



Department of Geography
& Atmospheric Science

ATMOSPHERIC SCIENCE DEGREE



2023-2024

*Photo: Jacob Asherman,
KU Atmospheric Science.*

WELCOME TO ATMOSPHERIC SCIENCE AT KU!



The atmospheric science program at the University of Kansas is the only one of its kind in the state, following national meteorological guidelines set by the American Meteorological Society (AMS) and the National Weather Service (NWS.) Today, more than ever, analyzing the environment and generating solutions that make a real difference in people's lives is essential. Our program has a unique interdisciplinary nature with pathway options, all of which provide students with the skills necessary for rewarding and enriching careers. Our faculty are passionate about teaching and research. Our students are engaged through research, internships, and the student-led KU Chapter of the American Meteorological Society.

Options

Our program provides a strong foundation with four specialized degree options. In addition to the General Meteorology option, we offer Air Pollution Meteorology, Hydrometeorology, and News Media Forecasting. Students from other disciplines such as environmental studies, biology, math, and psychology have added Atmospheric Science to enhance their education, skills, and career options.

Research & Facilities

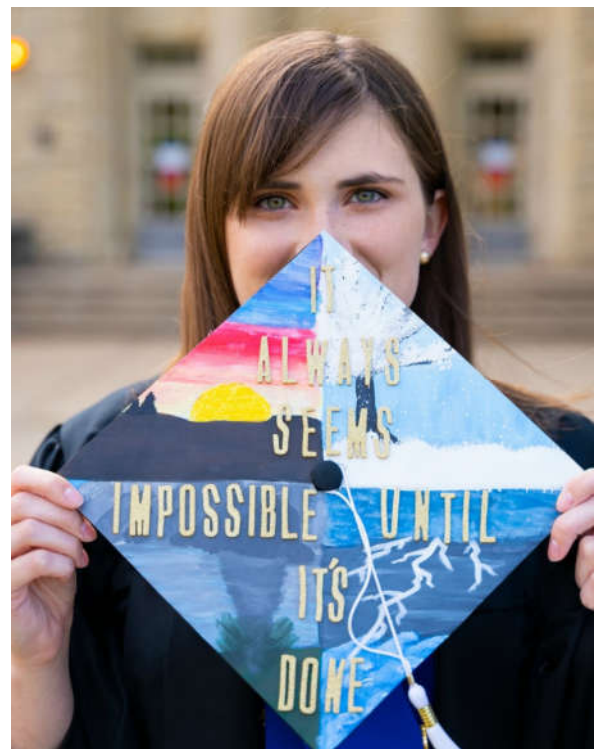
Students get hands-on experience, including forecasting for the university radio (KJHK) and television (KUJH), working with forecasters from the National Weather Service, and conducting research with professors in the department. The KU Center for Undergraduate Research helps support those interested in research, offers funding opportunities, and provides step-by-step workshops which provide students the skills necessary to explore, investigate, and excel. Our research facilities include three computer labs, an array of instrumentation at the KU Field Station, and a weather station on the roof of Lindley Hall. Computer labs include a Meteorology and Climate Hub (MACH) with state-of-the-art weather software used by the National Weather Service. There is also a computer lab and collaborative space solely dedicated to students doing research.

Careers

We work closely with students to connect them with internships and career opportunities. In addition to the university's KU Career Center, we work with our alumni and local businesses to provide opportunities for current students and graduates. Every fall semester is a Career Night where students meet and interact with people in a variety of atmospheric science careers in an informal setting. Many career paths are available to students with an atmospheric science degree.

We welcome you to visit and explore the Department of Geography and Atmospheric Science, meet with faculty, and experience our campus at the University of Kansas in Lawrence, Kansas!

Rock Chalk!



ABOUT



OVERVIEW

KU's atmospheric science program is designed to provide students with a solid base in meteorology with our core classes and a specialization through the degree options. Students develop the critical thinking, problem solving, reasoning, analytical, and communication skills that will equip them with the necessary versatility for a successful career as an atmospheric science professional.

Students benefit from direct access to experienced faculty and state-of-the-art weather forecasting techniques and observational equipment, which are all brought together in a small class setting. For hands-on learning.

Below are the four options that will prepare students for success in meteorology and atmospheric science careers or graduate studies.



A storm approaches Lindley Hall, home of the Geography and Atmospheric Science Department.

OPTIONS

GENERAL METEOROLOGY

Satisfies all the traditional professional meteorology requirements for employment with the National Weather Service, airlines, and other public/private agencies.

AIR POLLUTION METEOROLOGY

Meets the need for trained specialists in air quality and other environmental impacts.

HYDROMETEOROLOGY

Prepares you for a career as a meteorologist in one of the many water-related activities in private companies and governmental agencies.

NEWS MEDIA FORECASTING

Provides the training for a career as a broadcast meteorologist.



CORE KNOWLEDGE & SKILLS

CORE CLASSES FOR ALL OPTIONS

INTRODUCTORY METEOROLOGY

Learn the underlying processes that drive a range of weather phenomena

WEATHER FORECASTING

Apply dynamic and thermodynamic principles to weather analysis and forecasting

CLIMATE AND CLIMATE CHANGE

Understand global energy and water balances that are a part of our changing climate

MICROCLIMATOLOGY

Understand processes occurring at the earth-atmosphere interface and lower atmosphere

PHYSICAL METEOROLOGY

Thermodynamics and cloud microphysics

DYNAMIC METEOROLOGY

Fundamentals of atmospheric motion

ADVANCED DYNAMIC METEOROLOGY

Application of dynamic meteorology to diagnose various classes of motion including atmospheric waves

SYNOPTIC METEOROLOGY

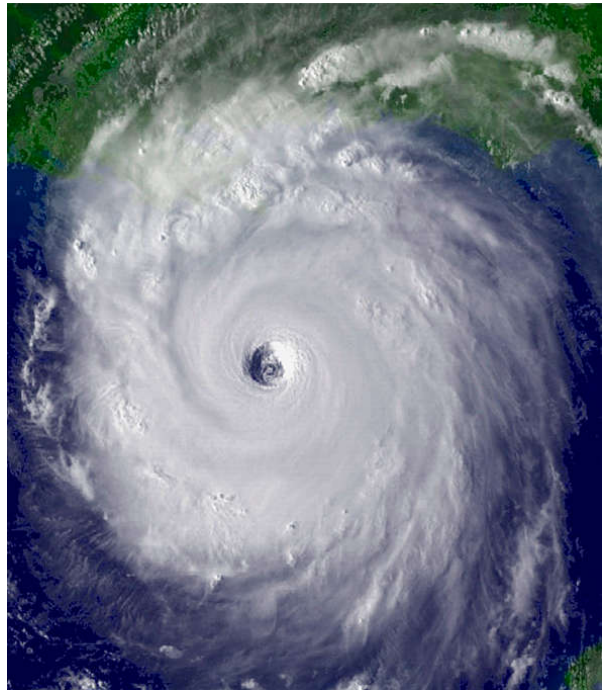
Structure and dynamics of mid-latitude cyclones and fronts

REMOTE SENSING

Radiative transfer and fundamentals of satellite retrieval techniques

SEMINAR FOR SENIORS

Current research topics in atmospheric science



Hurricane Katrina approaches Louisiana (Source: NOAA)

SKILLS ACQUIRED

Atmospheric science majors need to possess skills applicable to numerous work settings. While many graduates pursue careers with the National Weather Service or in broadcasting, many other career options are available with the acquired skillset.

Skill development includes technical skills such as processing and analyzing large data sets, data analytic skills, programming, geographic information science, communication skills, forecasting, and more, which are all obtained with an atmospheric science major.



GENERAL METEOROLOGY

This option is a popular route for many forecasting positions.

ADDITIONAL REQUIREMENTS

OPERATIONAL FORECASTING

Advanced forecasting techniques and forecasting verification

ADVANCED SYNOPTIC METEOROLOGY

Mesoscale processes and severe weather

AIR POLLUTION METEOROLOGY

Dispersion of pollution in the atmosphere

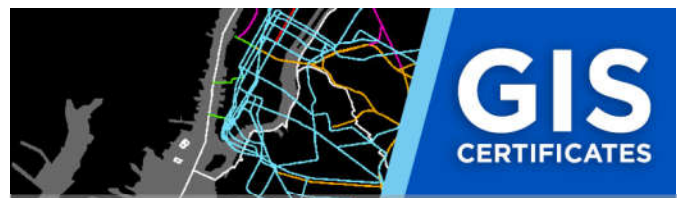
POSSIBLE CAREER PATHS

PUBLIC SECTOR

- National Weather Service
- Aviation Weather Center
- Storm Prediction Center
- National Hurricane Center

PRIVATE SECTOR

- Smaller consulting companies like Weather or Not, Inc. that provide customized forecasts for music and sporting venues, construction companies, and other clients.
- Large companies like AccuWeather and Weather Underground
- United Parcel Service (UPS)
- Wind energy companies
- Insurance industry
- Engineering firms



The Department of Geography and Atmospheric Science offers certificates in Geographic Information Science (GIS) that provide students with the knowledge and skills necessary to apply GIS concepts to a variety of applications used in atmospheric science careers and help students get an edge when applying for jobs.



AIR POLLUTION METEOROLOGY

This option emphasizes the environmental aspects of meteorology.

ADDITIONAL REQUIREMENTS

AIR POLLUTION METEOROLOGY

Dispersion of pollution in the atmosphere

FOUNDATIONS OF CHEMISTRY

Basic principles of atomic structure and chemical reactions

INTRODUCTION TO ENVIRONMENTAL ENGINEERING AND SCIENCE

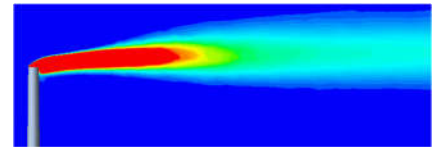
Scientific principles applied to the protection of atmospheric, aquatic, and terrestrial environments



POSSIBLE CAREER PATHS

PUBLIC SECTOR

- State offices like Department of Ecology Air Quality Program
- Regional offices like the Puget Sound Clean Air Agency
- Federal offices like the Environmental Protection Agency (EPA)



PRIVATE SECTOR

- Environmental engineering firms such as Allee King Rosen & Fleming, Inc.
- Non-governmental Organizations (NGOs) such as Clean Air Task Force and the Climate + Energy Project
- Chemical and industrial companies
- Air quality technician



Left: Idling diesel engines at the maintenance shop in the Argentine Rail Yard in Kansas City, KS.



HYDROMETEOROLOGY

This option focuses on the interface between meteorology and hydrology, important for flash floods, droughts, agriculture, and water supply.

ADDITIONAL REQUIREMENTS

OPERATIONAL FORECASTING

Advanced forecasting techniques and forecasting verification

STATICS AND DYNAMICS

Understanding forces and motion over a range of engineering applications

FLUID MECHANICS

Fluid flow and hydrostatics focusing on pipe and open channel flow

HYDROLOGY

Rainfall-runoff relationships and hydrologic routing

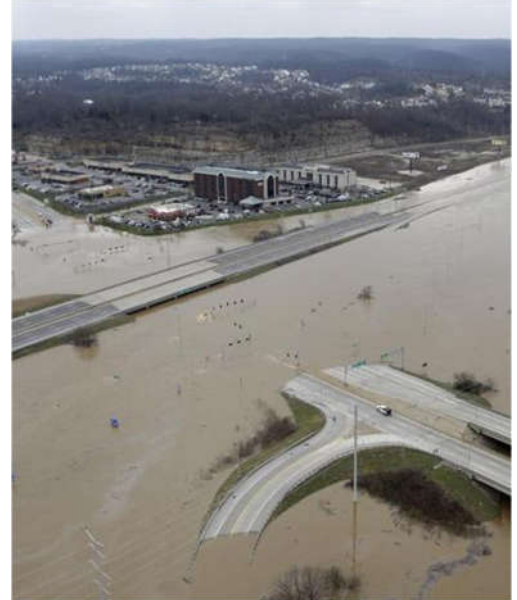
POSSIBLE CAREER PATHS

PUBLIC SECTOR

- 13 River Forecast Centers
- United States Geological Survey
- Army Corps of Engineers

PRIVATE SECTOR

- Meteorological engineering companies such as MetStat, Inc.

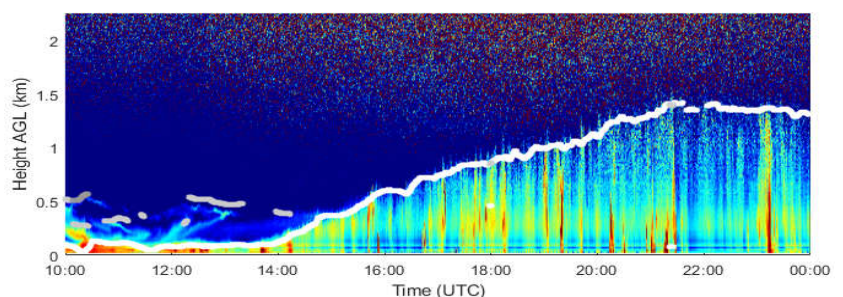


*Pottawatomie Creek at Lane, KS after heavy rainfall.
Photo by Madison May, USGS and KU Atmo. Sci.
Alumna.*



Observing the atmosphere

Understanding the atmosphere requires obtaining state-of-the-art measurements. Students gain hands-on experience with collecting, processing, and analyzing data from KU observing systems.



NEWS MEDIA FORECASTING

This option is a popular route for becoming a broadcast meteorologist.

ADDITIONAL REQUIREMENTS

OPERATIONAL FORECASTING

Advanced forecasting techniques and forecasting verification

ADVANCED SYNOPTIC METEOROLOGY

Mesoscale processes and severe weather

INFORMATION EXPLORATION

Learn not only how to gather information but how to evaluate, analyze, and synthesize it.

MEDIA WRITING FOR AUDIENCES

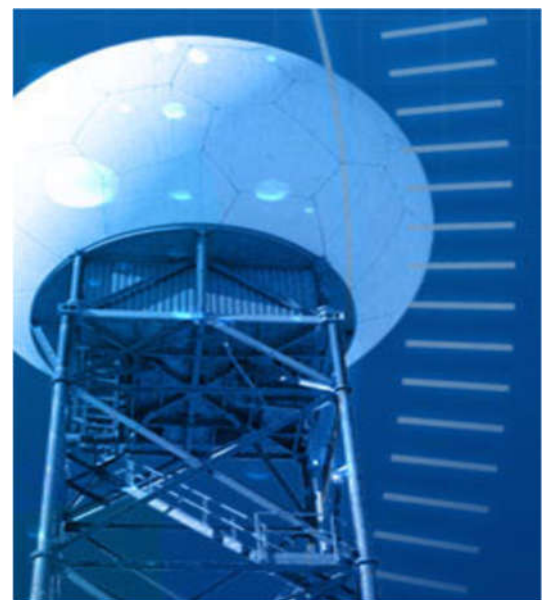
Journalistic writing to create coherent and engaging stories

MULTIMEDIA REPORTING

Gathering, writing, and presentation of news for a variety of media outlets

POSSIBLE CAREER PATHS

- Local television stations
- National companies such as Accuweather and The Weather Channel



School of Journalism

Students who choose the News Media Forecasting option enjoy close ties with the School of Journalism, which includes access to the latest media software and technology. Students who participate in KUJH-TV acquire broadcast experience in all areas of production, which is advised and supervised by experienced faculty members.

FINANCIAL AID

SCHOLARSHIPS

THROUGH KU

Several programs can help students fund their KU education. General financial aid and scholarship information is found at:

<https://financialaid.ku.edu/>



THROUGH OUR DEPARTMENT

The **Bohnstengel Fund** was established by KU student Walter Bohnstengel to promote weather-related research. In addition to being used to cover a variety of expenses including equipment and travel for field work and conferences, it also used to fund student scholarships.

The **Joe Eagleman Scholarship** was established by Donald J. Perkey and M. Nadine Perkey to support undergraduate students with financial need majoring in Atmospheric Science at KU. The endowment was established to assist the University of Kansas in one of its most important stated missions, increasing diversity. Dr. Eagleman established and grew the Atmospheric Science program (formerly named Meteorology) at the University of Kansas during his 39 years at KU, until his retirement in 2001.

OUTSIDE KU

KU students have also received national scholarships such as the National Oceanic and Atmospheric Association *Ernest F. Hollings Scholarship*, the *Naval Weather Service Scholarship* awarded by the American Meteorological Society, *National Weather Association Scholarships*, and many others!



ACADEMIC PLANNING

ADVISING

Any of the faculty can assist in student advising for a broad range of topics including careers, internships, scholarships, transfer credits, and any other concerns that may come up.

For class scheduling, Jaclyn Flinspach is an advising specialist that can help atmospheric science majors navigate both the department and university requirements for graduation.



JACLYN FLINSPACH

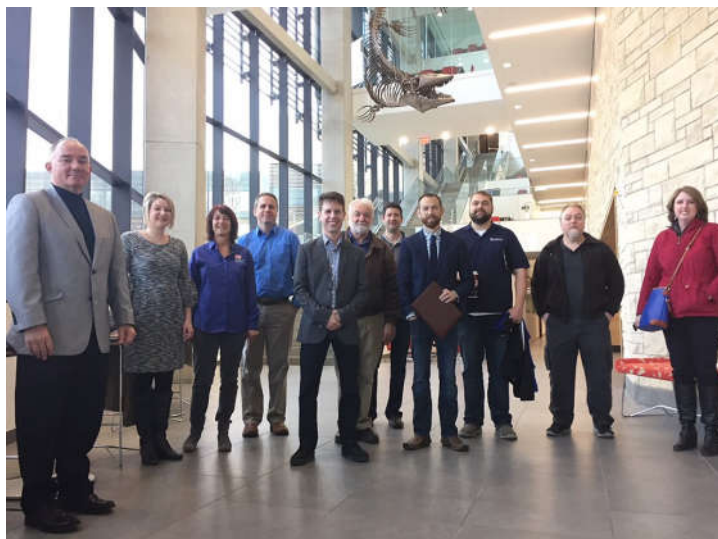
*Undergraduate
Academic Advisor*

jaclynflinspach@ku.edu

Sample 4-year Plan

General Meteorology Option

Year 1				Year 2			
Cr.	Fall	Cr.	Spring	Cr.	Fall	Cr.	Spring
5	ATMO 105	5	PHSX 211&216	5	PHSX 212&236	2	MATH 290
4	MATH 125	4	MATH 126	4	MATH 127	3	MATH 220
3	ENGL 101	5	CHEM 130	3	ATMO 321	3	EECS 138
3	EVRN 148			3	ATMO 505	3	ENGL 102
						3	Elective
Year 3				Year 4			
Cr.	Fall	Cr.	Spring	Cr.	Fall	Cr.	Spring
3	ATMO 640	3	ATMO 660	3	ATMO 650	3	ATMO 642
3	ATMO 680	3	ATMO 630	3	ENGL 362	2	ATMO 697
3	MATH 581	3	ATMO 521	4	GEOG 358	3	ATMO 525
3	MATH 526	2	ATMO 605	3	KU Goal 4.2	3	KU Goal 5
		3	KU Goal 4.1			3	Elective



Left: Career Day for the Department of Geography and Atmospheric Science that featured representatives from a wide-range of public sector and private sector employers.



OUTSIDE OF THE CLASSROOM

INTERNSHIPS

There are many local opportunities in eastern Kansas for internships and we strongly encourage that everyone does take advantage of these positions!

- EPA
- USGS
- Two nearby NWS forecast offices:
 - Topeka, KS and Pleasant Hill, MO
- Several TV stations in the Kansas City metro area
- Local companies such as Weather or Not, Inc.



Students preparing for the Douglas County Severe Weather Symposium

AMS STUDENT CHAPTER

The KU American Meteorological Society (AMS) chapter is open to all KU students and sponsors events including **Meet the Meteorologist Panel**, helps organize the spring **Severe Weather Symposium** sponsored by Douglas County Emergency Management, and hosts other social events throughout the year.



Left: The KU Student Chapter of the American Meteorological Society shows off the new t-shirt design. Right, Geography & Atmospheric Science Alumni Board member Nathan Wendt shows off his shirt at work.

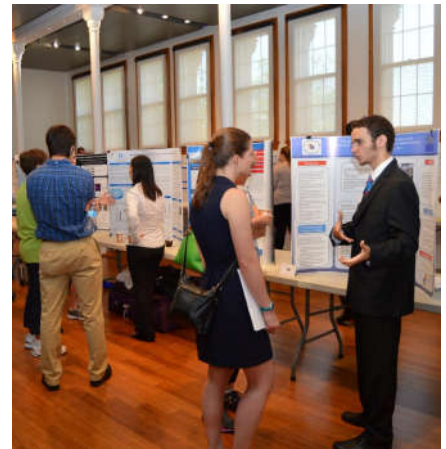


RESOURCES

COMPUTER LABS

Students have 24-hour access to departmental computing facilities. Lindley 405 is home to the Meteorology and Climate Hub (MACH) with RedHat Linux. Computers in the MACH lab run meteorological software packages such as Integrated Data Viewer and AWIPS-II.

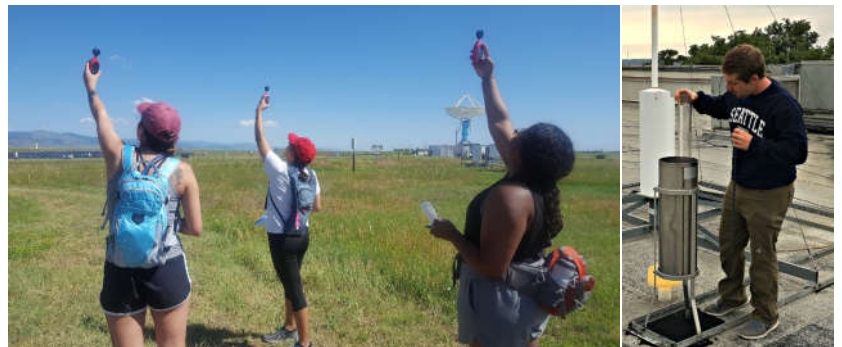
Students have access to other university-sponsored labs around campus and cooperative arrangements with other academic departments including Environmental Studies, the Kansas Applied Remote Sensing program of the Kansas Geological Survey, and the Kansas Geological Survey.



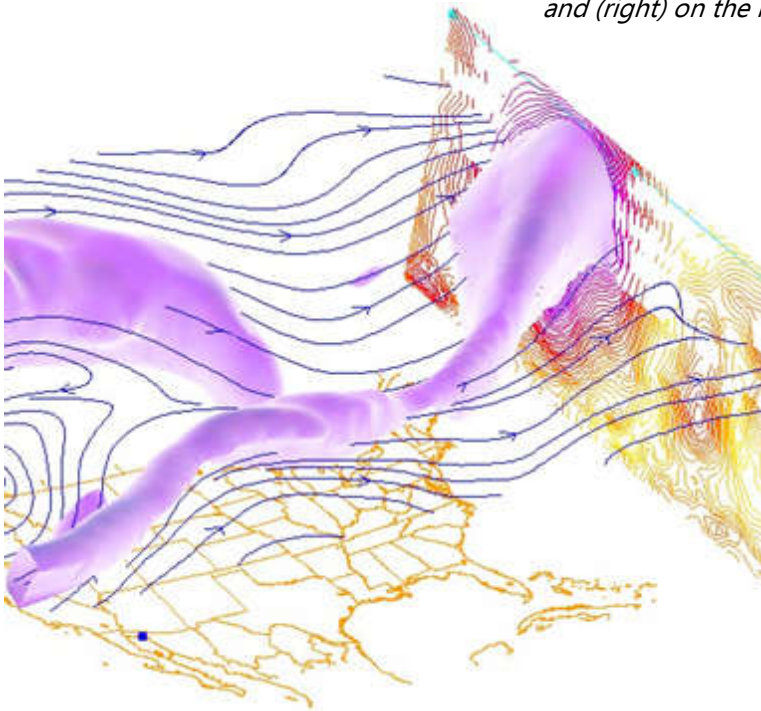
Students at the annual undergraduate research symposium.

FIELD INSTRUMENTS

Students also have opportunities for field work in collaboration with faculty. The department maintains several AmeriFlux eddy covariance stations, a ceilometer, and has long standing ties with the Kansas Field Station and the Konza Prairie Long Term Ecological Research Station.



Students measuring atmospheric conditions (left) during an internship and (right) on the roof of Lindley Hall.



CAMPUS RESOURCES

Faculty members are closely affiliated with a number of great campus resources including high performance computing on the KU Community Cluster. The Office of Undergraduate Research can help students navigate their first research projects, and help connect students with additional funding resources.

WEATHER STATION

We have an active weather station at Lindley Hall, and several students each semester are able to forecast and report to the university's radio and television stations.

STUDENTS & ALUMNI HIGHLIGHTS

STUDENT PROJECTS/RESEARCH

UNDERGRADUATE RESEARCH AWARD WINNERS

Two students in 2023 were awarded \$1,000 each by KU Undergraduate Research for their projects “Assessing cooling rates in urban areas using low-cost sensors” and “Analyzing the Spatial variability of Agricultural Drought Events in Kansas.”

WORLD’S FASTEST WEATHERMAN

Atmospheric science major Carson Vickroy, who is now a broadcast meteorologist for East Texas, was featured in a video profile by the university for World Meteorology Day. Vickroy, a cross-country runner, has created a personal brand as the “World’s Fastest Weatherman.” The video can be viewed at <https://youtu.be/mybN2nQ6fAw>

UNDERGRADUATE PRESENTATIONS

Each semester, seniors in the Special Seminar class, present their research. Spring semester 2023 presentations included:

- Public Interpretation of Storm Prediction Center Convective Outlooks
- Fire Impacts on the Environmental and Ecological Factors of the Amazon Rainforest
- Analysis of Large Tornado Outbreaks in the United States
- How Climate Change is Affecting Seasonal Snowpack and the Regions that Rely on them

ALUMNI

Our alumni actively communicate with the department and students, often providing internship and career opportunities as well as insightful advice.

They also actively communicate with each other, including a recent interview between two KU alumni: Chief Meteorologist and environmental reporter Cassie Wilson and hurricane-hunter Capt. Garrett Black.



ATMOSPHERIC SCIENCE FACULTY



NATHANIEL A. BRUNSELL (Professor):
Land-atmosphere interactions, remote sensing, micrometeorology. Research on the spatial and temporal variability of water, carbon, and energy cycling.



QINJIAN JIN (Assistant Teaching Professor):
Air quality, aerosol-cloud-monsoon interaction, cloud radiative effects of international shipping emissions, long-term variations of global monsoon system, land use and land cover change and their climatic impacts.



DAVID B. MECHEM (Professor):
Physical meteorology, cloud and mesoscale dynamics. Research on cloud microphysics and dynamics, mesoscale processes, numerical modeling, and boundary layer clouds.



BING PU (Assistant Professor):
Regional climate change, climate modeling, and climate dynamics. Research on drought development, variations of dust aerosol emission, dust-climate interactions, and vegetation-climate feedbacks.



DAVID A. RAHN (Associate Professor):
Boundary layer, mesoscale and synoptic meteorology. Research on the urban heat island, low-level jets, coastally meteorology, and the marine atmospheric boundary layer.



JUSTIN STACHNIK (Assistant Professor):
Tropical meteorology, climate variability and change, cloud physics and dynamics, mesoscale precipitating systems, radar and satellite meteorology, multi-scale interactions.



RESEARCH HIGHLIGHTS

Lots of exciting research is happening at KU!

- Land-atmosphere interaction at the Kansas Field Station Flux tower
- Aircraft measurements of the lower atmosphere over the oceans
- Numerical weather simulations using KU's High Performance Computing Center
- Understanding the microphysics and dynamics, and mesoscale organization of cloud systems
- Drivers and consequences of tropical meteorology
- Urban meteorology including the urban heat island effect
- Regional climate change
- Dust-climate variability
- Variations in the global monsoon system
- ...and much more!



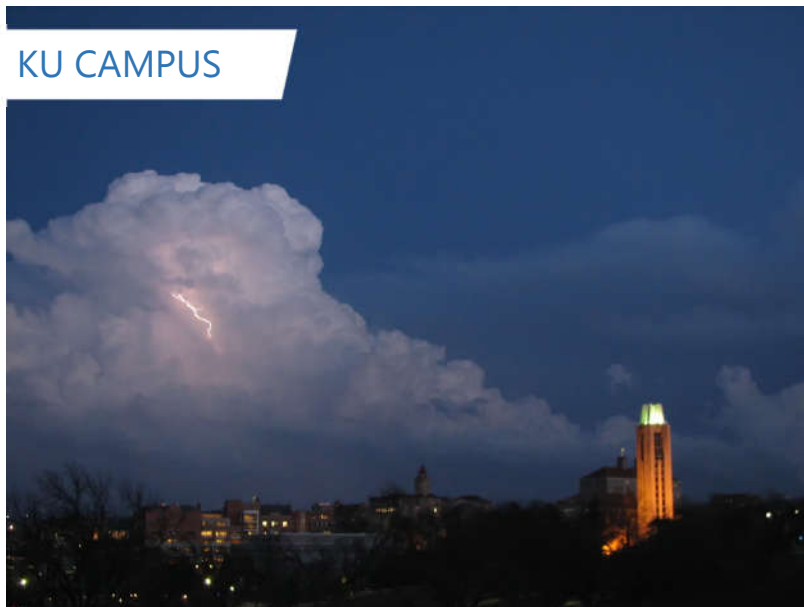
Atmospheric science student measuring the amount of water vapor released to the atmosphere through leaves.



ATMOSPHERIC SCIENCE CAREERS

- Air pollution Scientist
- Aviation Forecaster
- Broadcast Meteorologist
- Forensic Meteorology
- Hydrologist
- Operational Meteorologist
- Scientific Researcher
- Forecaster (Public Sector)
 - National Weather Service
 - Aviation Weather Center
 - Storm Prediction Center
 - National Hurricane Center
- Forecaster (Private Sector)
 - AccuWeather
 - Insurance Companies
 - Consulting Meteorologist
 - UPS/FedEx
 - Airlines
- ...and many more!!

KU CAMPUS



More information is available at: geog.ku.edu

CONTACT

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