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Low-cost Sensor and Imagers, Evaluation and Calibration, Data Fusion and Apllications

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Low-cost Sensor and Imagers, Evaluation and Calibration, Data Fusion and Applications

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Project Description

In recent years, there has been unprecedented availability of low-cost and miniaturized environmental sensors. These include in situ sensors capable of measuring atmospheric state variables, rain gauges, soil moisture and temperature probes and air quality sensors (both particulate and gas). Remote sensors are also available including infrared sensors that can be used to monitor sky temperature, mini spectrometers and multispectral and thermal imagers. Whereas the mini spectrometers and imagers are more expensive compared to in situ sensors, they are still low-cost compared to their laboratory, air or satellite borne counter parts.

Low-cost sensors are generally less accurate compared to research grade equipment, but they can be deployed in large numbers. The high spatial information content resulting from such dense sensor networks can be utilized for research and operational use by combining it with sparse resolution, high accuracy observations. Dense, low-cost sensor networks can also be used in combination with satellite observations. One such example is satellite observations to infer surface air quality, which relies on statistical relationships between surface air quality observations and satellite retrieved aerosol column loading. The small size of low-cost sensors also allow for them to be carried on unmanned aerial systems (UAS). On UAS platforms, low-cost sensors allow for the profiling of boundary layer. Imagers on UAS platforms can be utilized for both earth imaging and also for studying severe storm structure. Many of the low-cost sensors are available in Dr. Nair's lab. Student will work on developing applications using such sensors.

Student Duties, Contributions, and Outcomes

The student will research an application using their choice of low cost sensors.

Student Requirements:

Background in hands on use of microprocessors and single board computers are desired..

Faculty Mentorship:

The student will be supervised by Dr. Udaysankar Nair, who has experience in developing low cost sensor applications. Dr. Nair will train the student in compiling research results to be presented at a national conference and eventually into a peer reviewed publication. Depending upon the academic credentials and other qualifications, Dr. Nair may also mentor the student in leveraging the research for the prestigious NSF Graduate Fellowship program.

Previous RCEU Support:

2014, Chris Phillips, Sensitivity of Diurnal Temperature Range in Sahel Region to Atmospheric Dust Loading. Outcome: Chris successfully finished this project, made multiple presentations at the American Meteorological Society Annual Meeting. Chris used this topic for his MS research and Thesis. A peer reviewed publication has been compiled and is being submitted to Nature Geoscience