

VAISALA

WindCube® wind lidar: Elevating industry and atmospheric research

Solutions Brochure



Pioneers of environmental science



At Vaisala, we take every measure for the planet – investing heavily in research and collaborating with renowned scientists and research institutes for their projects.

Vaisala's successes are rooted in our long history of scientific excellence and industry contribution, our philosophy of end-to-end partnership, and the comprehensive capabilities of the WindCube® suite, the most recognized and trusted lidar solutions in the world.

Our WindCube lidar suite is a result of extensive scientific research and collaboration. We have partnered with over 20 respected wind research institutes, leading to more than 500 high-level publications on wind lidar.

Today WindCube lidars are backed by the best science and metrology and validated by the most demanding testing and certifications in the industry. Just as important, our unparalleled global service and support ensures you can count on us onshore, offshore, and worldwide.

Institute	Paper title
Department of Mechanical and Structural Engineering and Materials Science, University of Stavanger, Norway	Complementary use of wind lidars and land-based met-masts for wind measurements in a wide fjord
School of Science and Engineering, Reykjavík University, Iceland	
Kjeller Vindteknikk, Kjeller, Norway	
Department of Mechanical and Structural Engineering and Materials Science, University of Stavanger, N-4036 Stavanger, Norway	Assessing the potential of a commercial pulsed lidar for wind characterisation at a bridge site
School of Science and Engineering, Reykjavik University, Menntavegur 1, 101 Reykjavik, Iceland	
Christian Michelsen Research AS, Fantoftveien 38, Bergen, Norway	
eophysical Institute, University of Bergen, Allegaten 70, N-5007 Bergen, Norway	
Department of Mechanical Engineering, Kindai University, Higashi-Hiroshima, Hiroshima 739-2116, Japan	Can LiDARs Replace Meteorological Masts in Wind Energy?
National Institute of Advanced Industrial Science and Technology, Koriyama 963-0298, Japan	
Renewable Energy Research Center, National Institute of Advanced Industrial Science and Technology, Koriyama 963-0298, Japan	Coastal Wind Measurements Using a Single Scanning LiDAR
Department of Mechanical Engineering, Kindai University, Higashi-Hiroshima, Hiroshima 739-2116, Japan	
Graduate School of Maritime Sciences, Kobe University, Kobe 658-0022, Japan	
Coastal and Estuarin Environment Division, Port and Airport Research Institute, Yokosuka 239-0826, Japan	
Renewable Energy Research Center, National Institute of Advanced Industrial Science and Technology, Koriyama, Japan	Validation of near-shore wind measurements using a dual scanning light detection and ranging system
Wind Fluids and Experiments (WindFluX) Laboratory, Mechanical Engineering Department, The University of Texas at Dallas, Richardson, 75080 TX, USA	Wind LiDAR Measurements of Wind Turbine Wakes Evolving over Flat and Complex Terrains: Ensemble Statistics of the Velocity Field
Wind Fluids and Experiments (WindFluX) Laboratory, Mechanical Engineering Department, The University of Texas at Dallas, Richardson, 75080 TX, USA	LiDAR measurements for an onshore wind farm: Wake variability for different incoming wind speeds and atmospheric stability regimes
Korea Institute of Energy Research, Daejeon 34129, Korea	Analysis of Wind Turbine Aging through Operation Data Calibrated by LiDAR Measurement
Department of Mechanical Engineering, The University of Melbourne, Parkville 3010, Australia	Short-Term Wind Power Forecasting at the Wind Farm Scale Using Long-Range Doppler LiDAR
School of Geography, Earth and Atmospheric Sciences, The University of Melbourne, Parkville 3010, Australia	
Laboratory for Climatology and Remote Sensing (LCRS), University of Marburg, 35032 Marburg, Germany	Fog and Low Stratus Obstruction of Wind Lidar Observations in Germany- A Remote Sensing-Based Data Set for Wind Energy Planning
Ramboll, 81541 Munich, Germany	
Fraunhofer IEE Kassel, 34119 Kassel, Germany	

University of Colorado, Boulder, Colorado	Performance of a Wind-Profiling Lidar in the Region of Wind Turbine Rotor Disks
Department of Applied Mathematics, University of Colorado Boulder, Boulder, Colorado, USA Department of Atmospheric and Oceanic Sciences, University of Colorado Boulder, Boulder, Colorado, USA Department of Earth and Planetary Sciences, Department of Mechanical Engineering, Johns Hopkins University, Baltimore, Maryland, USA National Renewable Energy Laboratory, Golden, Colorado, USA	Influences of lidar scanning parameters on wind turbine wake retrievals in complex terrain
Fraunhofer Institute for Wind Energy Systems IWES, together with its project partners RWE, ForWind (University of Oldenburg), and Helmholtz-Zentrum Hereon	Optimized yield in offshore wind farms: Measurement campaign in C ² -Wakes project gets underway
University of Oldenburg	Lidar & Wakes // University of Oldenburg
The Carbon Trust	WA GloBE: Modelling and accounting for blockage and wake effects
	OWA GloBE: Measuring blockage effects
	OWA GloBE: Achieving Industry Consensus on the Global Blockage Effect in Offshore Wind
Centrale Nantes (LHEEA)	First successful offshore campaign for the stabilized scanning LiDAR, developed by the LHEEA for the measurement of wind in floating wind turbines
University of Notre-Dame, Notre-Dame, Indiana, USA Geophysical Institute, University of Bergen, and Bjerknes Centre for Climate Research, Bergen, Norway Christian Michelson's Research Institute, Bergen, Norway University of Stavanger, Stavanger, Norway	Offshore Wind Turbine Wake characteristics using Scanning Doppler Lidar
Technical University of Denmark (DTU) Wind	Turbulence Measurements with Dual-Doppler Scanning Lidars
University of Colorado Boulder, USA National Renewable Energy Laboratory (NREL), USA DNV, UK	Behavior and mechanisms of Doppler wind lidar error in complex terrain: stable flow case study at Perdigão
IFPEN	Real-time three dimensional wind field reconstruction from nacelle LiDAR measurements
IFPEN	IFPEN and Vaisala improve wind measurement to reduce wind energy costs

Wind lidar for scientific research



Wind lidar is a powerful remote sensing device that accurately measures wind parameters like wind speed and direction for your meteorological data requirements. Beyond Wind Resource Assessments and wind farm operations, lidar also significantly contributes to scientific research and projects in the renewable energy and atmospheric science industries.

WindCube

The iconic and trusted gold standard

- 20+ years of scientific lidar innovation
- 500+ authored or co-authored scientific publications
- 100+ validations by independent experts

Wind lidar has several benefits for research institutions:

- Lidar provides the continuous, accurate measurements critical for performing analyses that require wind data
- Long-term datasets are included for analyzing wind patterns
- Lidar is your go-to for any wind related projects and experiments, both onshore and offshore
- Lidar can be used for multiple projects, as it is portable and easy to deploy

To get started, you can either purchase or rent a WindCube lidar for carrying out your experiments and projects wherever you need it.

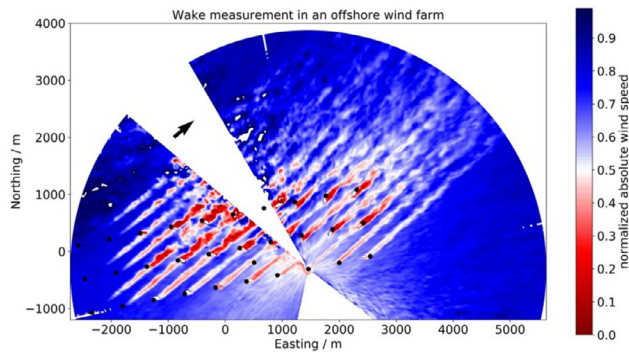
Research applications

WindCube lidar provides exceptional accuracy and reliability in measuring the most relevant parameters: Wind speed, wind direction, turbulence intensity, radial velocity, and free-stream wind.

WindCube Scan – our 3D Doppler scanning lidar – can be used to measure the atmospheric boundary layer, detect inhomogeneity across a wind farm, and compile windshear statistics.

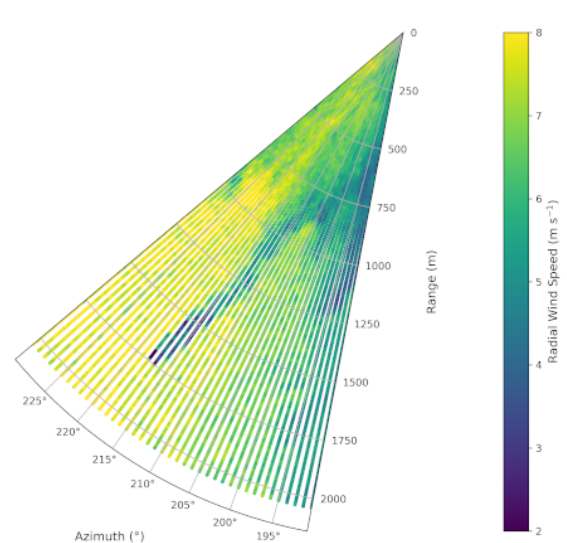
WindCube supports numerous research applications:

- Wakes measurement for near wake and far wake model validation and on-site calibration
- Wind farm blockage effect
- Nowcasting (accurate short-term forecasts with actual local measurements)
- Energy production forecast, grid balancing
- Severe wind event detection and alerts, such as wind ramps, wind gusts, and sudden changes in direction
- Wind farm performance optimization with yaw misalignment detection and monitoring, Power Performance Testing and AEP
- Wind farm control
- Wake steering
- Validation for weather models



Copyright: ForWind (University of Oldenburg)

Lidar & Wakes // University of Oldenburg (uol.de)



Copyright: Centrale Nantes

1st successful offshore campaign for the stabilized scanning LiDAR, developed by the LHEEA for the measurement of wind in floating wind turbines - Centrale Nantes (ec-nantes.fr)

Driving a bright future, together

Research institutes around the world trust Vaisala and WindCube lidar to elevate their projects that demand precise wind data. The WindCube lidar suite is renowned for its exceptional accuracy, versatility, and reliability, providing continuous measurements of critical wind parameters that support a wide range of applications. By choosing WindCube, research institutes can achieve unparalleled accuracy and reliability in their wind data to drive a bright future for industry, atmospheric studies, and beyond.

Contact us to start a conversation.

Why Vaisala?

We are innovators, scientists, and discoverers who are helping fundamentally change how the world is powered. Vaisala elevates wind and solar customers around the globe so they can meet the greatest energy challenges of our time. Our pioneering approach reflects our priorities of thoughtful evolution in a time of change and extending our legacy of leadership.

Vaisala is the only company to offer 360° of weather intelligence for smarter renewable energy, nearly anywhere on the planet. Every solution benefits from our nearly 90 years of experience, deployments in 170+ countries, and unrivaled thought leadership.

Our innovation story, like the renewable energy story, continues.



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