

POWSEIDOM

Deployment of wind and turbulence observations in the Mediterranean

DURATION: 30 months (2021-2024) | Total budget: €834K

CONTEXT

The Gulf of Lion, an area with a high potential for the development of floating wind turbines, is the focus of the challenges of fine characterisation of the wind resource and precise knowledge of the environmental conditions. In this region, direct measurements are currently collected through a network of coastal anemometers. **However, offshore data are needed to validate the numerical models used to characterise the resource and to design the systems. While the installation of anemometers on masts in deep waters is technically excluded, the use of remote sensing devices, such as profiling lidar, is promising.**

OBJECTIVES

- To overcome the lack of wind and turbulence data from in-situ measurements in the Gulf of Lion
- To propose specific recommendations for the design of offshore wind turbines in this region

MAIN ACHIEVEMENTS

- **Deployment** of a WindCube v2.1 lidar operating at 4 Hz (acquisition frequency 4x that of a commercial lidar of the same type)
- **Preliminary study** of the lidar's ability to measure turbulence by comparison with a mast equipped with anemometers
- **Characterisation** of turbulence in the Gulf of Lion using measurements from a lidar deployed on the island of Planier
- **Testing** a lidar onboard a mobile platform reproducing the movements of a buoy deployed at sea
- **Development** of a motion compensation algorithm
- **Elaboration** of recommendations for calculating wind-induced loads acting on structures deployed in the Gulf of Lion, taking into account turbulence intensity and spectra

CONCLUSION

POWSEIDOM demonstrated the ability of a profiling lidar to measure turbulence intensity and laid the foundations for a motion compensation algorithm. Unprecedented data sets have been compiled in terms of location, frequency and duration acquisition. Recommendations based on turbulence intensity and spectra were drawn up for calculating wind-induced loads on wind turbines.



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TECHNOLOGIES



STAGES OF THE VALUE CHAIN



Design



O&M

MAIN OUTPUTS

- **Dataset** for comparing lidar versus anemometer measurements
- **Processed dataset** from lidar measurements taken over a period of one year at a site representative of pilot farms in the Mediterranean: mean winds and direction, turbulence intensity, dissipation, low level jets
- **Methodology** for characterising atmospheric turbulence using the so-called variance method applied to data from lidar measurements
- **Dataset** for comparing fixed versus mobile lidar measurements
- **Preliminary motion compensation algorithm** for measuring turbulence using onboard lidar on a mobile platform

PARTNERS



This project benefits from French State funding of €284K managed by the National Research Agency under the France 2030 investment plan.