STEM Teacher Recruitment Notice & Project Descriptions
Climate Change Research Initiative (CCRI)
NASA Goddard Institute for Space Studies

NASA Climate Change Research Initiative: STEM Teacher Recruitment Notice & Project Descriptions

Program Description: The NASA Climate Change Research Initiative – CCRI is a year long STEM engagement opportunity for STEM educators to work directly with NASA scientists, lead research teams and develop STEM curriculum for their current classes. Educators participating in this opportunity will become associate researchers at the NASA Goddard Institute for Space Studies (GISS) and STEM education experts who will integrate NASA education resources and content into their classroom while improving STEM education within their community. During the fall and spring term of CCRI the research team will consist of NASA Principal Investigators who will lead graduate student research assistants and high school STEM educators to become immersed in a NASA science research area of study related to climate change. During the spring semester the graduate student research assistant and high school STEM educator will continue to perform NASA research. Additionally, the high school STEM educator will develop an Applied Research STEM Curriculum Portfolio, which will integrate components of their research into a comprehensive unit plan that utilizes NASA education resources while aligning instruction of NASA Science and STEM curriculum to the Common Core and Next Generation Science Standards. The teacher will then implement the STEM curriculum into their classrooms and also provide community outreach STEM engagement events related to their NASA research study. **The fall and spring term will not conflict with the educators' primary schedule, roles or responsibilities at their school site.**

During the summer session the primary research team will add an undergraduate intern and high school intern to the CCRI research team where the STEM educator will lead and work collaboratively on a full time basis to complete the research project, create a power point presentation and a scientific poster that will be presented at the NASA Goddard Institute for Space Studies and other regional symposiums. The final symposium may have participants from other government agencies, such as the National Science Foundation (NSF), National Oceanic and Atmospheric Administration (NOAA), the United States Department of Education (USDE) and the United States Department of Defense (DoD) and many others.

Program Dates:

Fall: 10/7/19 -12/13/19: (5 hours per week for 10 weeks)
Spring: 02/03/20 – 04/10/20: (5 hours per week for 10 weeks)
Summer: 07/06/20 - 08/14/20: (40 hours per week for 6 weeks)

STEM Teacher Stipend: $7,650.00

Requirements: Teachers applying for this position must be full time, in service credentialed teachers with a subject matter competency related to the research project.

To apply for the CCRI STEM Educator position, please fax a cover letter, resume, transcripts and letters of recommendation from a current supervisor (Principal, Assistant Principal, Department Chair, etc) to:

Matthew Pearce
NASA Goddard Institute for Space Studies
2880 Broadway | New York, NY 10025
Fax: 212-678-5552

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The cover letter should include the projects being applied to ranked in order of preference and a description of how the project being applied to aligns with the teachers current teaching position.

Applications are considered upon receipt. For questions regarding this opportunity, please contact Matthew Pearce at matthew.d.pearce@nasa.gov

Characterizing the Urban Land Surface Temperature via an Innovative, Multi-Platformed Suite of Satellite and Ground-Based Remote Sensing Technologies

Mentors: Dr. Reggie Blake; Dr. Hamid Nourizi

Duty Location: NASA Goddard Institute for Space Studies; CUNY-City College of Technology;

Project Description: In light of climate change, urban micro-climates, the urban heat island effect and other urban geophysical phenomena and processes, there is a new urgency to better study, understand, and characterize urban environments. Revolutionary and innovative ideas are being considered to transform the study of the urban landscape. Fundamental changes are taking place in geophysics and in engineering to aid in the adaptation and mitigation of the environmental challenges to which cities must respond.

For this project, students will perform a local, intensive, and comprehensive surface energy balance data collection and processing initiative that will help to characterize the urban heat island, the heat index, and more particularly the land surface temperature over various local community built and natural environments. The project aims to produce high temporal and spatial resolution land surface temperatures for the local community and for New York City using the combination of satellite remote sensing observations and ground-based measurements. Students will obtain remote sensing data from multiple polar orbiting and geostationary satellites. Additionally, students will use infrared cameras and flux tower instruments to understand how urban surfaces react to solar radiation and its consequent heat. Students will be able to monitor the incoming and outgoing radiation and heat energy components using the cameras. The differences between traditional rooftop materials and new green or white roofs will be explored. Moreover, hand held temperature measuring devices, Unmanned Aerial Systems (UAS), and observations from satellite infrared observations will be collected. Using statistical approaches and data processing, the gaps in temporal and spatial coverage appropriate for the development of a heat index (effect of air temperature + humidity) will be filled. The volume of data used in this project is expected to in the range on 5TB. The added-value of this initiative is that cross-pollination between students and the local community and the transfer of knowledge between the two groups will be created and sustained long after the project ends.

Project Activities Include:

- Monitoring thermal characteristics of urban surfaces such as concrete, asphalt, rooftop, and vegetated surfaces at different seasons and times of the day by collecting data
- Coordinating with community partners to receive skin temperature measurements from various surfaces in the local community.
- Obtaining and analyzing satellite land surface temperature observations from geostationary and polar orbit satellites such as from the Geostationary Operational Environmental Satellite-R

Series (*GOES-R*), LandSat, Ecostress, Sentinel 2A, the Moderate Resolution Imaging Spectroradiometer (MODIS), etc.

- Analyzing the collected data to define and to develop a high spatial resolution (10 m) and high temporal resolution (every 5 min) skin temperature over the local community and over New York City using several statistical approaches by fusing satellite based and ground observations.
- Developing an online interactive server platform to disseminate the data to the local community and to scientists. Data visualization and queries will be among important features of the proposed platform.
- Working closely with the local community on the use of the collected data to interpret and predict the strength and extent of heat wave events.

Preferred Major Course of Study: Applied Math, Computer Science, Data Science, Environmental Sciences, Earth Science, Physical Science, Climate Science and Engineering are encouraged to apply.

Preferred Computer / Technology Skills: Strong computer programming in environments such as JAVA, Python, Matlab, R, or experience with Google Earth Engine is preferred.

Climate Change in the Hudson Estuary- Past, Present & Future

Mentor: Dr. Dorothy Peteet (CS)

Duty Location: Lamont Doherty Earth Observatory; NASA Goddard Institute for Space Studies

Project Description: The Hudson Estuary is comprised of key tidal marshes, which serve to provide many ecosystem services to the large population of this important coastal region, including NYC. These services include fish nurseries, coastal protection, water purification, paleoclimatic archives, and carbon sequestration repositories. We seek to understand the records of past droughts, cold intervals, floods, and vegetation shifts along with the past shifts in carbon storage. From this information we can better understand our present snapshot of climate/carbon, and predict future accumulation rates as climate warms and sea level rises.

Preferred Major Course of Study: Biology, Earth Science, Paleoecology, Environmental Science,

Preferred Computer / Technology Skills: Interest and desire to learn paleoclimatic skills, including field and lab research as well as data analysis. Field research includes plant identification, sediment coring, and sediment probing. Skills include processing samples including Loss-on-ignition, carbon content, x-ray fluorescence, and pollen and macrofossil identification. Botanical background a plus, along with past microscope experience and use of Excel.

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Earth Observation Applications for Resiliency – Assessing Climate Change Impacts in Urban, Agricultural, and Natural Environments

Mentor: Dr. Christian Braneon

Duty Location: NASA Goddard Institute for Space Studies

Project Description: The history of Earth observation began in the 1840s, during the era of geographical exploration, when pictures were taken from cameras secured to the tethered balloons for the purpose of topographic mapping. It took another 100 years for earth observations to evolve to a platform based in space called satellites. Remote sensing is the science of obtaining information without physically being in contact with it. This process involves detection and measurement of radiation at different wavelengths reflected or emitted from distant objects or materials, by which they may be identified and categorized.

Through various remote sensing platforms such as satellites and aircraft, supplemented by surface and subsurface measurements as well as modeling and mapping, practical information about Earth's physical, chemical, and biological systems can be obtained. We seek to help urban stakeholders, agricultural leaders, and conservationists respond to the challenges presented by a changing climate by transforming a wealth of NASA Earth observation data (e.g. Landsat, MODIS) into actionable information.

Preferred Major Course of Study: Applied Math, Computer Science, Data Science, Environmental Sciences, Climate Science, Earth Science and Engineering are encouraged to apply.

Preferred Computer / Technology Skills: Previous work with Excel and GIS software.

Atmospheric Rivers in a Changing Climate

Mentor: Dr. Allegra LeGrande

Duty Location: NASA Goddard Institute for Space Studies

Project Description: Atmospheric River events cause dramatic flooding along the western coast of the USA and populate our news headlines. These phenomena occur globally and are responsible for ~80-90% of meridional moisture fluxes in the mid-latitudes and 30-40% of meridional moisture fluxes in the Arctic. In the Arctic, moisture fluxes associated with ARs have been proposed as a means for polar amplification through latent heat fluxes as well as downwelling thermal radiation. For this project, students will use simulations from the NASA Goddard Institute for Space Studies ModelE, version 2.1 (GISS-E2.1, CMIP6) enabled with suite of tracers to diagnose the moisture source for Atmospheric River events to contrast with climatological moisture sources and amounts. Simulations will be evaluated for skill in the modern/historic period. Further simulations and analysis will then be performed with an augmented suite of simulations of both past and future climate to determine the impact of climate change on AR events.

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Preferred Major Course of Study: Computer Science, Earth Science, Geoscience, Paleoecology, Data Science

Preferred Computer / Technology Skills: Python, NCL, Matplotlib, C, C++, Fortran