Vision Statement: Remote Sensing Facility

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1. Background

EOL is unique in that it is a research establishment capable of fielding and building specialized instruments for challenging research tasks and thereby playing an active role in the advancement of NCAR's mission. EOL currently provides measurements for research ranging from aerosol, precipitation intensity and hydrometeor type, to the dynamics of hurricanes and severe storms, to boundary layer wind fields. Although a ground-based instrument is easier to develop and deploy, an instrument on a mobile platform offers an increased flexibility when collecting observations over rugged terrain and in the ocean; it is also able to better observe fast moving events, such as vortexes or squall lines and thus, both the ground based as well as the airborne measurement platforms of EOL should be maintained.

The remote sensing measurements are most useful to the research community when a high data quality is maintained and the data are provided in a quick and convenient format; this should be the focus regarding future tool developments. Also, the necessary software tools that enable the interpretation of measurements and quantify the error structure of observations need to be made available to the user community. A variety of retrieval techniques to interpret remote measurements and advanced signal processing, such as spectral signal processing to improve data quality, will be developed.

2. Challenges and Possible Solutions

In spite of having the most state-of-the-art remote sensing instruments in the community, there is a lack of robust remote measurements for the following: (i) Water vapor and liquid water content estimation (ii) 3-D wind field estimation, (iii) cloud phase: liquid, ice or mixed phase, (iv) temperature estimation, (v) error bars on retrieved products, and (vi) precipitation and microphysical products. Also, the recent trend in assimilating operational remote sensor observations and products will set a new standard for the research quality data from EOL instruments.

The combination of LIDAR, mm-wave radars, precipitation radars and radiometers has the potential to measure processes from clear air, to clouds, to precipitation. From these measurements, scientists can derive radiative properties, kinematics, cloud microphysics, winds, precipitable water vapor, temperature profiles and various spatial scales. For example, NASA's GPM (Global Precipitation Mapping) is seen as a major initiative to monitor global precipitation at 3-hour cycles and at scales of tens of kilometers. A pod-based airborne multi-wavelength and dual-polarization radar that can be flown on HIAPER will be developed to support studies related to calibration and validation of satellite sensors by observing the atmosphere along the satellite trajectory much more frequently than in the case of a fixed ground-based sensor. Extensions of the current research can also be accomplished through the development or purchase of existing systems that can be packaged onto a platform to meet our needs. NSF sponsored remote sensing activities can be strengthened further when we work closely with the data quality, ground validation and calibration components of prominent observational programs such as CloudSat, GPM and NWS polarization radar activities. The close cooperation among technicians, engineers and scientists is one of the key factors in achieving a practical solution.

3. Maintenance and Upgrades to Current Instruments

An eye-safe LIDAR is a great concept and it has the ability to track and map aerosol in populated urban regions at 3 m resolution for 10s of Km. However, its usefulness in retrieving water vapor and Doppler winds is yet to be realized. Also, a high pressure Raman cell might pose a safety problem for airborne applications. The EOL is challenged to develop both eye-safe LIDAR and also apply the technology for estimating water vapor and wind. Within five to 10 years, the community may be ready to embrace an advanced airborne Doppler to map 3-D winds of severe storms and hurricanes. RSF should look into emerging technology for designing an advanced airborne Doppler radar. In less than 10 years, most of the WSR-88D will have a polarization capability similar to the S-Pol to study precipitation. In order to strengthen research in the areas of clouds and radiation, EOL has already added a second wavelength to S-band to enhance its capability to a dual-wavelength radar (S-Polka) that is capable of sensing both clouds and precipitation. In partnership with the NexRad range-velocity and proposed calibration projects, S-Polka will actively serve the needs of NSF and the operational community.

4. Implementation

My goals include a meticulous plan for instrumentation maintenance and upgrade, along with an advanced development of scientific products. I will maintain state-of-the art facilities by competing for external funds, joint research programs, and dynamic interactions with universities and other major research establishments. My management style is based on consensus building and careful listening. I strongly believe that open communications among staff members, a well-defined reporting structure in the organization, and access to the latest technologies are the key ingredients to a successful facility.

Under the role of a manager of remote sensing facilities, I will continue advancing the measurement capability of microwave and optical instruments, calibration techniques, and data quality. I will strive to deliver the best-in-class solutions to these problems by applying my technical and management skills. By fostering the already ongoing collaborations with a number of universities and research institutes both in the US and abroad, I envision that I will play a role which benefits all participating institutions.

As a manager of the facility, I would strive to promote a culture of excellence and respect for our fellow-workers while delivering products that are central to EOL's mission and leadership in remote sensing.