

Innovative Approaches to Wildfire Monitoring: High-Resolution Data Sampling of Smoke and Plume Evolution

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Wildland fires pose a significant issue in North America, especially in the Western half of the United States and Canada. With increased frequency of wildfires and extended fire seasons projected, analyzing wildland fires is becoming more relevant. Hazardous air quality events, stratospheric smoke injection, rapid progression of fire fronts, ecological and structural damage associated with wildfires pose a threat to regional and synoptic regions. To monitor such rapidly evolving events, data acquisition must be swift and flexible to provide high quality data for studying wildfires.

We have been developing a field-ready vehicle for capturing high-resolution lidar scans of wildfires and smoke emissions, enhancing our ability to analyze and respond to these events. Providing higher quality data also requires obtaining high resolution data alongside supplemental data to provide conditions for which measurements were obtained. Lidar provides exceptional capabilities in delivering high-resolution data of aerosol backscattering and radial velocity in wildfire environments. With our lidar unit equipped on a short-bed half-ton pickup truck in addition to a stabilizing mount, GNSS system, and mobile radiosonde system, we intend to provide nimble, high-quality data of wildland fire events in the Western United States and Canada.

With field unit, scans can be conducted while the vehicle is in motion and remain level with a gyroscopic mount attached to the bed of the truck. With a GNSS system installed in the vehicle, we utilize pitch, roll, yaw, GPS coordinates, and velocity data for further refined analyses. When stationary, the gyroscopic mount also provides a means for adjusting the lidar to point at a target for scanning by manually adjusting the roll and pitch. Coupling lidar scans with radiosonde data will also allow for a complete meteorological evaluation of a given fire environment at a given time.