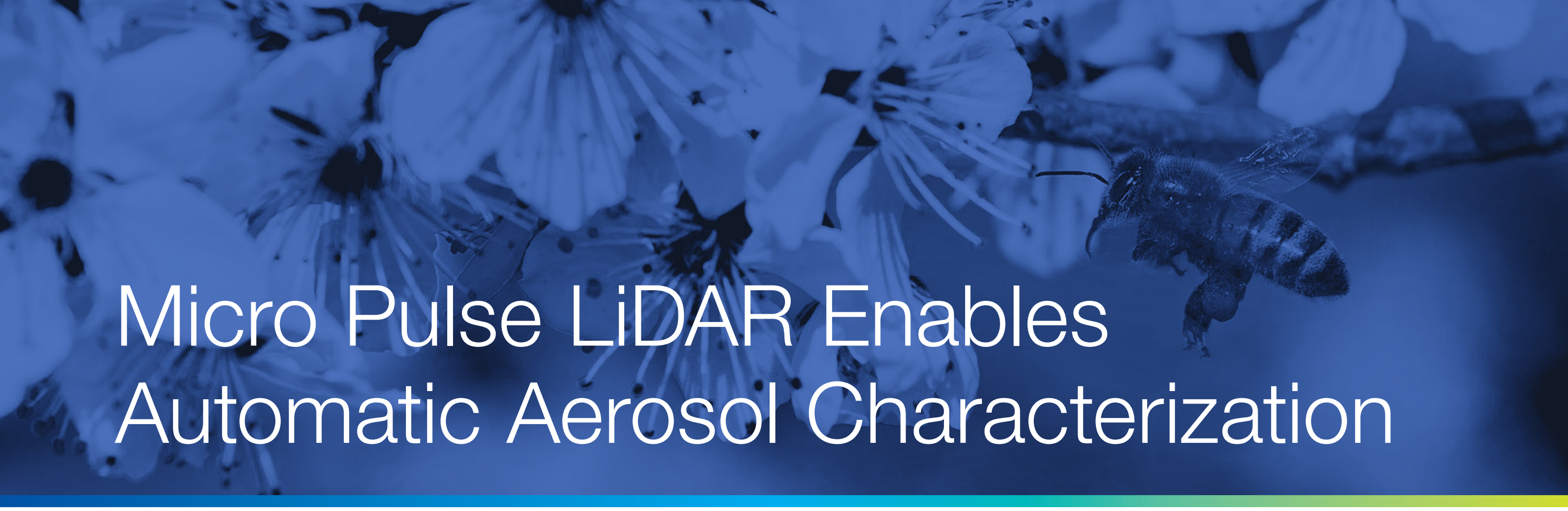

Micro Pulse LiDAR Enables Automatic Aerosol Characterization

Depolarization and Continuous Data Collection Support Pollen Research in Barcelona, Spain

Public health problems related to airborne pollen activity are on the rise in European megacities. Many people suffer from allergic reactions to biogenic particles that are naturally created by trees, grasses, flowers and other vegetation. Cities with large parks and gardens or nearby forests tend to have higher pollen counts than less green urban areas. In Barcelona, Spain, the Remote Sensing Laboratory (RSLab) at the Universitat Politècnica de Catalunya (UPC) collects columnar atmospheric measurements with a Micro Pulse LiDAR (MPL) instrument to support its research efforts in the field of pollen release, dispersion and transport.

Improved Technology Produces Precise Information

The RSLab has been performing atmospheric research with LiDAR technology since 1993. The group monitors aerosol events at the regional and continental scale and participates in the evaluation of aerosol transport models. The RSLab is a member of MPLNET, a global atmospheric monitoring network operated by NASA. NASA uses only MPL systems to continuously measure aerosol and cloud vertical structure and boundary layer heights at sites around the world.

“Pollen events are difficult to predict, so we needed a system to continuously monitor pollen dispersion in the atmosphere with surface concentration measurements, LiDAR measurements and meteorological data in and around the Barcelona area,” said Michaël Sicard, Associate Professor at UPC. “The capabilities of the MPL met our needs for unattended operations and real-time volume depolarization ratio, especially in the bottom part of the atmosphere (< 2 km). The greatest benefit that RSLab has gained is the possibility to provide 2D (height vs. time) figures of the aerosol load in real-time. Very few groups have this capability in Europe.”

The RSLab uses the MPL to continuously produce a total backscatter coefficient and volume depolarization ratio using variable temporal resolutions of 30 seconds to 1 hour. This information is combined with other local meteorological data (pressure, temperature, relative humidity, wind speed and direction) recorded simultaneously.

The MPL data are complemented with in-situ measurements of pollen concentration from an impactor and supplemented regularly with sun-photometer data from AERONET (Aerosol Robotic Network), which provides valuable information about the aerosol columnar properties. The results are then compared to a recently developed pollen module of an air quality forecast system managed at the Barcelona Supercomputing Center. Over time the comparisons of actual data to forecast data will lead to more accurate and useful models.

Depolarization Capabilities are Crucial

The MPL’s ability to measure depolarization helps researchers to characterize aerosol types. “The MPL Polarization Package allows the system to continuously collect co-polarized and cross-polarized backscatter signals,” explains Justin Fisher, Director of Atmospheric LiDAR products at Hexagon. “The ratio of these signals lets researchers identify scatter caused by biogenic aerosols, like pollen, versus other particles, because each shape interacts with light in a different manner.”

Distinct particle types can be classified using empirically established ratio thresholds. The MPL software offers a 2D view of the results, with false color masks used to easily

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>
> *– Michaël Sicard, Associate Professor at UPC*

pick out different aerosol layers, giving additional visibility into the composition of the vertical aerosol column. The volume depolarization ratio is an excellent tracer of pollen dispersion in the atmosphere.

Public Health is of Primary Concern

Despite the recognized allergies that pollen grains produce, the dispersion of pollen in the atmosphere has not been adequately investigated. There are clear indications that model forecasts are underestimating the amount of pollen in the atmosphere. The RSLab is continuing to monitor pollen to detect possible correlations between pollen vertical distribution, temperature, humidity, wind speed, in-situ concentration and solar radiation. More accurate observations recorded by the highly sensitive MPL are being used to closely track aerosol levels and to improve existing aerosol transport models so that more useful information may be provided to the public.

About Micro Pulse LiDAR

Elevating Atmospheric Monitoring

Micro Pulse LiDAR (MPL) instruments help scientists, meteorologists and air quality professionals monitor aerosols to better understand the structure of our atmosphere. MPL’s long-range capabilities and high quality signal increase efficiency and accuracy of the data capture process for improved atmospheric monitoring. Originally designed by Sigma Space for NASA, MPL uses eye-safe lasers, precision photon counting, and built-in data analysis to deliver the best signal-to-noise ratio and thus the most reliable information in this category.

Micro Pulse LiDAR is part of Hexagon (Nasdaq Stockholm: HEXA B; hexagon.com), a leading global provider of information technologies that drive quality and productivity improvements across geospatial and industrial enterprise applications.

For more information, visit www.micropulselidar.com or call +1(301) 552-6000.

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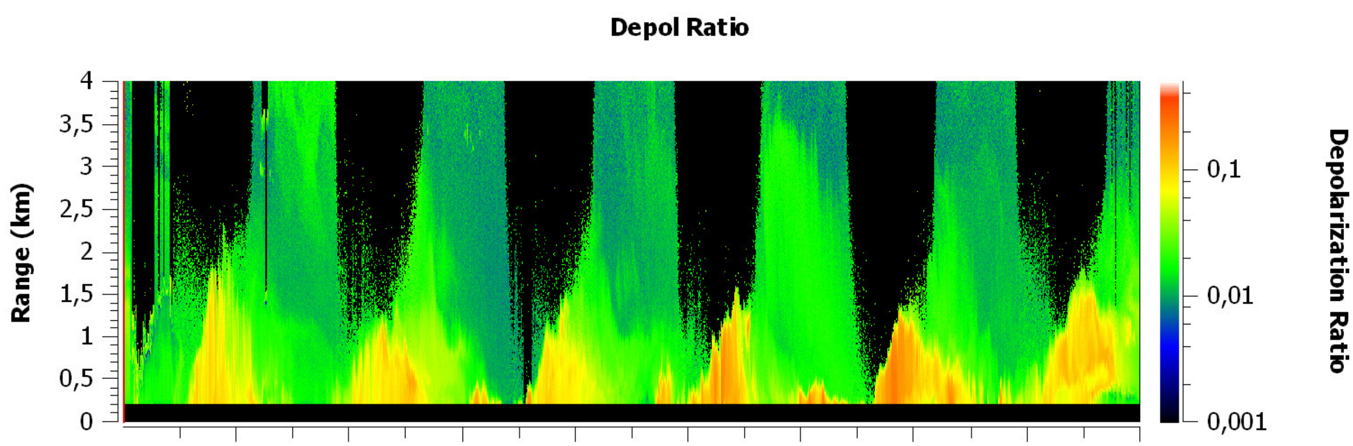

Volume depolarization ratio during 26-31 March, 2015, in Barcelona Spain. The yellow/orange features indicate the presence of pollen.