

Ports in a storm: Safer and stronger

Case Study



The client:

Department of Civil, Chemical and Environmental Engineering, University of Genoa

Vaisala solution:

WindCube Scan

How a multinational wind analysis project is leveraging lidar to help ports prepare for sudden winds

Seaports are vulnerable by nature. Operations and safety can be put at risk by extreme weather, often made worse by their locations in urban areas. A promising, multinational wind and weather analysis project is now underway to help ports be better prepared for storms – especially sudden winds.

THE CHALLENGE:

Wind impacts port safety and construction

The Department of Civil, Chemical and Environmental Engineering (DICCA) at the University of Genoa includes a highly respected wind engineering group who regularly studies wind phenomena. To address the challenge of wind in ports, the Department began a project to understand wind fields and optimize wind forecasting.

Their study was expanded to include thunderstorms and became Project Thunderr: an ongoing collaboration that leverages wind lidar to expand storm research and improve port construction and structure design. Joined by organizations in Germany, the Netherlands and Canada, Project Thunderr aims to help ports all around the world—and the cities they serve—to become better prepared for whatever nature throws their way.

THE APPROACH:

Major wind analysis project uncovers the details

As DICCA began the project, they selected the WindCube® Scan to complement the extensive wind monitoring network. The WindCube Scan is well-known as the industry standard for accurate

"Lidar equipment helps us to capture fine detail from the inside of a storm, so we can gauge its geometric structure, distribution and evolution as the storm progresses...Data from the research will help us to design and build safer and more cost-efficient dock structures."

*Massimiliano Burlando
Associate Professor at the University of Genoa*

and reliable wind measurements, and provides 3D scanning at ranges up to 10km from the shore.

Positioned in the Port of Genoa, the Department is using the WindCube Scan to search for downburst outflows, gust fronts, and waterspouts produced by thunderstorms approaching from the sea.

The wind monitoring network spans several ports across Italy and France and includes the WindCube Scan plus more than 30 ultrasonic anemometers, 3 lidar vertical wind profilers, and PTH sensors. This advanced network detects the position, diameter, structure, direction and translational speed of downbursts. Semi-automated software separates wind events and collects a wide range of information types to classify the weather scenarios in which thunderstorms occur.

THE RESULTS:

The future looks brighter for all ports

What began as a small-scale wind study has become an international collaboration, with results expected to benefit ports worldwide. The five-year Project Thunderr will be complete in 2022, and project leaders are on track to study 25 thunderstorms during this time.

Thanks to its rugged design and easy setup, the Department was able to quickly deploy the WindCube Scan where it is needed most. Fast and thorough 3D scans plus automatic 3D cloud

and aerosol detection provide data instrumental for understanding downbursts and other wind conditions, while autonomous operation gives more time to focus on wind analysis.

As an integral part of the wind monitoring network, WindCube Scan is an important technology for proving how lidar can be used for updating decades-old forecast models—and creating new ones—for use in port construction and operations.

The project is providing extensive, promising data that could enable everything from wind tunnel testing of new building designs to new classifications for the types and severity of storm-related structural damage.

Why Vaisala?

Weather and environmental insights are the greatest catalysts for successful maritime operations— from sensors to systems and digital services, Vaisala provides actionable insights that empower stakeholders to confidently meet challenges and harness new opportunities.

Our globally trusted maritime weather solutions enable remarkable efficiency gains, digital transformation, the protection of people and investments while supporting sustainable and responsible operations.

We are scientists and explorers driven by passion, relentless curiosity, and the desire to create a better world. Backed by 85+ years of unmatched scientific leadership, our solutions increase maritime weather awareness and drive innovation.

