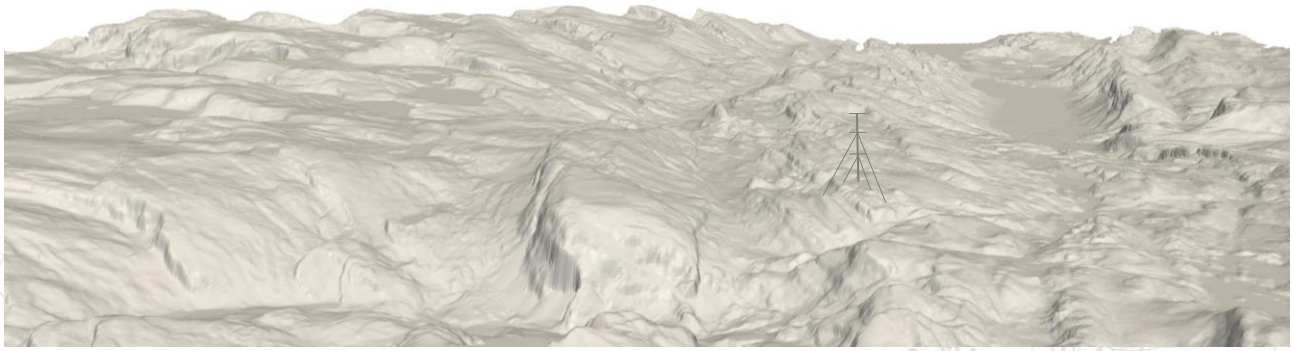
Measure turbulence and shear across entire wind farms? No problem!

Meventus' expertise in utilizing high precision lidar systems for wind regime assessment provides you with better accuracy in turbine load predictions.

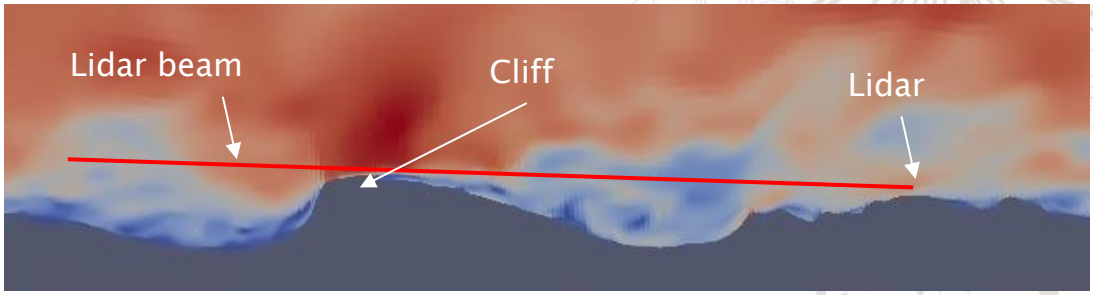
Through our innovative application of new lidar systems, Meventus has developed methodologies to better predict wind loading in highly complex or forested terrain. Using our methods, we can predict turbine loading and maintenance needs in the pre-construction phase with much higher accuracy.

Traditional wind resource assessments are typically based on wind data from one single met mast and extrapolated across the site using simple RANS-based flow models.



Can one measurement mast be representative across an entire complex site?

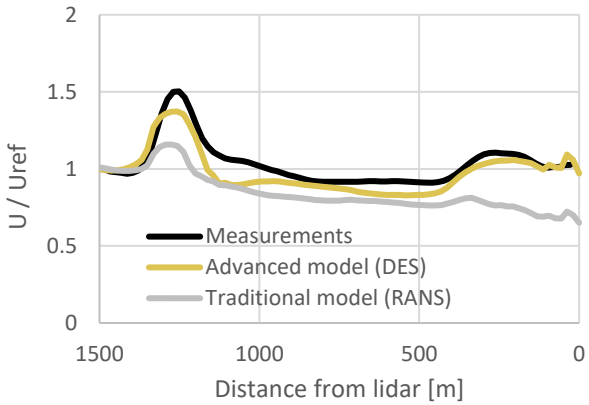
Our approach uses lidar systems with high spatial and temporal resolution in combination with advanced DES flow models. By using the lidar measurements along a line-of-sight for validation of the flow model, the number of validation points increases from one (using a traditional approach) to several hundred (using the Meventus approach). This increases the accuracy of the flow models significantly.



Schematic display of validation case, measuring flow recirculation and turbulence downwind a steep cliff using a high-resolution lidar system capable of measuring small scale turbulence at up to 2000 meter distance.

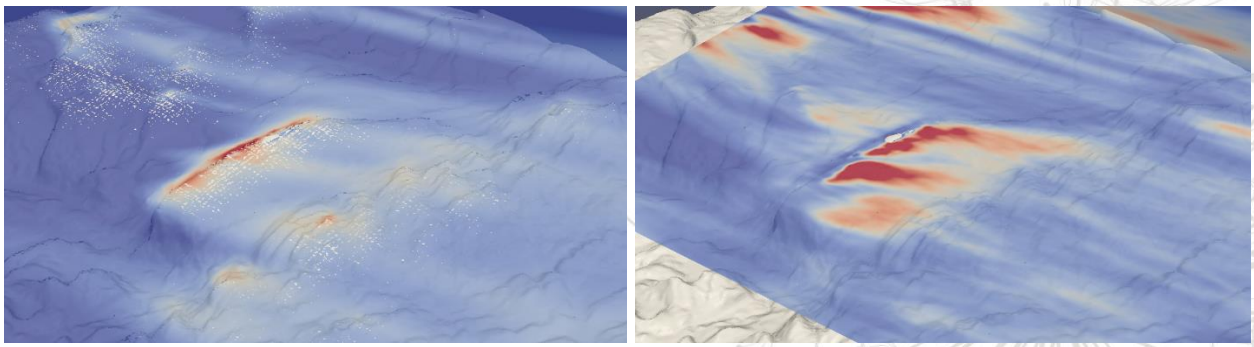
Using advanced flow models, we are capable of describing the physics of large scale turbulence in complex and forested terrain. We can document the accuracy of the models,

and use the models to predict wind loading on turbines across entire wind farms. The accuracy of the advanced models we use is superior to traditional RANS models that use crude approximations to model turbulent structures. These tend to fail in highly complex and forested terrain.



Model validation along a lidar line-of-sight clearly show shortfall of traditional RANS model in highly complex terrain. RANS model gives error in the order of 40%!.

Our novel approach to model validation is only possible using high resolution lidar systems, capable of measuring small scale turbulence structures at distances several kilometers away. Our system is capable of measuring at 2000 meters distance at 1Hz with spatial resolution of 12-18 meters. On distances shorter than 1000 meters, spatial and temporal resolution can be reduced to 9 meters at 10 Hz.



RANS model (left) shows clear underprediction of turbulence behind cliff. DES model better describes the physics of large scale recirculation.

Please contact Meventus for more information, client references and how you could benefit from our expertise in Advanced Lidar Applications.

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Your partner in wind

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