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UMBC Atmospheric Lidar Group

The University of Maryland, Baltimore County (UMBC) Atmospheric Lidar Group research focus in laser remote sensing technology for atmospheric chemistry and physics applications. The impact of meteorology on air quality, and wind energy, is examined with the use of active and passive remote sensing techniques, and surface in-situ measurements of gases and aerosols. Lidar activities are key support component of the National Oceanic and Atmospheric Administration (NOAA) Cooperative Remote Sensing Science and Technology Center (CREST) Lidar Network activities to monitor and study regional and urban air quality in eastern United States. Initiatives in air quality and wind energy are centered in two research projects.

1- UMBC Monitoring of Atmospheric Pollution (UMAP)

UMAP provides a three dimensional (3D) evaluation of the aerosol pollution environment over by combining ground based sampling measurements with profile measurements provided by UMBC lidars and radiative aerosol properties measured by satellite instruments. Lidar measurements at UMBC have supported air quality administrators at the Maryland Department of the Environment (MDE) to determine the relative impact of long-range transport versus local emissions during nocturnal low level jet (NLLJ) and wintertime pollution events over the Baltimore-Washington region. These efforts have aided the MDE to identify local sources and long range transport of pollutants that affect the state of Maryland, gain insight into interstate transport and direct policy decisions towards fair and equitable emission control strategies. In addition, mixing layer height (MLH) products from remote sensing platforms have been developed and evaluated to help guide new hourly MLH requirements by the U.S. Environmental Protection Agency and supplement the National Weather Service ceilometer test bed.

2- UMBC atmoSpheric Profiling for Advancing offshoRe wind researCh (U-SPARC)

Remote sensing technologies is used to advance understanding of the impact of meteorology on the atmospheric boundary layer, both marine and terrestrial, to reduce atmospheric-related energy yield uncertainties that contribute to sub-optimal offshore wind farm performance, thus unintended high costs. U-SPARC initiatives focus in:

- Meteorological controls (stability, wind shear, turbulence) impact on seasonal & diurnal variations in wind regimes (thus potential turbine power generation)
- Optimal turbine design and wind farm layout strategies (minimizing energy loss)
- Uncertainties of Doppler wind lidar retrievals (measurements)
- Validation/improvements of Numerical Weather Prediction and weather industry's model output (reducing uncertainty)