

One device for wind and aerosol measurements

Case Study



The client:

University of the Littoral
Opal Coast

Vaisala solution:

WindCube® Scan

How a university study of air pollution and wind characteristics is measuring both with WindCube Scan

For both environmental protection agencies and industries, it is crucial to understand the concentration and movement (or spatial dispersion) of airborne pollutants. This information helps organizations to understand how much pollution is in the air, both currently and historically, as well as how weather affects its travel – all of which help them to effectively mitigate pollution and protect local citizens.

THE CHALLENGE:

Understanding the concentration and movement of airborne pollutants

Researchers at France's University of the Littoral Opal Coast (ULCO) conducted a 8-month campaign to measure particulate matter (PM) and detect particle plumes using a combination of in-situ and remote sensing technologies.

The project site is a section of the northern coastal city of Dunkirk which has a mix of industrial, residential, road and boat traffic emissions. Detecting and tracking aerosols in this area is a challenge because of the many sources and sizes of aerosols – and important because of the proximity of industrial activity to nearby residents.

In-situ PM sensors provide accurate measurements of aerosol concentration with time, but only as point measurements. ULCO understood that a broader, multidimensional view of dispersion over a specific area would provide a much deeper understanding of aerosol movement and concentration.

Doppler lidar has been used for more than ten years to measure wind speed and direction, notably by the wind energy industry. Its use in air quality applications is limited but significantly

growing. For this campaign, the use of Doppler lidar would demonstrate its relevance for studying aerosol and cloud properties, thanks to the backscatter coefficient, which is proportional to aerosol concentration.

THE APPROACH:

The University chose Vaisala WindCube Scan for their measurement project

The University chose Vaisala WindCube Scan for their measurement project – both for its capabilities and their experience with its reliability and accuracy. WindCube Scan is the ideal multiuse tool, providing outstanding flexibility and useful at-a-glance insights. It provides simultaneous wind, boundary layer, cloud, and aerosol backscatter measurements, giving ULCO all the right data for this air quality research project.

ULCO set up the WindCube Scan in the harbor area of Dunkirk where it would be close to a coal power plant, petrochemical and agrochemical facilities, docks with ore and rubble storage, and the coast. To measure aerosols, the University set up a PPI horizontal scanning scenario at a low 2° elevation angle to provide a map of aerosol backscatter measurements, comparing them with a PM analyzer and optical particle counter.

THE RESULTS:

ULCO achieved their goal of combining aerosol quantification with wind information

WindCube Scan Doppler lidar has a major advantage over PM sensors: It measures both wind and aerosol simultaneously, and can be used for 4D monitoring of their concentration. This data creates a full, essential picture of fugitive particulate emissions and wind conditions, significantly improving awareness and decision-making for air quality agencies and industries.

This demonstration is a strong step in the direction of the project's larger goal: To demonstrate an unprecedented ability to quickly report excessive particulate emissions from an industrial site, support early warnings, and aid decision-makers by acting as a tool for locating and characterizing an air pollution incident. All of these will help protect the public and provide vital insights into mitigating air pollution.

Why Vaisala?

As the global leader in weather and environmental measurements, Vaisala empowers businesses and community leaders to build resilience to climate change and extreme weather events. Our 85+ years of expertise is grounded in science, innovation and our unwavering commitment to constantly evolving.

We boldly demonstrate that a culture of resilience and a connection to nature can create new ways of smarter, resilient living. We are champions for smarter, safer and more sustainable urban communities.

