

Nick Gerardus Cornelis Janssen, Eduardo Gil Marín,  
Sowjanya Subramaniam Iyer  
ROMO Wind

ROMO Wind has developed an innovative way to process iSpin measurements, which requires only a single sensor, instead of three.

## Single-sensor iSpin

A traditional iSpin system consists of a controller, and three ultrasonic wind speed sensors on the spinner of a wind turbine. The iSpin system was successfully reduced from a multi-sensor system to a single sensor measurement system, **lowering the cost significantly.**

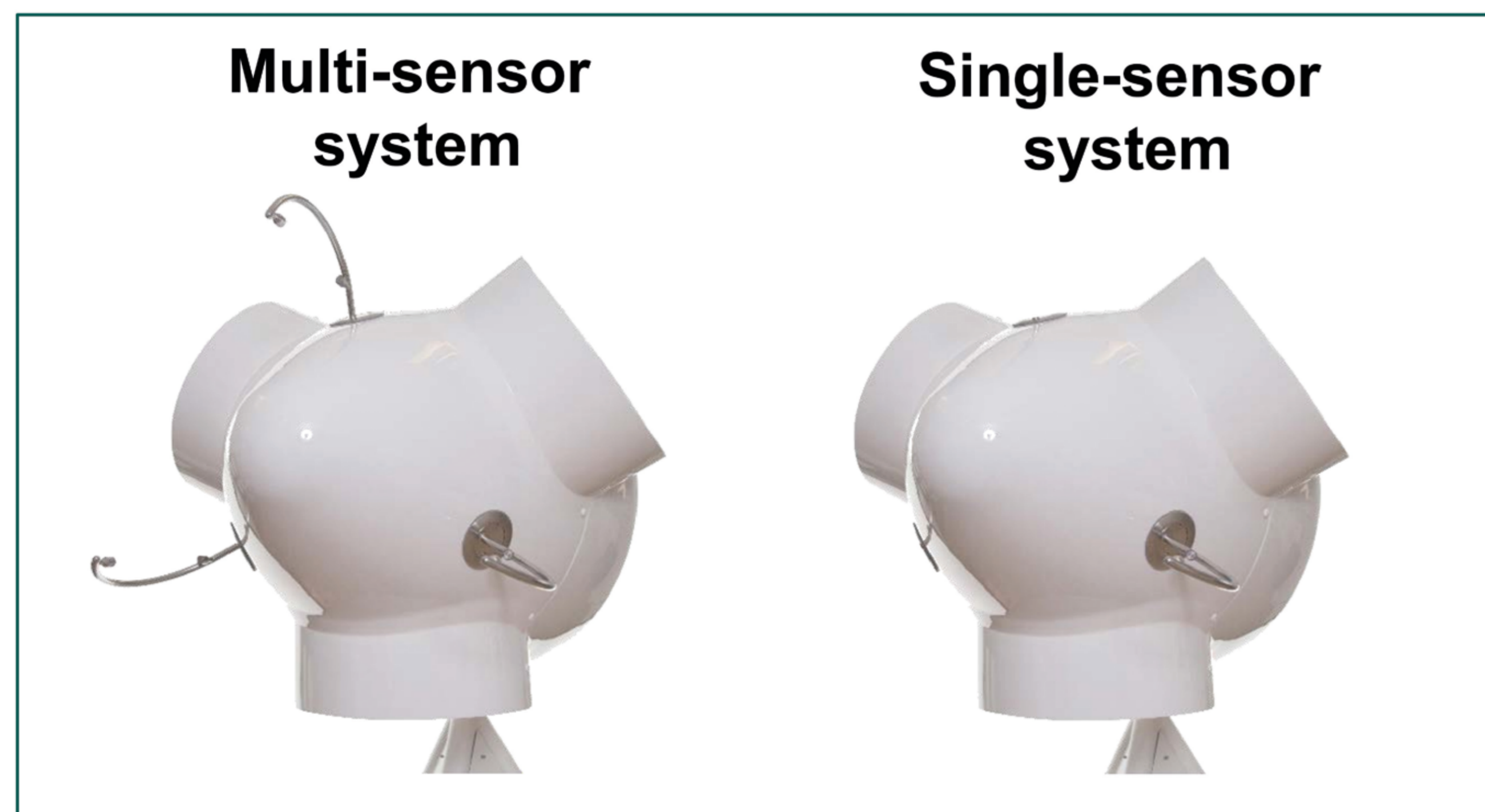


Figure 1: Illustration of multi- as well as single-sensor setup

## Methodology

With a multi-sensor setup, three independent measurements from three independent sensors are used to construct a three-dimensional wind speed vector:

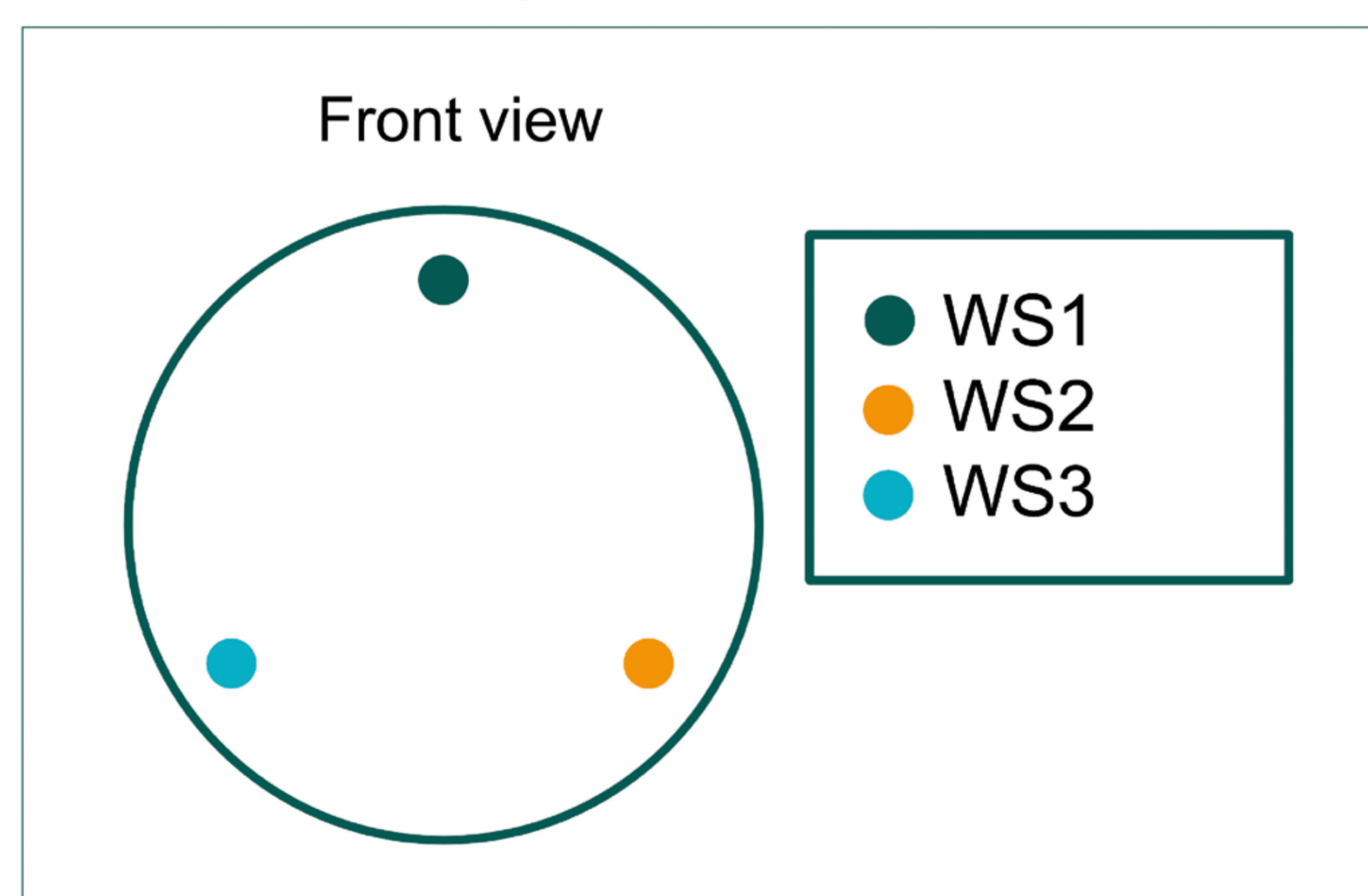


Figure 2: Schematic of the multi-sensor measurement setup

A single-sensor setup can be achieved, because each sensor travels along the same path and therefore collects **the same information** during a rotation. Storing historical information makes it possible to make up for the missing sensors:

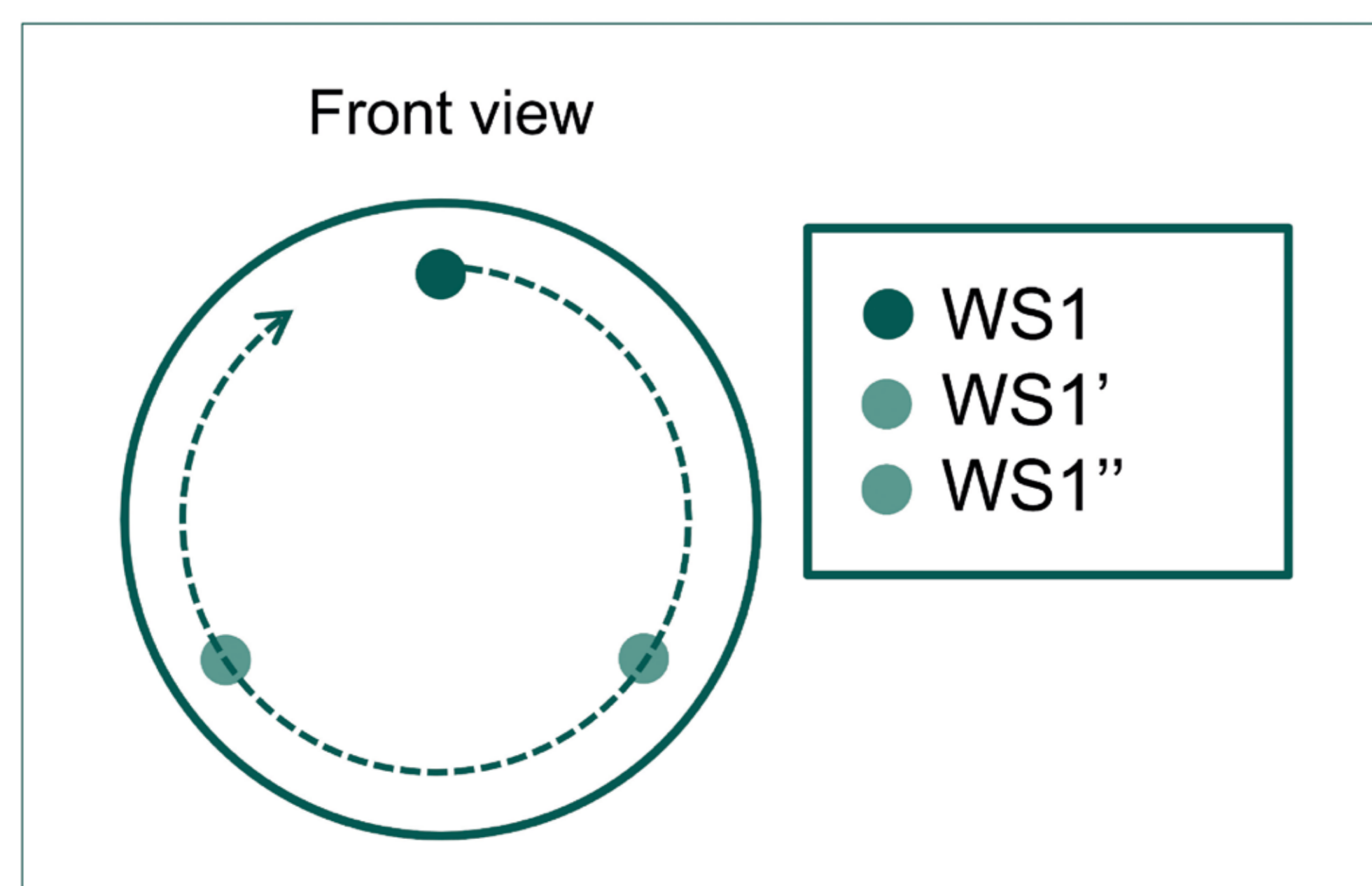


Figure 3: Schematic of the multi-sensor measurement setup

## Results

Results from a single-sensor measurement setup were compared to a multi-sensor setup. Note that the single-sensor time series looks like a running average, because it uses historical data from **up to 1 minute back in time.**

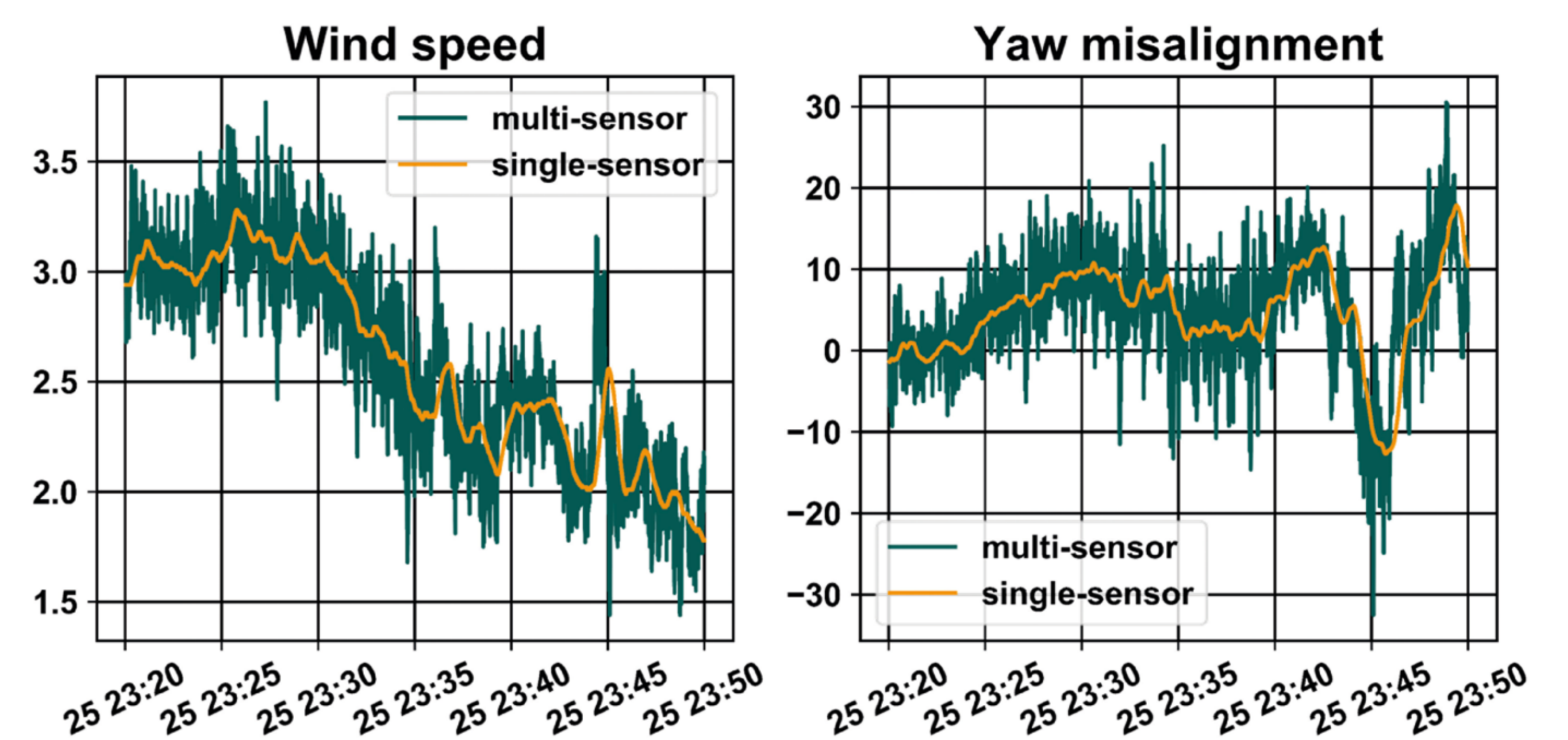


Figure 4: Time-series of multi- as well as single-sensor setup

It was concluded that measurements are equally accurate when using a single sensor. When comparing multi-sensor measurements to single-sensor measurements, correlation coefficients **above 99%** were obtained:

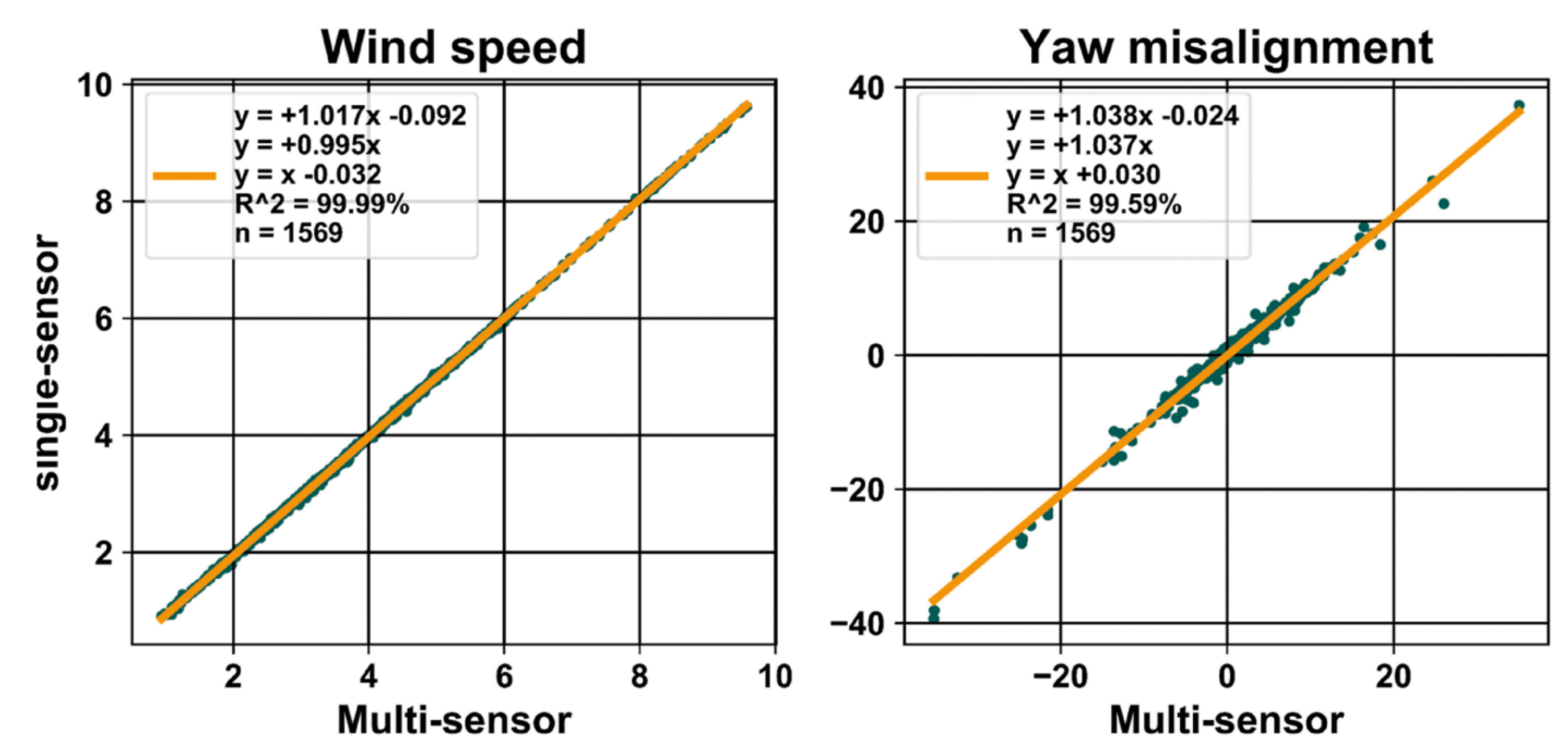


Figure 5: Multi-sensor iSpin measurements vs. single-sensor measurements

This means, that it is safe to reduce the amount of iSpin sensors on the spinner from three to one.

## Conclusion & limitations

From the previous section it was concluded that single-sensor measurements are **equally accurate** as multi-sensor measurements. There are however also some limitations:

- The turbine needs to rotate, in order to measure
- The redundancy of the system is lower
- Turbulence intensity (TI) is not comparable to traditional TI

## References

[1] Pedersen, T.F. (2010) *Spinner anemometry - basic principles for application of the technology*. Risø-I-2968(EN)(rev.1)

