National Science Foundation-GEOPATHS: Pathways to Atmospheric Sciences

Through Immersion in Geosciences Research

Choosing a Career in Atmospheric Science

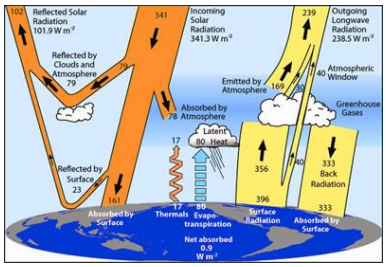
Atmospheric science is the study of the physics and chemistry of clouds, gases, and aerosols (airborne particles) that surround the planetary bodies of the solar system. Atmospheric Sciences often involve multidisciplinary teams usually include people in other related careers such as aerospace engineers, electronics engineers, computer and communications technicians, data systems analysts, pilots, astronomers, physicists, geologists, oceanographers, and biologists.

Research in atmospheric science covered under this program is:

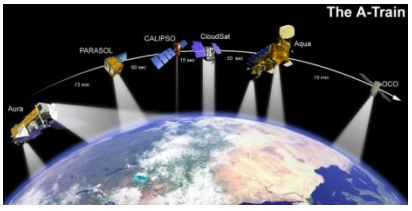
- **Climatology** — the study of long-term weather and temperature trends.
- **Dynamic meteorology** — the study of the motions of the atmosphere.
- **Cloud physics** — the formation and evolution of clouds and precipitation.
- **Atmospheric chemistry** — the chemical composition of the atmosphere.
- **Atmospheric physics** — the study of processes such as heating and cooling of the atmosphere.
- **Hydrology**— the branch of science concerned with the properties of the earth's water, especially its movement in relation to land.

Tornadoes- Severe weather

Hurricanes



Radiation



Remote sensing

NCA&T students at NCAR

Flooding

Types of Jobs

Training in Atmospheric Sciences provides opportunities to apply your training in STEM for interdisciplinary applications on problems of societal relevance: Air Quality, Climate Change, Severe Weather and Water resources Management.

http://www.bls.gov/ooh/life-physical-and-social-science/atmospheric-scientists-including-meteorologists.htm

The jobs include:

1. **Instrumentation and data acquisition** — the design and operation of instrument systems that measure the Earth's atmosphere from space, from within the atmosphere, and from the ground. This area requires a background in electronics, optics, computer science, or radiative transfer.
2. **Data analysis and modeling** — the examination of the data produced by the experiments and the development of theoretical models to interpret the data. The result is an improvement of our understanding of atmospheric motions and chemistry, climate change, and weather forecasting. This area requires experience in computer science, mathematics, chemistry, physics, meteorology, radiative transfer, or fluid dynamics.
3. **Laboratory studies** — the examination of the chemical and physical processes that occur in the atmosphere, including cloud microphysics, photochemical reactions, and absorption and emission of radiation by atmospheric gases and particles. This area requires experience in quantitative laboratory techniques, chemistry, or spectroscopy.

Design of the GeoPath Program:

(1) Promoting atmospheric sciences as a career option for African Americans for the recruitment of qualified students,

(2) Cohort building activities and effective mentoring based on best practices,

(3) Undergraduate year round research opportunity at NCAT in atmospheric chemistry (aerosols) and weather, climate, and hydrologic modeling.

These are complemented with field trips to local National Weather Service (NWS) stations, the Appalachian Atmospheric Interdisciplinary Research facility (AppalAIR), NOAA's National Centers for Environmental Information (NCEI-Ashville), Pisgah Astronomical Research Institute (PARI), and short but intensive research trip to Colorado State University and National Center for Atmospheric Research (NCAR) to develop career relevant competencies,

Eligibility:

- Be a US citizen or permanent resident.
- Be enrolled in a degree-granting program at a United States college or University.
- Have completed at least 3-4 semesters of college education with a cummulative GPA of at least 2.75
- Students who have had course in Calculus, Physics, Chemistry and Computer programing will get priority.
- Secodary Science Education Major with interest in teaching Geosciences in High school.
- Seniors at STEM Early College.
- Community College Students who graduated and ready to transfer to a 4-year College.

Benfits:

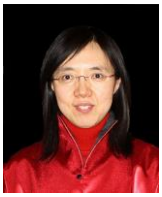
- Stipends up to $3000/semester
- Paid travel to Colorado State University and Boulder- National Center for Atmospheric Research and local sites
- One on one mentoring by distinguished NCA&T and Colorado State University Faculty
- Exposure to Interdisciplinary research and education and research in socially relevant issues.

Mentors and faculty Involved:

Bililign (PI; Professor, Physics) has been at NCAT since 1993 and has served as the Chair of the Physics Department and was responsible for the development of several geophysics courses in the Department of Physics and international experiences in geosciences for over two dozen students. As the Director of the NOAA ISET Center, he led the effort to establish the Atmospheric Science Programs and the hiring of the faculty. He has a proven record of recruiting and mentoring a number of underrepresented students to STEM areas, which gave him the recognition as a recipient of the 2010 Presidential award for STEM mentoring.

Lin (Professor, Physics/Energy & Environmental Systems (EES)) is the Senior Scientist of the NOAA ISET Center and has been a research advisor to a significant number of the undergraduates in the Atmospheric Sciences and Meteorology (ASME) program. He has provided high quality research mentoring to all the students and collaborated with NOAA scientists at NOAA-ESRL and NOAA-NCDC to provide additional experiences for the students. During the academic year, the ASME REU students are gaining research experience through working with graduate students in Dr. Lin's Mesoscale Dynamics and Modeling Lab.

Mekonnen (Assistant Professor, EES) has experience mentoring undergraduate students while he was working at The City College of New York (2009-2011). He has been involved in mentoring REU students since he joined NCAT. Dr. Mekonnen's research areas include the interaction between tropical waves and convection, regional monsoons, climate variability and climate change. He specializes in tropical wave activity and its relationship with convection over tropical Africa and the Atlantic.



Zhang (Associate Professor, Physics/EES) has been an academic mentor and research advisor to a number of the undergraduates in the ASME program. The students supervised by Dr. Zhang are gaining research experience through working with her and the graduate students in her group. Dr. Zhang has encouraged and advised several undergraduates to successfully apply for educational scholarships and REU opportunities.

Jha (Assistant Professor, Civil Engineering) has made internationally recognized contributions in the Soil and Water Engineering field via watershed modeling and other analysis techniques. He has extended the boundaries of our knowledge and understanding of the impacts of land use and climate change on hydrology, water availability, water quality, and crop production. His active research group includes several graduate and undergraduate students.

Schimmel (Chair, EES) has a long history of mentoring over 60 chemical engineering undergraduates. His previous undergraduate student mentoring included being a co-PI on the NASA PAIR project "Integration of NASA Research into Undergraduate Education in Math, Science, Engineering, and Technology". During this project he directed 14 undergraduate students in preparing multimedia modules on NASA research for use in undergraduate courses. Since 2006 he has been teaching the Introduction to Research Ethics course in the EES curriculum.

Denning **(**Professor, Atmospheric Sciences**,** CSU Co-PI) has worked with **Burt (**Research Associate, Atmospheric Sciences CSU**)** for eight years to provide an extraordinary REU as part of the new Earth System Modeling and Education Institute ESMEI (established as CMMAP through NSF STC). ESMEI has recruited diverse undergraduate students from institutions around the U.S. and paired them with faculty mentors as well as graduate student and peer mentors. ESMEI will provide training for the mentors and coordinate residential logistics as well as a range of professional development activities. They have hosted 89 undergraduate interns in the past eight years (61% women and 32% from underrepresented groups). Half of CMMAP's past interns are now graduate students, and a

quarter of them are doing graduate work in Atmospheric Science at CSU. The mentor pool for the undergraduate visitors from NCAT includes Professors **Denning, Kreidenweis, Pierce, Randall, and Schumacher** (See attached letters of support). These five faculty mentors have been especially successful in summer REU programs in the past and have each mentored several CMMAP interns.

Applications will be accepted in every spring (September for freshman) of 2016-18

For more information, contact:

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