EQUIPMENT

University of Puerto Rico

Ground Based Flux Measurement Systems
Our laboratory has four ground based energy and moisture flux/Bowen ratio stations, and one eddy covariance station, which will be available for use to support the remotely sensed (satellite)-estimated surface energy and moisture fluxes calibration/validation. The stations have been described by Harmsen et al. (2009).

Computational Resources
UPRM has computer servers (academic.uprm.edu and ece.uprm.edu) that are available for use on project. The UPRM campus computer network utilizes dual redundant fiber optic connections to each building on campus that connect to the Internet with a 2 GB link in Rio Piedras. The UPRM computing facility provides Virtual Computing Lab (VCL) for the use of many software packages (e.g., Matlab, ArcView, AutoCad, etc.).

University of Alabama in Huntsville

UAS/UAV Support Systems
For this proposal we will make use of DJI Phantom (quadcopter) and DJI Wookong (hexacopter) that are owned by UAH's System Management and Production Center. We have conducted field tests that have demonstrated the ability of these systems to carry multispectral earth observation payloads. For this proposal we will purchase a thermal sensor as well as make use of an existing multispectral camera system, Tetracam ADC Lite, already owned by UAH. This system can be used on either of the two platforms listed above and captures multispectral imagery in the visible and near-infrared spectrum (equivalent to Landsat TM bands 2,3,4). These platforms are able to carry sensors up to the FAA-approved altitude of 400 feet, at which altitude an area of approximately 2 acres can be captured in a single instance at resolution on the order of several inches. This imagery will subsequently be generalized to the level of detail specified elsewhere in this proposal. Using the autopilot system integrated natively in the Wookong, and in integration development for the Phantom, we will be able to program GPS waypoints to allow these platforms to cover the target regions in automated fashion according to the survey methodology we define. Together, these platforms and observation systems provide a great deal of flexibility for data collection and their recorded spectra dovetail well with satellite-recorded datasets.

Ground-based Observing Systems
The University of Alabama in Huntsville's (UAH) Atmospheric Science (ATS) Department NASA Marshall Space Flight Center (MSFC) have developed unique remote sensing capabilities that offer great potential to improve short-term forecasting of severe and hazardous weather. The Tornado and Hazardous weather Observation and Research (THOR) Center/testbed is being used as a mechanism to infuse new science and technologies into the short-term forecasting of severe and hazardous weather and the warning decision-making process. THOR observations cover northern Alabama and southern Tennessee, utilizing instruments maintained by several organizations, including NASA, UAH, Alabama A & M University, NWS forecast offices, the

U. S. Army Redstone Arsenal, and other partners. THOR provides integrated data sets from the UAH Mobile Integrated Profiling System (MIPS), real-time regional (southeast U.S.) level 2 data from 10 regional WSR-88D radars, total lightning observations from a ten-station NASA LMA, and the National Lightning Detection Network (NLDN). An additional component of THOR, new in late 2006, is the upgraded WSR-74C radar, the Advanced Radar for Meteorological and Operational Research (ARMOR) as located at the Huntsville International Airport 14 km southwest of NSSTC. The ARMOR possesses clear-air capabilities similar to that of the WSR-88D, and is dual-polarization as described in the proposal. Other ground-based measurements, mounted atop and near the NSSTC building, include a 2 μm Doppler lidar, solar radiation (total, diffuse, and NIP), an ASOS (New in July 2004), a 2-D video disdrometer, and high-quality rain gauges. An important component of the NSSTC THOR testbed is a mobile Alabama X-Band (MAX) dual-polarimetric Doppler radar, which will facilitate dual-Doppler analy- ses of selected convective storms. We will use the ARMOR dual-polarimetric Doppler radar in conjunction with NWS WSR-88D data (from Hytop, AL, Nashville, TN., and Birmingham, AL) and MAX to gather important 3D information on the selected convective storms analyzed in this study. Additional rainfall data will come via the Cooperative Huntsville Area Rainfall Measurement (CHARM) network. Lastly, the NASA SERVIR team is housed within NSSTC, and provides access to international collaborators on topics closely linked to the use of NASA satellite assets toward addressing significant problems in environmental science, water management, environmental monitoring, as well as a host of related activities.

Computational Resources

Computer facilities at NSSTC are very adequate for performing the stated research in data assimilation and short-term prediction, as needed for this project. The in-house matrix Linux cluster is comprised of over 300 processors, and is available to the PI and Co-I's as a form of cost sharing for this project. In addition, the Alabama Supercomputer is available, a CRAY X-MP/24, to perform high- resolution data assimilation experiments over the lifetime of this initiative. Lastly, 5 high-end desktop Linux workstations are available within the PI's Team for carrying out the data processing for this project.