

The BeNeWakes project: combining fixed, floating, and scanning LiDARs to produce high-quality measurements of wind farm wakes from near field to inter-farm effects

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BeNeWakes: wake measurements at a new scale. A public dataset to accelerate research and innovation

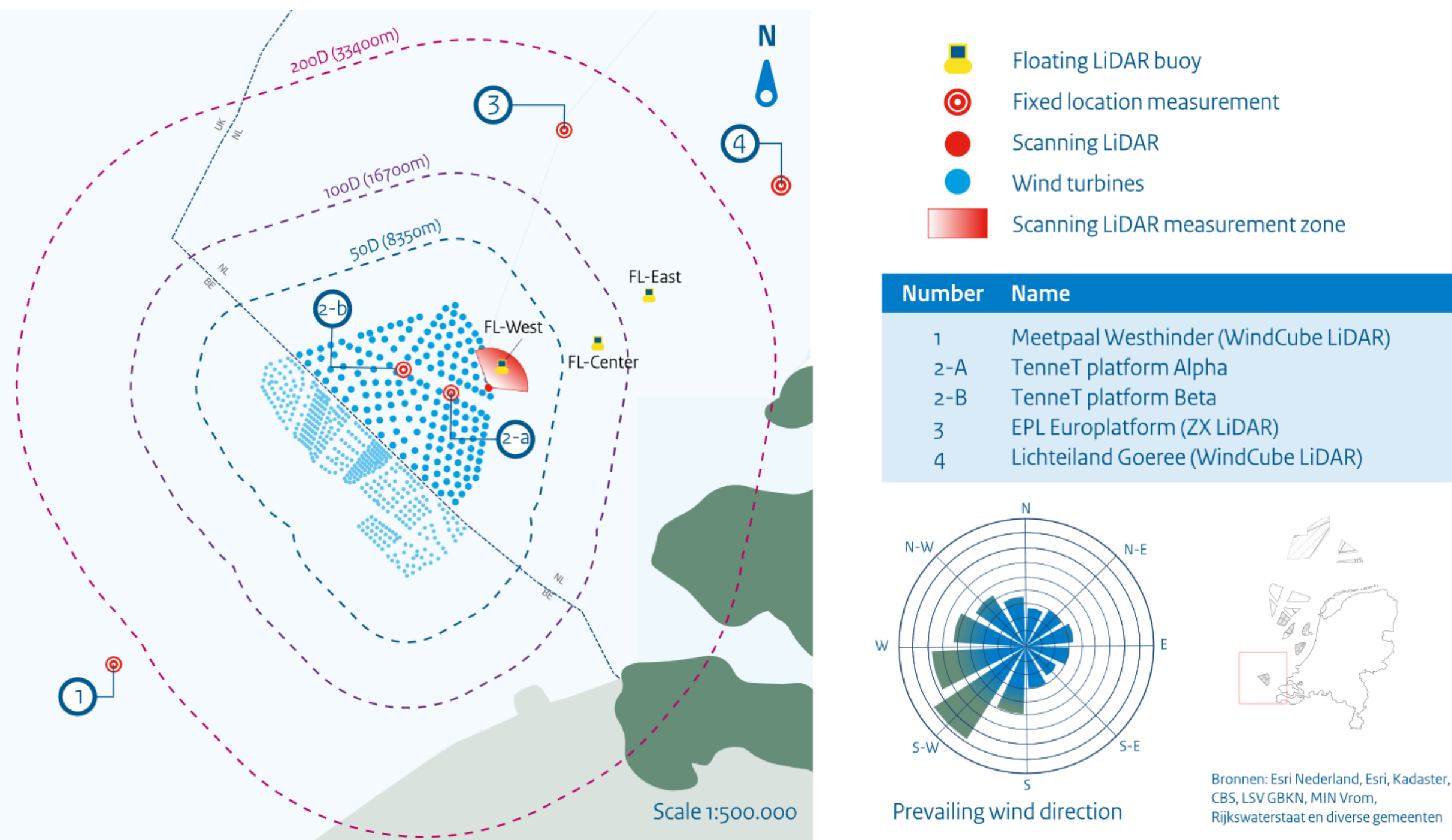


Figure 1: Campaign LiDAR overview

Project consortium

The project includes contribution from multiple agencies and companies: RVO, REdouble, Accurasea, TNO, Mecal, KNMI, Rijkswaterstaat, Orsted and Afry.

Current status

The measurement campaign is now fully deployed. The three floating LiDAR buoys and the scanning LiDAR were all installed in December. LiDAR data streams from TNO at platforms LEG and EPL are operational and being integrated to the quality control. In parallel, we have retrieved and are processing KNMI data from their LiDARs and ceilometer at the TenneT offshore transformer platforms; and Rijkswaterstaat buoys data from around the wind farm. Finally, atmospheric (HARMONIE, KNMI) and wave (SWAN, Rijkswaterstaat) model outputs are being archived and will be integrated within the coming weeks, establishing a comprehensive multi-sensor, multi-scale wake dataset.

First analysis

Initial analysis has begun. Vertical wind profiles from the three floating LiDAR buoys and LEG show consistent directional dependence. Under south-westerly winds (across the wind farm) all buoys record a clear wind speed deficit. Also, a modified shear structure at FL-West is observed (see in Figure 2). Together with additional quality and consistency checks, this confirms that the campaign is capturing the targeted wake effects. First wind-field maps from the scanning LiDAR have been generated (see in Figure 3), and we are extracting wind speeds and direction at higher altitudes to extend the vertical profile above FL-West.

Final results and future outlook

The dataset and analyses will be released in Q3 2026. We aim at a broad dissemination to maximise visibility and enable both academia and industry to fully benefit from it.

The project and its goals

The BeNeWakes project is an offshore wake measurement campaign capturing long-range wake dynamics behind the Borssele wind farm cluster (± 3.4 GW). We deployed scanning and floating LiDAR systems alongside existing meteorological sensors to collect high-quality, real-world wake data over tens of kilometres. Figure 1 shows the campaign setup. This dataset fills a critical gap for validating and improving wake models, reducing uncertainty in energy yield and load predictions, and enhancing wind farm design, planning and optimisation. All data will be fully open-access once the campaign closes. By advancing our understanding of wake behaviour at scale, we support more efficient and reliable offshore wind development.

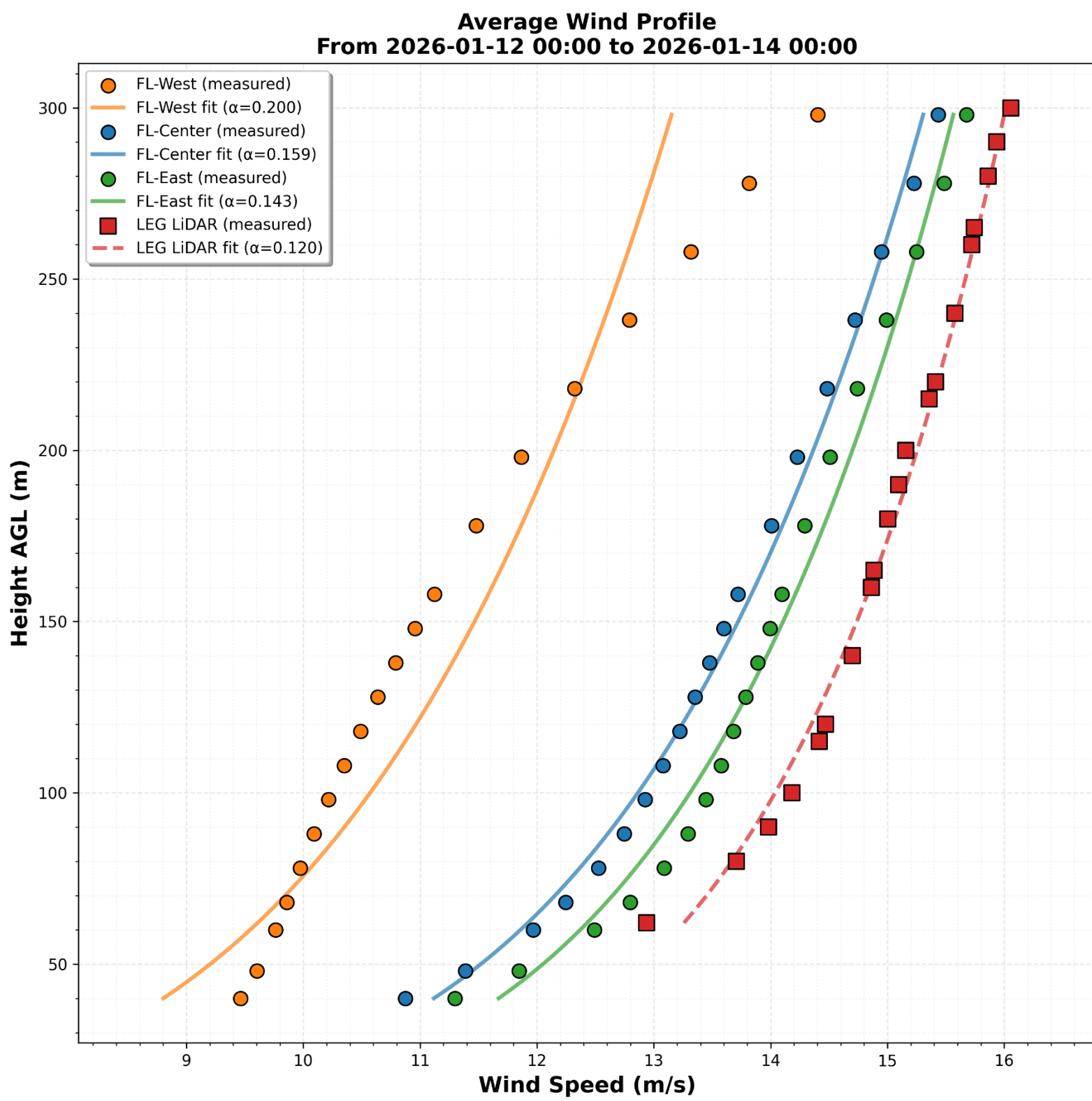


Figure 2: Wind profiles

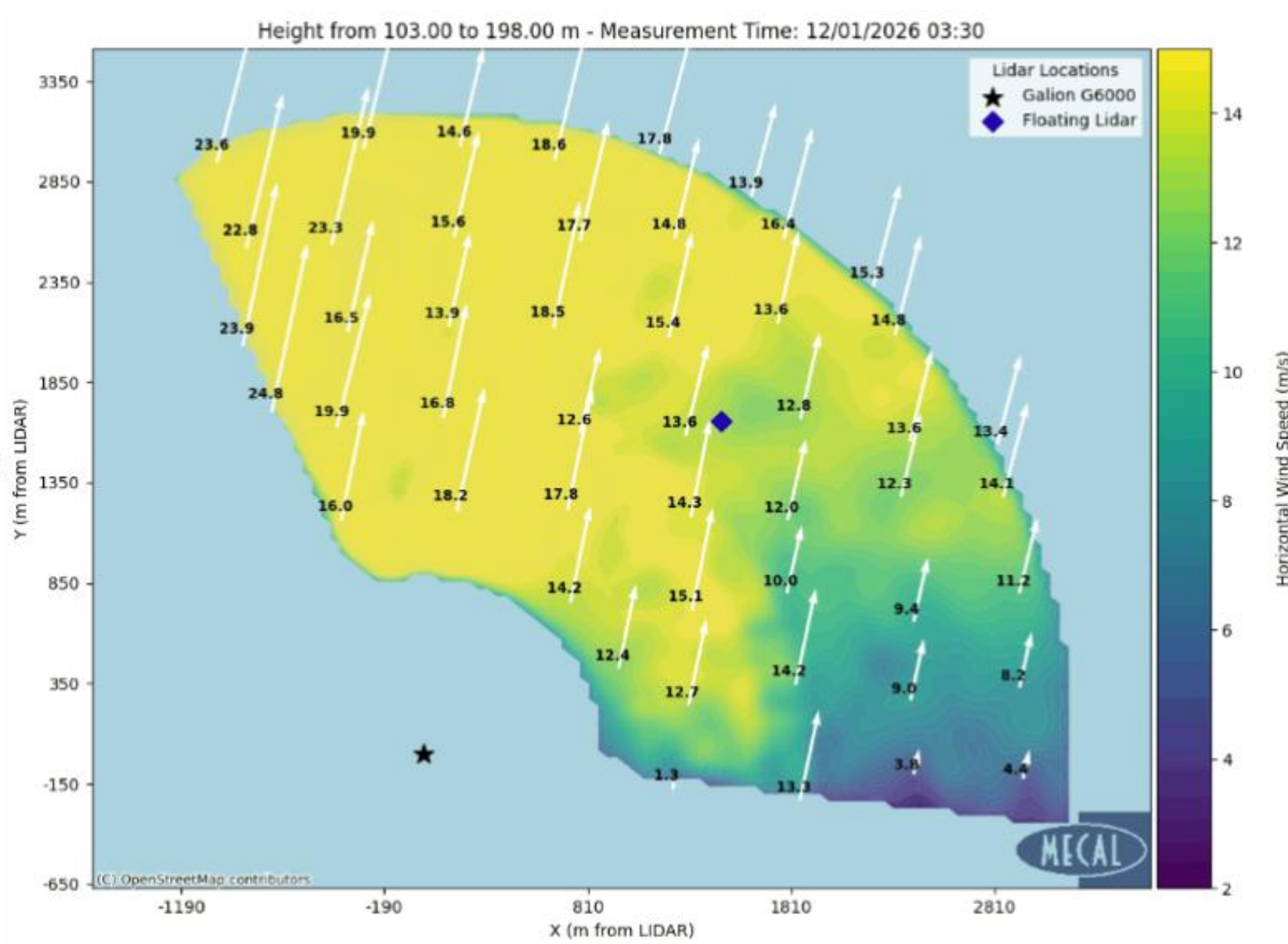


Figure 3: Wind field scan