

NSF Award Brings Remote Sensing Capabilities to Millersville Meteorology

For over a decade the Millersville University meteorology program has been using tethered balloons and a ground-based station as platforms to deploy instruments to study the vertical structure and evolution, air chemistry, and distribution of aerosols in the lower atmosphere. Over 60 students have participated in externally-funded field research since 1995, and many more have been involved in the analysis of data collected during the field campaigns. As hinted in the photo, tethered balloon operations are human-power intensive and require marathon efforts to capture the details of the atmospheric boundary layer. (*The atmospheric boundary layer is the layer of air that responds to surface forcing (heat, wind, etc.). It can be 100 meters deep in winter and 2.5 kilometers in summer.*)



The current capabilities will soon be augmented thanks to a \$280,000 award from the **National Science Foundation-Major Research Infrastructure** program. According to Dr. Richard Clark (earth sciences), recipient of this award, the project entitled “**Acquisition of Remote Sensing Systems for Lower Atmospheric Research and Undergraduate Research Training at Millersville University**” will provide funds for the purchase of three key remote sensing instruments capable of continuous and high frequency measurements of boundary layer parameters, including turbulence fluxes of heat, momentum, water vapor, carbon dioxide, and net solar radiation. Adding a remote sensing capability will significantly expand our capacity to document the structure and evolution of the

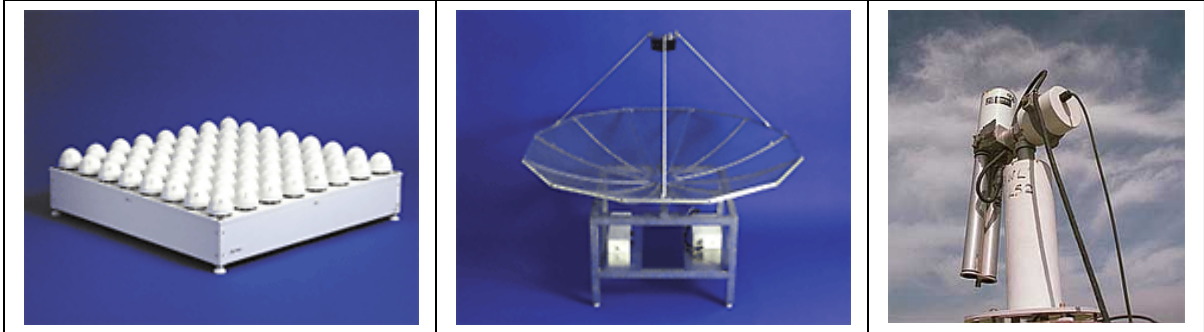
boundary layer in ways that are not currently possible using the tethered balloon system alone.” The major additions to the Millersville Atmospheric Research Facility (MARF) include:



1) a Micropulse Lidar system (left), which is essentially a vertically pointing laser that uses a telescope to collect light that is backscattered from atmospheric aerosols;

2) an acoustic sodar with a radio acoustic sounding system (RASS) (next page) that can send sound pulses into the atmosphere and collect the return signal, which is then converted into high frequency wind and temperature profiles and; 3) a Cimel total sun photometer (next page) that will measure the amount

of extinction of solar radiation due to absorption and scattering in the atmospheric column. Ancillary equipment acquired through this grant includes instruments that will be deployed on the tethered balloons to measure aerosol particle concentrations and size distributions.



We expect that the addition of research-grade remote sensing instruments to the existing MARF will help maintain our position as one of the top 2-3 mobile boundary layer facilities in the country. Our plan is to leverage this facility as a means of developing research collaborations with other universities that want to include boundary layer measurements as part of their field research in meteorology, atmospheric chemistry, and aerosol science. This approach has proved to be successful in the past with institutions and agencies such as Penn State, Harvard School of Public Health, E.P.A., Drexel University, Brigham Young, DARPA, and others. The remote sensing capability should serve to enhance opportunities for future multi-institutional collaborations, as well as to provide the stimulus for original research and meaningful research training experiences for Millersville students.