



Expand your possibilities

With the WindCube® Complex
Terrain Ready offering



Wind farms are expanding in complex terrains as land in simpler terrain becomes less available. Since wind flow isn't uniform in complex terrain, modeling technologies complement lidar sensors to ensure the data is accurate, reliable, and bankable.

The industry-leading WindCube® lidar has long been a proven solution for wind resource and energy yield assessment. Our WindCube Complex Terrain Ready offering ensures that you realize precise data in all types of complex terrain.

Many organizations today leverage the patented, integrated correction method built into the WindCube: Flow Complexity Recognition (FCR), a simplified and robust modeling tool. This method has proven to be reliable and accurate for moderately complex terrain.

For more complex terrains, customers work with our partners to integrate the industry-leading Computational Fluid Dynamics (CFD) method, trusted and accepted for wind measurement in moderately complex to very complex terrains. Here is a quick overview of each, plus our strategic partners who provide WindCube CFD integration services.



WindCube: Recognized, proven innovation

Our years of experience, impressive global client roster and numerous industry breakthroughs demonstrate that WindCube is the gold standard in wind energy.

1. FCR: For simple to moderately complex terrain

FCR technology is essentially an embedded, simplified, real-time CFD model.

FCR accounts for the impact of moderate terrain complexity and provides a direct correction to the data. Hardware and software innovations combine to enable WindCube to reach accurate measurement in moderately complex terrain.

- Patented tool, embedded in every WindCube v2.1
- Free and immediate
- Proven and accepted by customers and independent experts

2. CFD: For moderately complex to very complex terrain

Full CFD software is the best post-processing tool for more complex terrains.

Commercial CFD providers offer correction tools and methods for post-treatment of lidar data, collected using the “normal mode” algorithm without the FCR mode algorithm.

- Industry-proven technology
- Available through trusted and verified organizations
- Independent and consultant-led implementations ensure complete, accurate CFD use

3. Partnerships

Beyond improving the accuracy of WindCube in complex terrain, our strategic partners can also approve the corrected data and evaluate the resulting measurement uncertainty following industry best practices. These steps ultimately ensure WindCube data reliability and bankability in complex terrain. In some cases, customers leverage both FCR and CFD data to ensure the highest possible wind measurement outcomes.

Site-dependent wind correction factors: For organizations who have or are developing in-house complex terrain expertise. Expert statements confirming viability are required.



Meteodyn provides a lidar data correction file, built using the GPS position of your WindCube and a CFD calculation using terrain roughness and orography data. Generated factors are distributed across 36 wind sectors and across your lidar-measured altitude gates. Please contact Meteodyn to request a quote at lidar@meteodyn.com.



WindSim Global Consulting Team supplies CFD correction factors for your WindCube and a tool to apply these factors directly to your WindCube STA wind speed files. WindSim's CFD correction is tailored for WindCube devices and considers the lidar GPS location as well as the orientation of the lidar beams. Please contact WindSim for requesting a quote at consulting@windsim.com. Further information can be found by visiting <https://windsim.com/services/LIDAR-and-SODAR-flow-curvature-correction/>.



Teaming up with CFD correction software ZephyrScience, Wind consultant **Deutsche WindGuard** provides correction factors for lidar measurement data measured in complex flow situations. The organization provides a lidar correction report that includes topography as well as a detailed description of the methodology with corresponding results. DWG also proposes an in-depth analysis of the results (the DWG approval) and a comparison of both FCR and CFD corrected data. Please contact DWG for requesting a quote at WindCubeCFS@windguard.de.



As a global Wind Energy consultant, **UL** offers a wide variety of wind resource assessment services including the use of remote sensing devices such as WindCube. Within the scope of an Energy Yield Assessment in Complex Terrain, UL has developed its own CFD tools to correct the WindCube data, taking into account the local flow curvature, and reduce the final uncertainty over the measurement campaign. Please contact UL at the Sales.REN.Germany@ul.com for enquiry on resource assessment projects in complex terrain.

In-depth consultation: For organizations who do not have in-house complex terrain expertise and need expert consultation. Corrected data is approved by third parties.



ArcVera Renewables, a US-based technically-leading renewable energy consultancy, generates a customized report with the correction factors derived from WindSim CFD model simulations, using the orientation of the fielded WindCube and high-resolution elevation and land use data specific to the site. ArcVera's wind analysis team experts assess the CFD analysis results and compare them to the local topography to ensure the reconstructed wind flow consistency. ArcVera provides an additional service to validate the flow curvature correction results to a co-located met tower. For further information and to request a proposal, please contact ArcVera Renewables at RemoteSensingCFD@arcvera.com.



Using in-house CFD software, **DNV** can demonstrably reduce energy assessment measurement uncertainty for projects in complex terrain. Supported by a systematic validation, the outputs of the DNV service include the directional conversion factors to be applied to the WindCube data and estimates of measurement uncertainty with and without the DNV adjustments. For further information and to request a quote, please contact the DNV expert via the [DNV website](https://www.dnv.com).



Fraunhofer Institute for Energy Economics and Energy System Technology IEE offers a full wind measurement campaign service. Their expertise also extends to complex terrain with the use of the Meteodyn WT CFD solution combined with WindCube measurements. Please contact Fraunhofer at paul.kuehn@iee.fraunhofer.de for requesting additional information on the services available.



Flexible and validated. Bankable and accepted. This is lidar without limits.

Learn more about the WindCube Complex Terrain Ready offering and bring your wind farm projects closer to realization.



windcubelidar.com



Scan the code for more information

Ref. DID66485EN-A ©Vaisala 2021

This material is subject to copyright protection, with all copyrights retained by Vaisala and its individual partners. All rights reserved. Any logos and/or product names are trademarks of Vaisala or its individual partners. The reproduction, transfer, distribution or storage of information contained in this brochure in any form without the prior written consent of Vaisala is strictly prohibited. All specifications — technical included — are subject to change without notice.