



## From ports to shipping:

Three ways WindCube® lidar is enabling safer, more efficient operations and helping propel the future of cleaner shipping

*Wind presents both risks and opportunities for maritime operations, and lidar is the modern answer to traditional wind measurements.*

*Vaisala WindCube® wind lidars are known the world over as the gold standard in accurate wind measurements. Trusted for decades, the third-party verified wind lidar helps improve local and short-term weather forecasting with continuous observations.*

*Here are three ways Vaisala's future-proof wind lidar is helping diverse stakeholders in maritime to improve situational awareness, ensure safety and operational continuity, and help propel the future of cleaner shipping.*

# 1 Port operational efficiency

Wind is the #1 weather challenge at ports. Extreme weather, especially gusty winds, causes more — and very expensive — risks for port infrastructure, operations, and business continuity as well as the safety of vessels and people.

Large-scale wind insights enable ports to act decisively to protect productivity. Instead of making an educated guess on closures, for example, port leaders can limit downtime and promptly get operations back on track after storms.





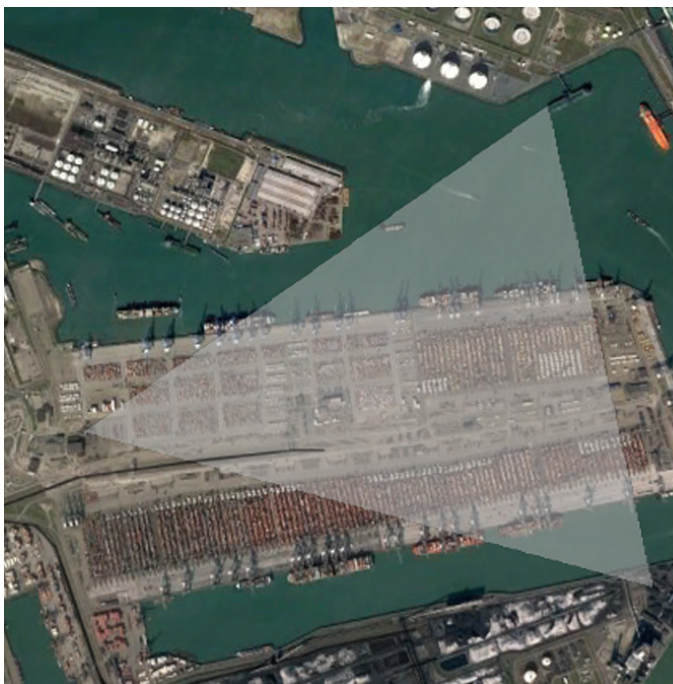
## Key technology

WindCube Scan *Explore Edition* — captures 3D wind field data with measurement range extending beyond 18 km.

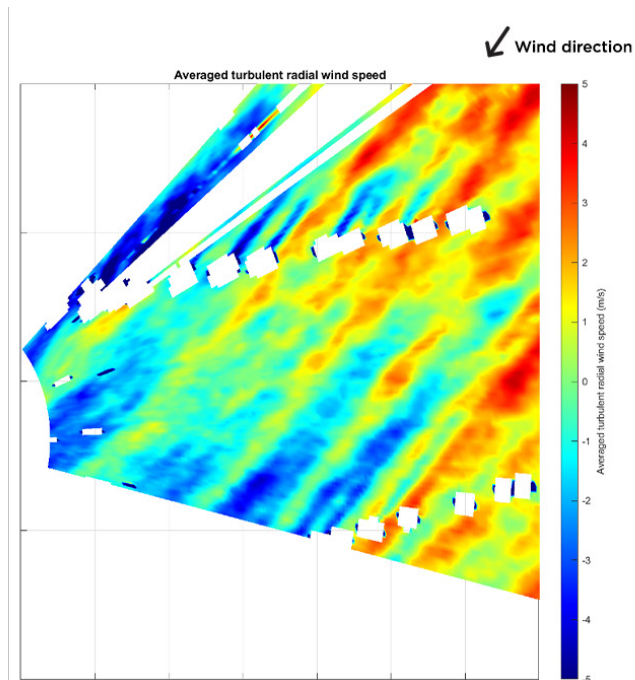
**Here's how the Maritime Research Institute Netherlands (MARIN) uses WindCube Scan to help characterize wind hazards and minimize wind impact on port operations.**

- MARIN launched the Wind Loads and Securing Ships Joint Industry Project (WindLASS JIP) to develop a practical wind load prediction tool
- WindCube Scan is providing high-resolution 3D wind measurements above several European seaports
- The results will be used to improve the wind models in order to predict wind loads on ships and their response including drift angle, berthing loads, and mooring line loads

## Complex wind fields at ports: Impact on docked ships



WindCube Scan with measurement area in gray. In this example, the wind is coming from the northeast direction. On the top right corner a few cylindrical buildings are visible, and these are causing a wake in the downfield wind direction at the berth locations: The front of the ship gets a much stronger wind and the back gets a slower and milder wind. As a result, the loads are being unevenly distributed on the ships which causes an uneven distribution of force on the mooring lines themselves.



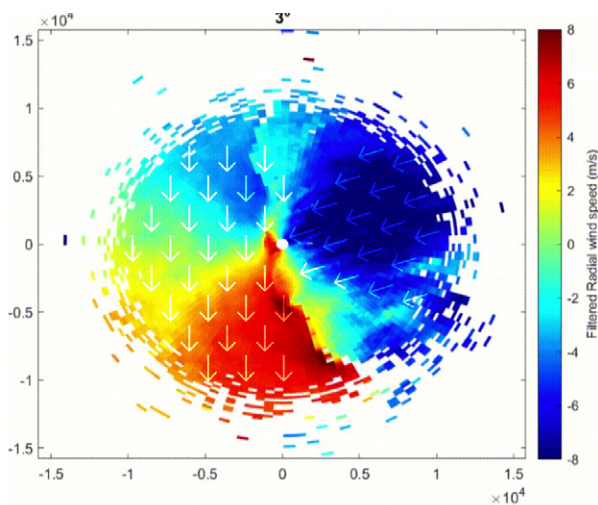
These visualized WindCube Scan measurements show the wind field variation in the port area. The darker red color indicates that the wind is stronger in the incoming direction, and darker blue indicates the wind is stronger in the opposing direction. The white squares correspond with ship cranes.



# 2 Offshore wind farm builds

For offshore wind farms, bad weather has a year-round impact through every phase of construction, installation, and maintenance. WindCube Scan offers new capabilities to improve and secure crane operations and planning for lifting.

Vaisala can also couple highly accurate forecast, lightning, and thunderstorm data with WindCube Scan in order to measure weather fronts and dangerous events coming to your site 5-10 minutes in advance.



These are actual measurements taken by WindCube Scan in a 10 km configuration, and show a convective cell wind blowing in from the right.

## Key technology

WindCube Scan *Explore Edition* — provides comprehensive wind data over the whole wind park.

WindCube Offshore vertical profiling lidar — measures the wind up to 300 meters above, ideal for timing safe crane operations and blade installations and maintenance operations.



# 3 Wind-assisted vessel optimization

Wind-assisted ship propulsion (WASP) technology such as rotor sails and other types of mechanical sails are showing great promise as a viable source of cleaner propulsion.

High quality, accurate and dependable wind sensing technology is critical to making the most of wind-assisted ship propulsion — not only for collecting the most wind, but also for optimizing power when the air is still.

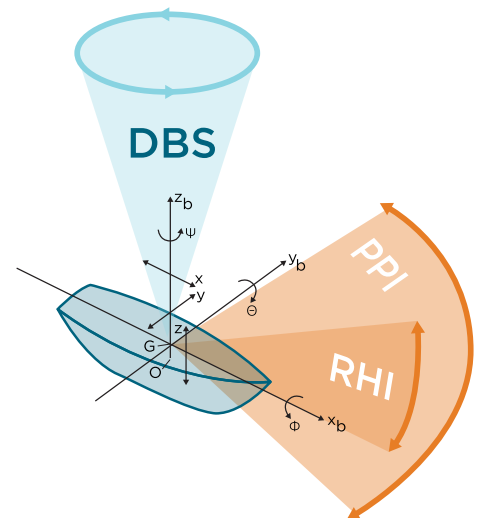
## Key technology

WindCube Nacelle horizontal profiling lidar — measures the wind ahead up to 700 meters, ideal for performance testing and proactive responses to changing conditions.

WindCube Scan *Explore Edition* — provides comprehensive 3D wind data with measurement range extending beyond 18 kilometers from its position.

## Here's how MARIN is gaining performance and optimization insights for wind-assisted propulsion systems using WindCube Scan.

- MARIN teamed up with eConowind, a ship design and engineering company dedicated to wind-assisted ship propulsion, to evaluate in-situ wind conditions on a vessel equipped with two of eConowind's VentiFoils®
- WindCube Scan enables an undisturbed, high-resolution 3D wind field without the use of additional wind measurement devices — essential for assessing the real-world performance of a wind propulsion system
- By using comprehensive lidar wind data, VentiFoil operators gained new insight about accurately optimizing power, fine-tuning operation, and verifying system performance to take full advantage of wind conditions



## Weather and environmental insights are the greatest catalysts for successful maritime operations.

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

*Trusted weather observations for a sustainable future*

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