ENVIRONMENTAL SENSING & SCIENCE

The Environmental Sensing and Science branch at the Energy Dynamics Laboratory (EDL) is committed to providing innovative, technological, and environmental monitoring solutions that meet our clients' needs. We have applied standard instrumentation and techniques to new areas, as well as developed and applied new instrumentation and measurement protocols. Our current areas of focus include ambient air quality measurements, meteorological measurements, and computational modeling for both meteorological and air quality parameters.

At EDL, our instrumentation capabilities include both point and remote sensors, with most our instrumentation development focused on remote sensing techniques such as Light Detection and Ranging (lidar) and Fourier Transform Infrared spectroscopy (FTIR). Computational air quality modeling capabilities include local- to meso-scale models for a variety of applications, including the American Meteorological Society and U.S. EPA Regulatory model (AERMOD), the CALPUFF model, and gridded meteorological models such as the Weather Research and Forecast (WRF) model coupled with a chemistry and dispersion toolkit (WRF-Chem). EDL is advancing the science of regional air quality modeling by fusing lidar data with traditional photochemical grid models, which require gridded meteorological inputs from WRF.

EDL has assembled a highly qualified team of physicists, atmospheric scientists, and environmental, optical, computer, civil, and electrical engineers to perform diverse environmental analysis projects. Cooperative partnerships are in place with key experts at Utah State University, Montana State University, and the United States Department of Agriculture-Agricultural Research Service.

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Environmental Sensing & Science

EDL's instrumentation development and application projects include:

AGLITE MEASUREMENT SYSTEM

- A suite of point and remote sensors to measure concentrations and quantify emissions of both particles and gasses from agricultural and industrial operations (funded by the USDA Agricultural Research Service)

KEY DEVELOPMENTS

- A scanning lidar with three wavelengths
- An algorithm that uses optical and mass point sensor measurements to calibrate the lidar return signal to provide spatially and temporally resolved $PM_{2.5}$, PM_{10}, and TSP mass concentrations over the lidar field of view
- A scanning FTIR to quantify ammonia and other trace gas concentrations

VISUAL WIND

- A collection of traditional and novel wind velocity measurement techniques to provide support and information to all parties interested in air motion, especially the wind energy sector

MPM-DIAL

- A conceptually proven instrument to measure both particles and methane over a large area using differential absorption lidar (DIAL)
- Additional capabilities to measure ammonia, aromatic hydrocarbons such as benzene and toluene, and other volatile organic compounds (VOCs) are under investigation

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