AARMS

Advanced Atmospheric Research and Monitoring Station

Center for Sustainable Communities - Atlanta (CSC-ATL)

AARMS Objectives

- To support **academic research** in air quality, weather, and climate change by collecting **long-term**, **multi-level**, and **highly-quality meteorological** and **atmospheric** data from a 140-ft tall tower located in a 65-acre undisturbed, old-growth hardwood urban forest in Atlanta, GA
- To support the development of an world class **Earth Science Laboratory** linked to capabilities of orbital satellites, national laboratories, and applicable agencies
- To support the development **STEM education** by serving as an atmospheric and earth science research lab for elementary, middle and high school students
- To support the development of urban outreach and community engagement initiatives including enviornmental health

AARMS Tower

- Urban forest location
- To be instrumented with meteorological and atmospheric monitors at multiple levels above and below forest canopy
- Meteorological measurements, energy and momentum fluxes, upwelling and downwelling radiation components, trace gas and particulate measurements, ionizing radiation monitoring
- Real-time data display and archive data accessible

AARMS Tower Instrumentation Phase I

- Multi-level Instruments:
  - Mechanical wind speed/direction
  - Insolation
  - Temperature
  - Humidity
  - Precipitation
  - Net radiation
  - Soil temperature

- Single-level Instruments:
  - Barometric pressure
  - Net radiation components

- Dataloggers

Morehouse College Student Mounting Propeller-Vane Anemometer on Boom

AARMS Tower Instrumentation Phase II

- Multi-level Instruments:
  - Wind speed/direction, temperature, humidity profiles
  - Sonic anemometer
  - Krypton hygrometer
  - Trace gas detectors (NO_x, O_3, CO_2, others)
  - Particulate matters
- Single-level Instruments:
  - Soil moisture profiler
  - Soil temperature profiler
  - Ground heat flux plate
- Dataloggers

Anemometers Deployed on 30-Meter Crank-Up Tower

Stable Zero-Point Ice Reference for Thermocouple Temperature Profile Measurements at Four Depths in Soil

Examples of Research Scope

- Air quality, weather, climate change
- Interactions of anthropogenic and biogenic aerosols
- Energy balance and morphometric analyses
- Aerosol studies with LED sun photometer
- Emissivity measurements by cone and radiance-kinetic methods
- Influence of weather elements on transpiration behavior in trees
- Derivation of water diffusion rates from tree roots
- Wind turbine selection criteria for small sites

2nd-Generation LED Sun Photometer
Atlanta Metropolitan College research student measuring the spectral intensity of solar radiation to determine the aerosol column depth on that day

Current AARMS Research

Currently the AARMS Project through its Earth Science Laboratory (ESL) is helping to lead and partner on a comprehensive survery of the Fernbank Forest to determine its potential to capture and sequester carbon.

Additionally the ESL is conducting various soil testing research campaigns to support urban agriculture and healthy communities initiatives in conjunction with a NASA based initiative, Emory University and the State of Georgia.

AARMS STEM Education Scope

- Laboratory experiments and quantitative projects in urban climate and meteorology
- Mechanical engineering
- AGIS and satellite imagery
- Physics, chemistry, earth science
- Environmental engineering
- Atmospheric sciences
- Applied physical principles
- Radiation science
- Earth science

Clark Atlanta University Research Student Fabricating Thermocouple Sensor for Soil Temperature Measurements

Sustaining AARMS: A Ten Year Plan

- **World Class Earth Science Research and Education Program**
- **Full Scope Earth Science Program - Geology, Hydrology, GIS, Weather, Climate**
- **Collaborating with National and International Programs and Laboratories**
- **Cutting Edge Innovation, Methodologies, Products and Services**
- **Real World Applications and Solutions**