



Carolinas Integrated Sciences & Assessments

About CISA

The Carolinas Integrated Sciences & Assessments (CISA) program is 1 of 10 NOAA-funded Regional Integrated Sciences & Assessments teams. CISA works in North Carolina and South Carolina to integrate climate science into decision-making processes and improve society's ability to respond to climatic events and stresses.

CISA supports a coastal climate extension specialist to assist coastal communities and stakeholders in addressing the impacts of climate variability and change on major coastal issues.

CISA Connects Coastal Climate Science and Decision Making Through

- » Applied research to produce relevant climate information
- » Assessments of climate impacts and adaptation strategies
- » Processes to support and inform community planning
- » Fostering climate networks and climate communities of practice

Coastal Climate Partners

- » Charleston Resilience Network
- » East Carolina University
- » N.C. Sea Grant
- » S.C. Sea Grant Consortium
- » National Integrated Drought Information System (NIDIS)
- » NOAA Southeast and Caribbean Regional Team (SECART)

FOCUS AREA: Coastal Climate

What is Coastal Climate?

Climate is the long-term average weather conditions that are characteristic of a region, such as the Carolinas coast. Climatology is the study of climate and includes historical climate characteristics, natural variations in climate, and long-term climate change. Coastal climate also includes the ways the ocean interacts with the land and the air. This means that coastal climate studies consider both atmospheric and marine data, including maritime winds, salinity, currents, wave characteristics, and tides.

How Does Climate Affect the Carolinas Coast?

The Carolinas coast is vulnerable to hurricanes and strong coastal storms. On average, hurricanes strike the South Carolina coast every 8 to 9 years, and between 5 and 7 years for the North Carolina coast¹. Heavy rains and droughts also affect the Carolinas coasts. Most recently, the 2015 floods caused by a rare weather pattern brought record rainfalls to South Carolina and into southeastern North Carolina. Hurricane Matthew, in 2016, also brought extreme rainfall to southeastern North Carolina. Major droughts have occurred in the Carolinas, including multi-year events from 1998 to 2002, 2007-2008, and 2011-2012. These droughts contributed to increased salinity and saltwater intrusion in coastal waterways.

Long-term climate and weather events in the Carolinas have several impacts on the coast. These include:

- » Flooding
- » Erosion
- » Degraded water quality
- » Habitat disturbance
- » Degraded air quality



Source: NOAA

Many important sectors of our economy rely on coastal resources and are affected by climate and weather events:

- » Water resources (e.g. availability of freshwater during drought)
- » Utilities and infrastructure (e.g. increased energy demands during warmer periods, flooded roads during heavy rainfall events)
- » Fisheries (e.g. changes in ocean temperature and salinity can affect fish migration and reproduction)
- » Recreation and tourism (e.g. warm temperatures on the Carolinas coast are a draw for beachgoers, while storms and hurricanes can keep tourists away)

Climate Change and the Carolinas Coast

Sea level rise: Observations since the 1920s and 1930s indicate that the sea level in Wilmington, N.C., rose at an average rate of about 0.68 feet per century; in Charleston, S.C., the rate was about one foot per century.² Globally, climate scientists expect sea level rise to range from 8 inches to 6 feet in the next 100 years; sea level rise in the Carolinas may be more or less depending on regional factors such as wind patterns and vertical land movement.³

More frequent rainfall extremes: Rainfall is difficult to predict over long periods of time. Climate models cannot say precisely how much average rainfall the Carolinas will get in the coming decades; however, more frequent extremes of both drought and heavy rainfall are expected.⁴



Hurricane Hugo, Source: NOAA

Hurricane intensity: Scientists are uncertain about the frequency and tracks of hurricanes in the future. However, storms that do form will likely be stronger in terms of wind speed and rainfall amounts because warmer seas will provide more fuel for storms.⁵

Extreme heat: While the location of coastal lands next to the ocean moderates some of the more extreme temperature highs experienced in upstate N.C. and S.C., the coastal Carolinas still are subject to intense summer heat. Scientists project average summer temperatures to increase significantly, leading to more frequent heat waves.⁴

CISA Coastal Climate Projects

COMMUNITY PLANNING & ADAPTATION

City of Folly Beach, S.C. Sea Level Rise Planning

The City of Folly Beach is a small barrier island community that faces a variety of coastal hazards, including the threat of rising seas from the ocean and marsh sides of the island. With technical assistance from CISA and S.C. Sea Grant Consortium, the city is now actively planning for long-term impacts from sea level rise and chronic erosion.



Source: CISA

A Community-Wide Health Risk Assessment of Vulnerable Water Infrastructure in Coastal Cities

This project, funded by NOAA's Coastal and Climate Applications program, seeks to expand the capacity of decision makers, including public health officials, environmental agencies, emergency managers, and water/wastewater utility operators, around the issues of critical coastal water infrastructure and public health. Pilot communities include Morehead City, N.C., and Charleston, S.C.

South Atlantic Regional Research on Coastal Community Resilience

CISA is collaborating with researchers, Sea Grant staff, and community partners from Florida, Georgia, North Carolina, and South CISA is collaborating with researchers, Sea Grant staff, and community partners from Florida, Georgia, North Carolina, and South Carolina to help local governments better visualize, understand, and plan for local coastal hazard impacts. The team will use the FEMA HAZUS model coupled with improved digital elevation files to refine risk assessments. The team will use the Vulnerability, Consequences, and Adaptation Planning Scenarios (VCAPS) process to engage with the partner communities. They will also evaluate the effectiveness of VCAPS in supporting different stages of the resilience planning process.



Source: S.C. Sea Grant Consortium

Building Community Resilience to Water-Related Hazards in the Charleston, S.C. Region

This project, funded through NOAA's Regional Coastal Resilience Grant program, will result in a high-resolution flood model that incorporates rainfall and climate change projections with tidal flooding and sea level rise. This method will create a more realistic image of flooding causes and impacts at the neighborhood level. CISA and S.C. Sea Grant Consortium also are leading extensive neighborhood-level community education and engagement activities to help residents understand impacts and identify solutions.

FOSTERING NETWORKS FOR RESILIENCE

Building Regional Resilience Capacity in Charleston, SC

Established in 2015, the Charleston Resilience Network (CRN) is composed of public and private sector stakeholder organizations throughout the Charleston, S.C. metropolitan area that have a collective interest in community resilience, critical infrastructure, and socio-economic continuity to natural disasters and chronic coastal flooding and erosion. The CRN works to foster a unified strategy and provide a forum to share science-based information, educate stakeholders, and enhance long-term planning decisions that add to the region's resilience. Learn more at www.charlestonresilience.net.

The Southeast and Caribbean Climate Community of Practice

Initiated by NOAA's Southeast and Caribbean Regional Team (SECART) and regional Sea Grant programs, the Southeast and Caribbean Climate Community of Practice (CCoP) was created in 2010 in response to the growing need for climate extension professionals to bridge the gap between science and decision makers. Comprised of individuals from government, academic, non-profit, and private sectors, the CCoP provides a forum for sharing lessons learned and best practices related to climate communication and adaptation. CISA is providing leadership to maintain and enhance the CCoP, which provides education and networking opportunities to increase its members' knowledge and awareness of climate science and, ultimately, to increase adaptive capacity in the region.



Source: Shana Jones

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Other Ways to Connect

CISA publishes a quarterly newsletter, the Carolinas Climate Connection, and manages the Carolinas Climate Listserv in order to share up-to-date information about climate research, upcoming events, funding opportunities, or other relevant news.

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1 NOAA National Hurricane Center "Tropical Cyclone Climatology". www.nhc.noaa.gov/climo/. Accessed 21 April 2014.

2 <http://tidesandcurrents.noaa.gov/sltrends/sltrends.html>

3 Parris, A., P. Bromirski, V. Burkett, D. Cayan, M. Culver, J. Hall, R. Horton, K. Knuuti, R. Moss, J. Obeysekera, A. Sallenger, and J. Weiss. 2012. Global Sea Level Rise Scenarios for the US National Climate Assessment. NOAA Tech Memo OAR CPO-1. 37 pp.

4 Ingram, K., K. Dow, L. Carter, J. Anderson, eds. 2013. Climate of the Southeast United States: Variability, change, impacts, and vulnerability. Washington DC: Island Press.

5 Christensen, J.H., et al. 2013. Climate Phenomena and their Relevance for Future Regional Climate Change. In Climate Change 2013: The Physical Science Basis. Contribution of WG1 to the Fifth Assessment Report of the IPCC. Cambridge University Press, Cambridge, UK and New York, NY, USA.