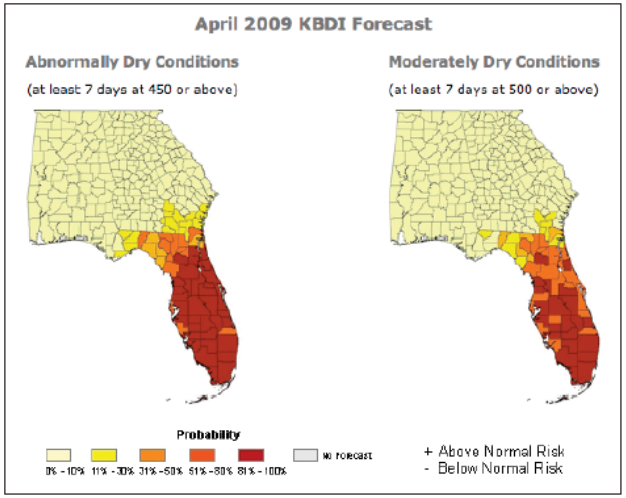
Freeze forecast from the Southeast Climate Consortium.

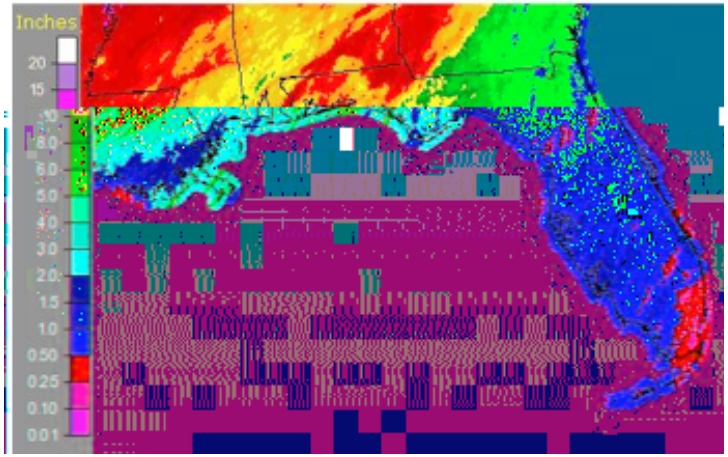
Probabilistic Wildfire Threat Forecasting at COAPS

Southern pineland forest fire



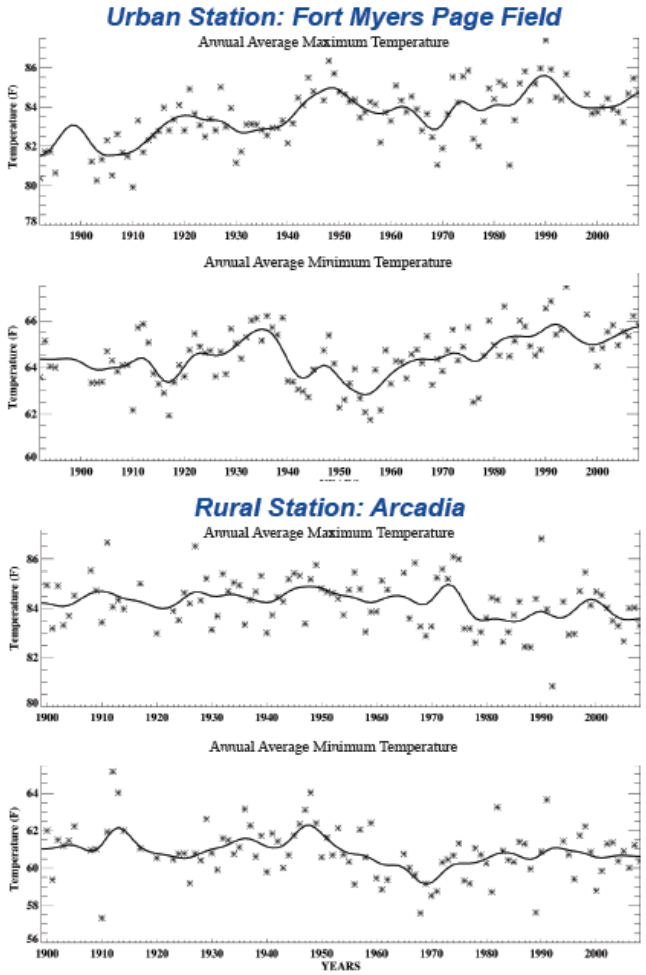
Satellite view of smoke plume from a 2001 wildfire
(courtesy of NOAA)



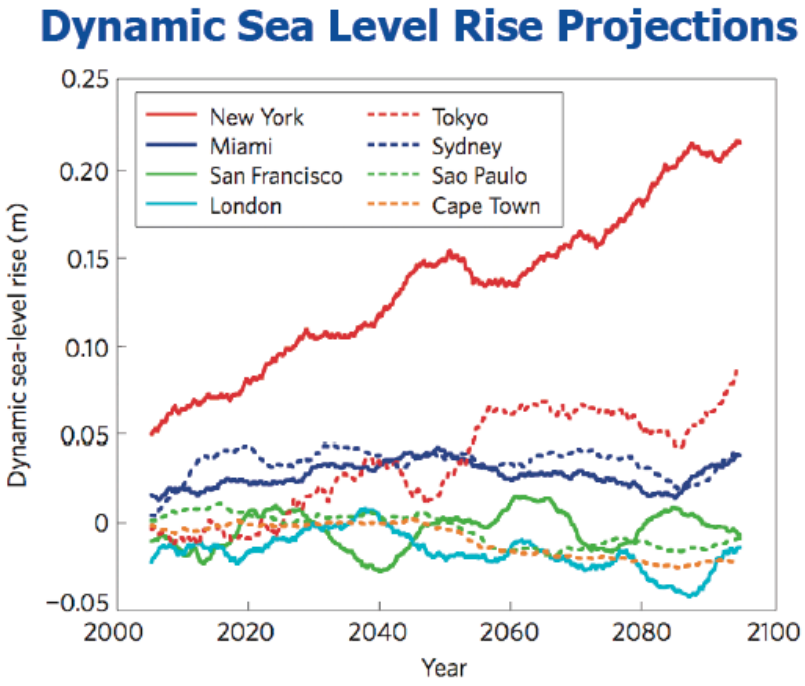


The Florida Climate Center produces monthly climate summaries which include rainfall totals.

Climate Change



Climate change can occur under both natural and anthropogenic influences. As part of the Florida Climate Institute, COAPS is developing state-of-the-art climate models, identifying regional climate variability, and locating biases and uncertainties that can lead to inaccuracies in climate predictions. We are also studying changes in global tropical cyclone activity in the mid to late 21st century resulting from anthropogenic and natural climate variability.

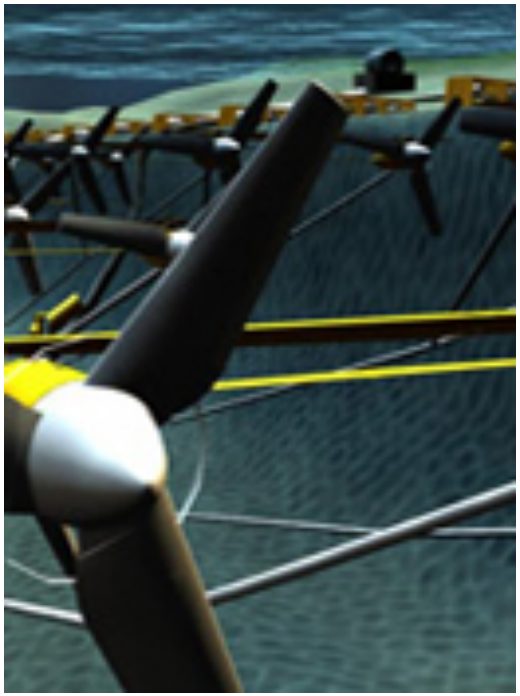


- Most rural weather stations in Alabama, Florida, and Georgia exhibit 1 to 3°F cooling over the last century, while stations influenced by the “urban heat island” effect show warming temperatures.

Alternative Energies

As energy demands and costs continue to increase, scientists at COAPS are examining various ocean-atmospheric power options for Florida. Preliminary studies indicate that both offshore winds and ocean currents may be viable sources of renewable energy for Floridians.

- Research indicates that the ocean power available in the Florida Current can range between 6 to 10 gigawatts, depending on ocean turbine efficiency, which is equivalent to about 6 to 10 nuclear power plants.



- Preliminary results indicate that winds over the northwestern Gulf of Mexico have the potential to generate several thousand megawatts of power for Floridians.

Outreach & Education

Through outreach and education, COAPS engages students, policy makers, and the general public in the process of scientific discovery and encourages a sense of stewardship for our natural environment.

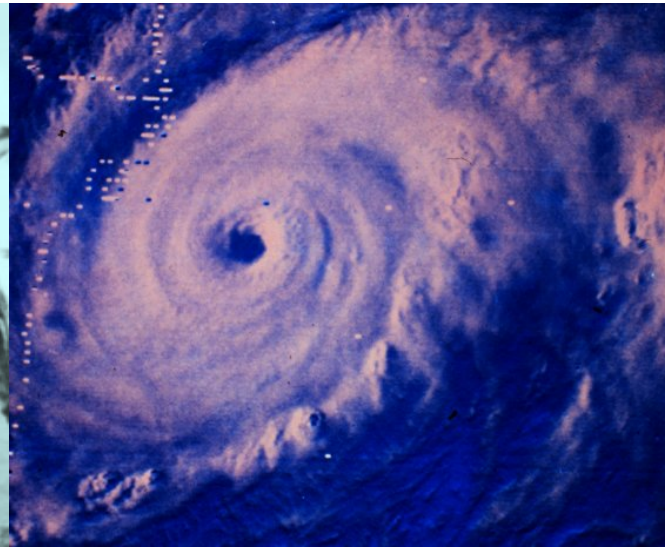
▲ ➤ Through classroom and summer camp presentations, the FSU Young Scholars Program, and teacher professional development projects, we reach over 1,000 K-12 students each year.

➤ We regularly setup booths at local festivals to showcase COAPS research and engage the public in hands-on activities and demonstrations.

▲ We provide briefings to state policy makers on topics such as offshore wind energy and offer trainings and other materials to encourage our scientists to develop their communications skills.

Long Term Goals





Maintain a
Leadership Role
in interdisciplinary ocean-atmospheric research

Educate
the next generation of earth system scientists

Increase our
Collaboration
with universities, government agencies, and members of the private sector