

Industry standard compliant offshore wind speed measurements, on floating platform

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Abstract

The offshore wind industry must be fully competitive with new conventional power by 2025.

One of the most important drivers for reducing the cost of energy is minimizing the uncertainty and have good knowledge of the wind resources, as a small deviation of the wind speed values may have significant effect in the wind farm cash flows.

This would have tremendous impact on the viability of a project, especially if offshore energy cost reduction is a goal.

Onshore, a measurement campaign usually lasts for at least one year. Afterwards the gathered/processed data are compared to long-term data from other sources.

In offshore environments a several years campaign is recommended.

Due to the remote and many times inaccessible environment, as the offshore wind industry keeps pushing away from the shores, a long term campaign can be performed by means that have low energy and maintenance needs.

A proven, technology that incorporates the above is a Met mast, as it offers Hub height industry standard measurements with low energy consumption and easy maintenance. A Met mast though, is a significant investment at the early development stages of a project, which increases radically as the sea depth increases.

Respectively, the floating RSD is a low cost, portable solution with easy deployment almost at any water depth, with low environmental impact able to perform hub height measurements. However it introduces a risk, that arises by the lack of industry standards for wind resource assessments performed with it.

Objectives

The main objective is the ability of performing Low cost offshore wind measurements according to Industry standards.

Methods

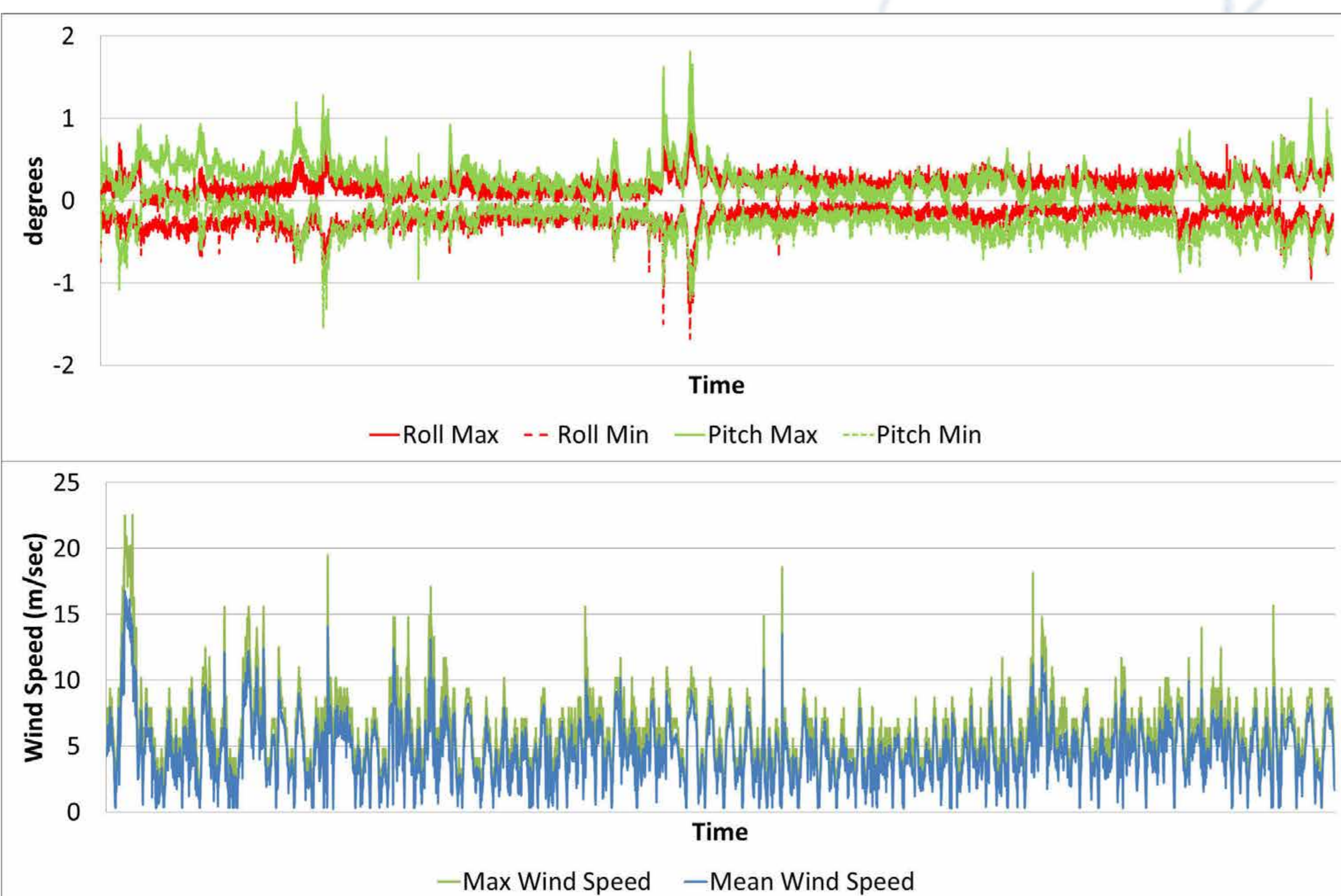
seaLIDAR is a purpose made, stable floating platform able to perform offshore wind measurements. seaLIDAR hosts both a Met Mast and a LiDAR. Data regarding the movement of the platform were recorded to prove it's stability and the quality of the collected wind data.

Wind data from seaLIDAR platform were correlated with wind data from a nearby Fixed Met Mast to prove the quality of the offshore data collected.

Results

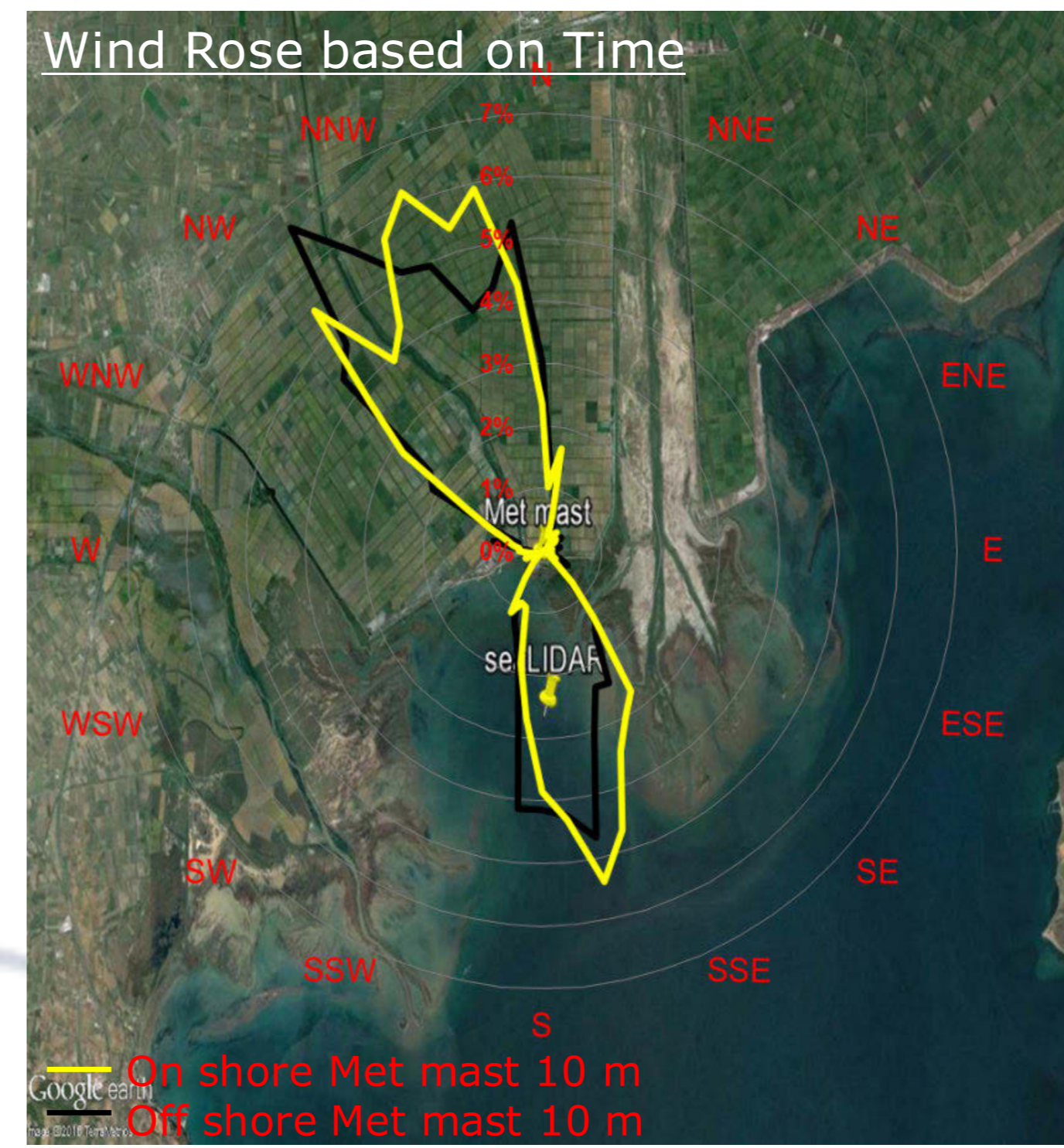
• A case campaign

During the campaign the recorded data show that the movement of seaLIDAR platform movement is well within the $\pm 2^\circ$, range even for high speed wind gusts.



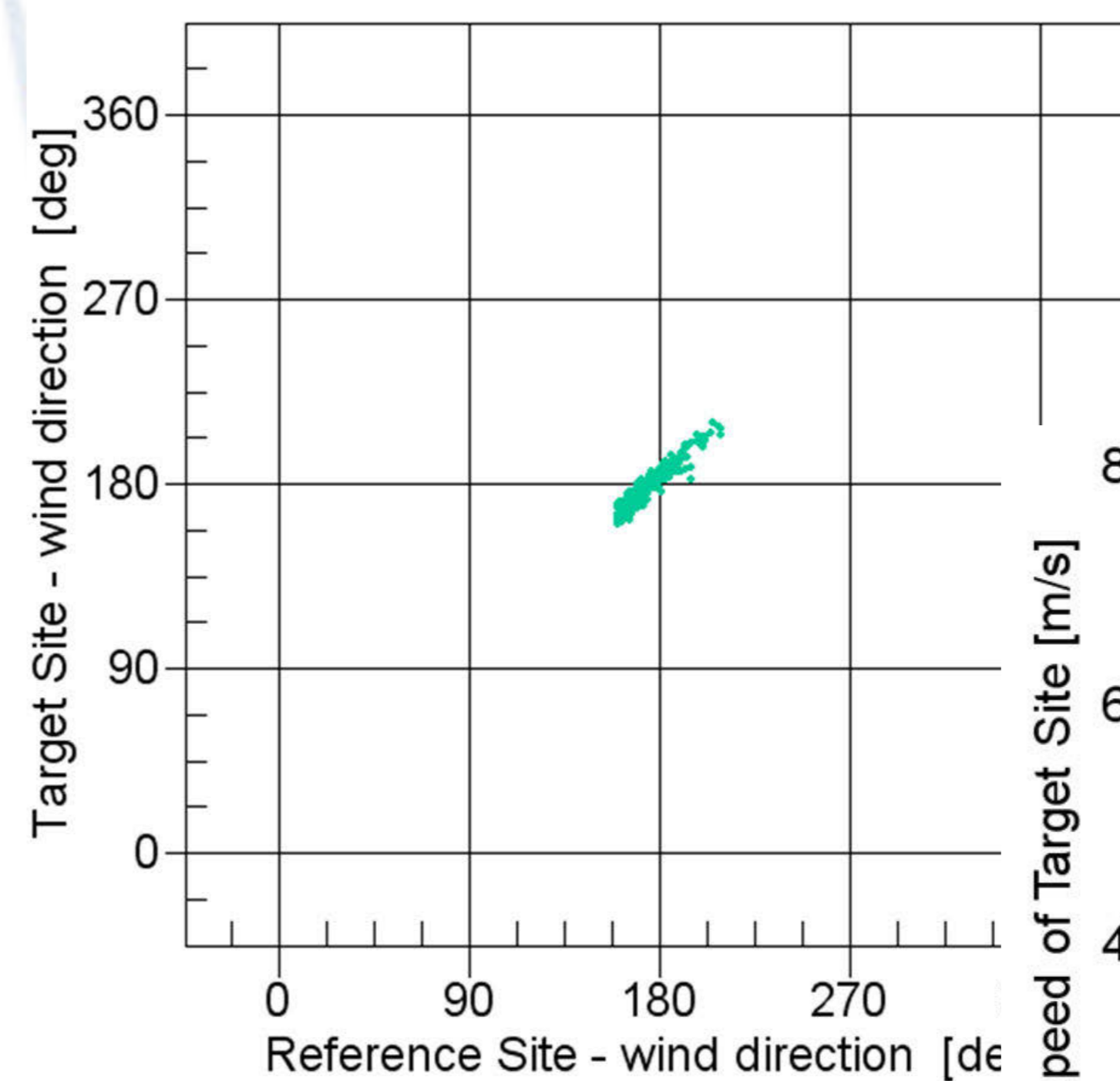
• Correlation with a fixed mast

To validate the wind data recorded by seaLIDAR, a 40 meter met mast was installed in the near shore at a distance of 2.2 km from the floating platform.



To get data sets suitable to check the performance of seaLIDAR we take into account wind data from 160° to 220° .

Concurrent data set - Wind Direction
10-min data with $U > 5\text{m/s}$

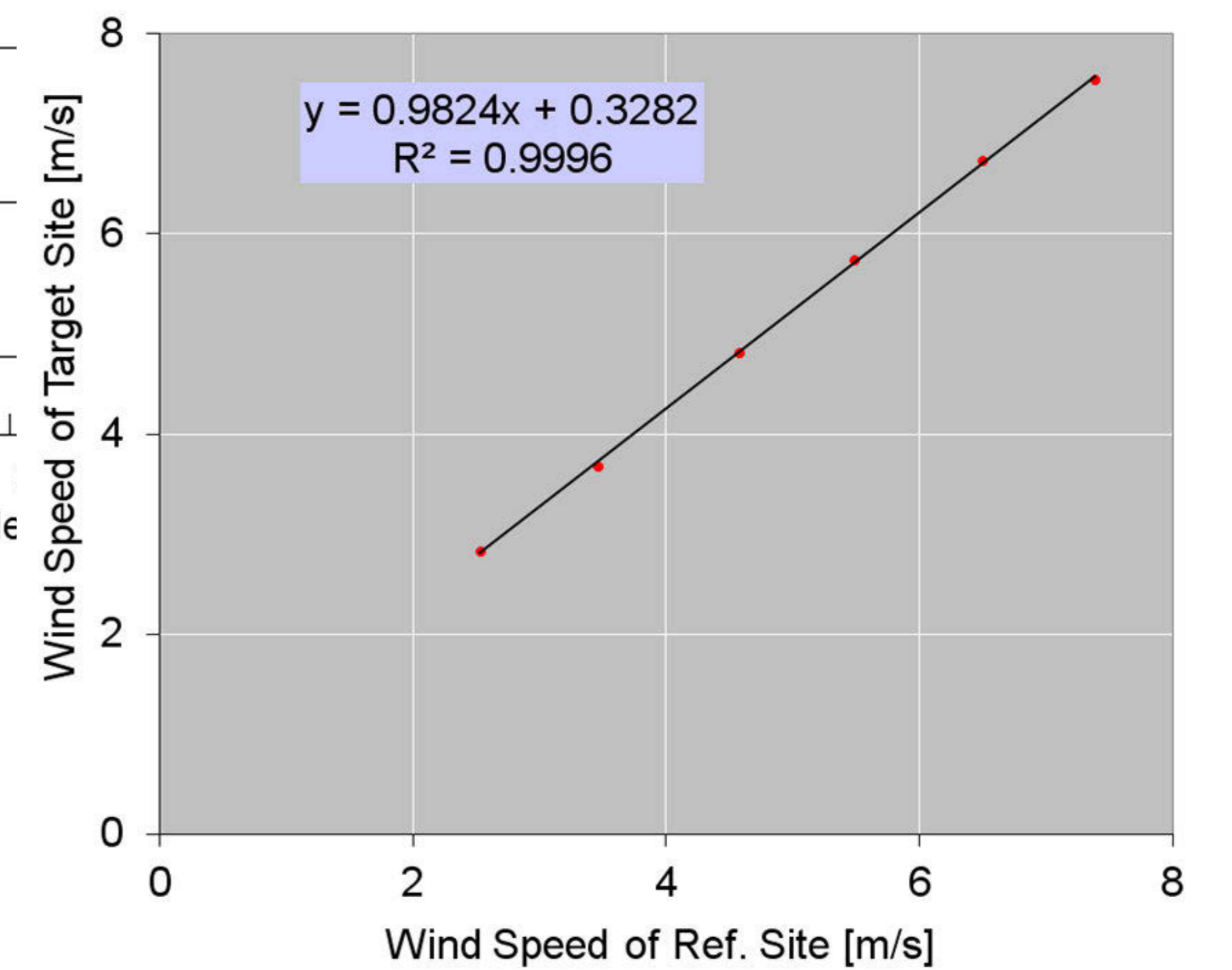
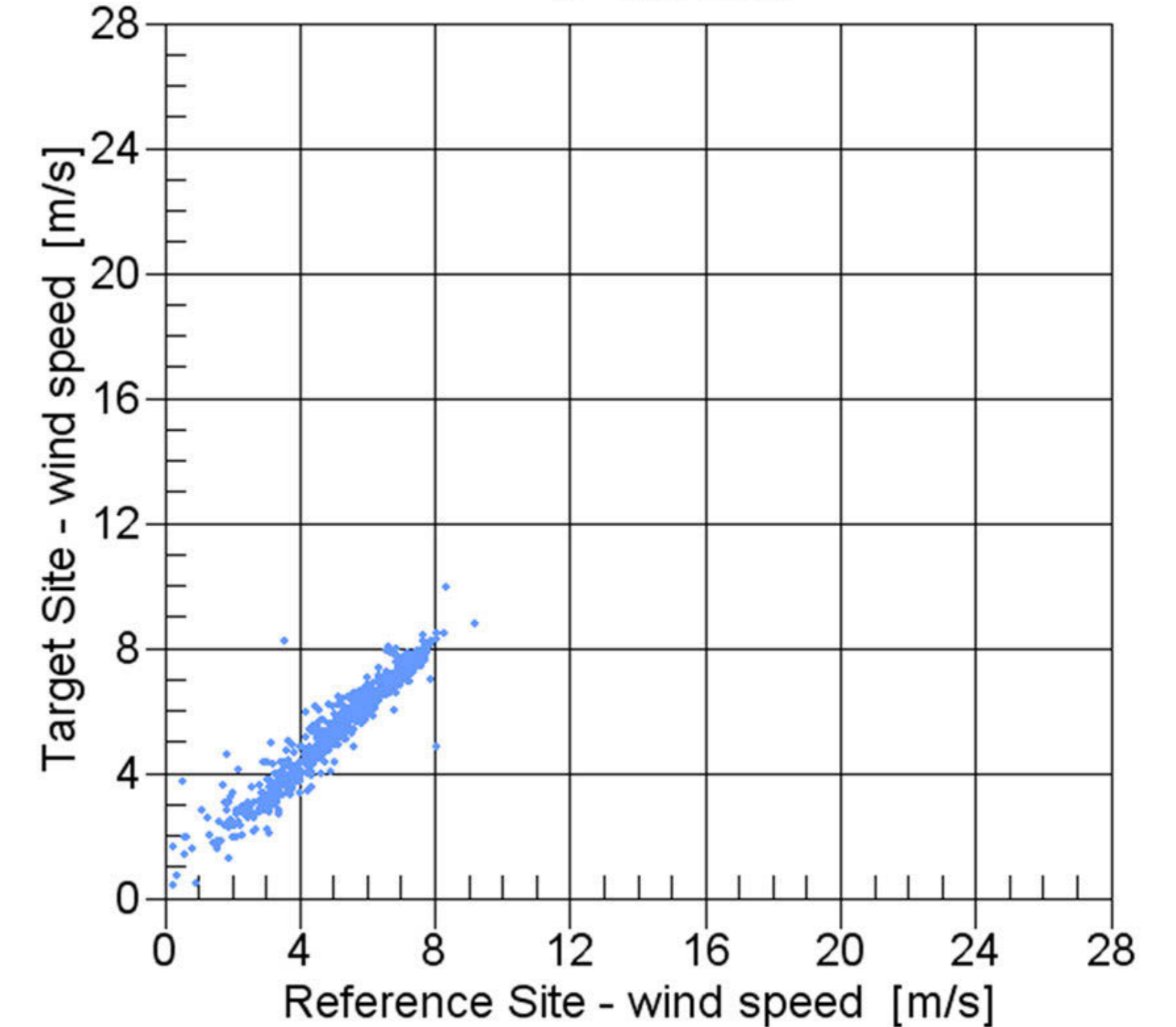


40m Met mast, and seaLIDAR, at the north Aegean sea near Thessaloniki, Macedonia-Greece.

- R^2 for direction : 0.96

Rotational move, typically imposed by the sea waves and currents, has no effect at seaLIDAR.

Concurrent data set - Wind Speed
10-min data



Conclusions

Results show that the wind data collected using seaLIDAR are bankable data, since the platform movement is well within the $\pm 2^\circ$ range required by the current industry standards –IEC 61400-.

Further more the correlation of seaLIDAR data with the fixed onshore mast is very good showing high certainty.

The above and taking into account all the other characteristics of seaLIDAR

- Portability and simple assembly
- Ease of deployment at any water depth with no need for underwater works
- Low energy and maintenance needs
- High accurate wind resource assessment using all the current technology advancements makes it the best solution for offshore wind measurements.

References

1. IEC EN 61400
2. MEASNET Document, Evaluation of site-specific wind conditions v.1, November 2009

