# Supplemental Material

## Using computational fluid dynamics and field experiments to improve vehicle-based wind measurements for environmental monitoring.

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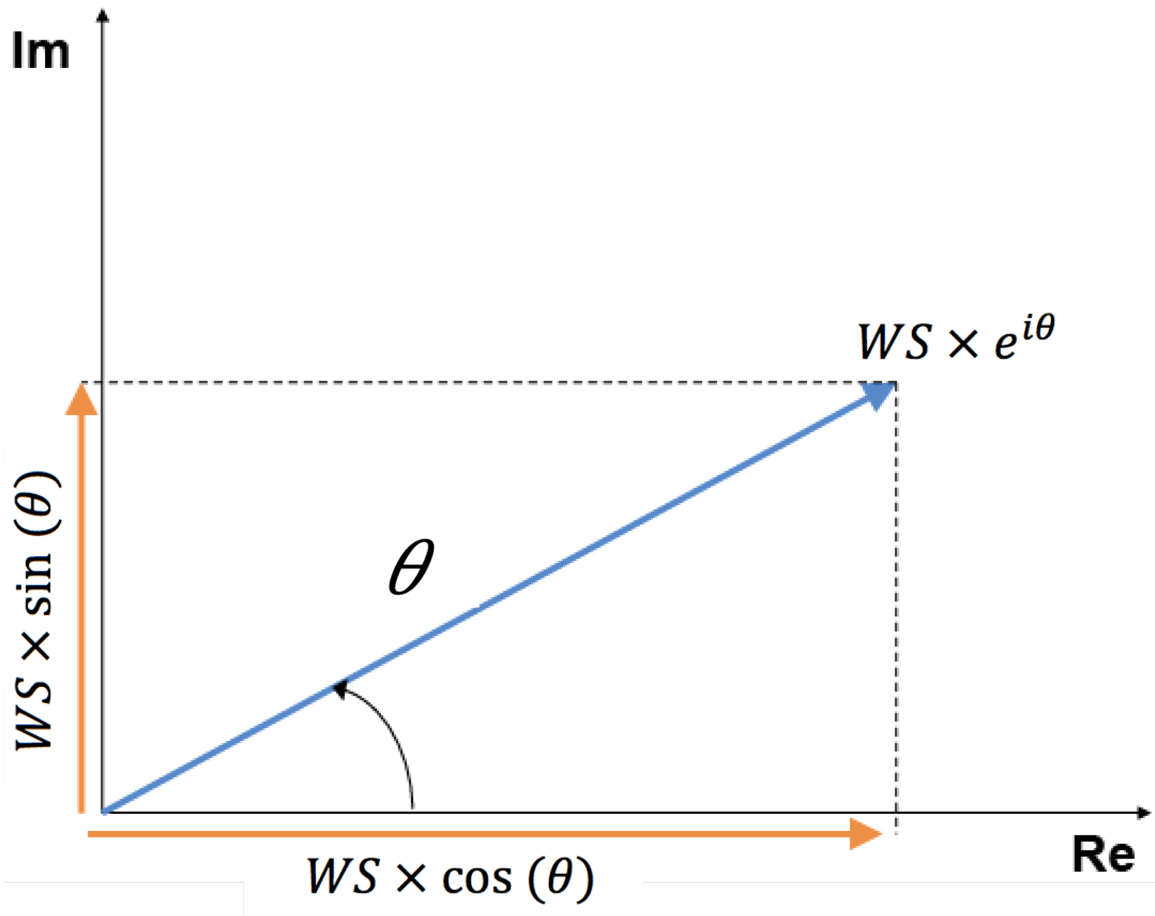
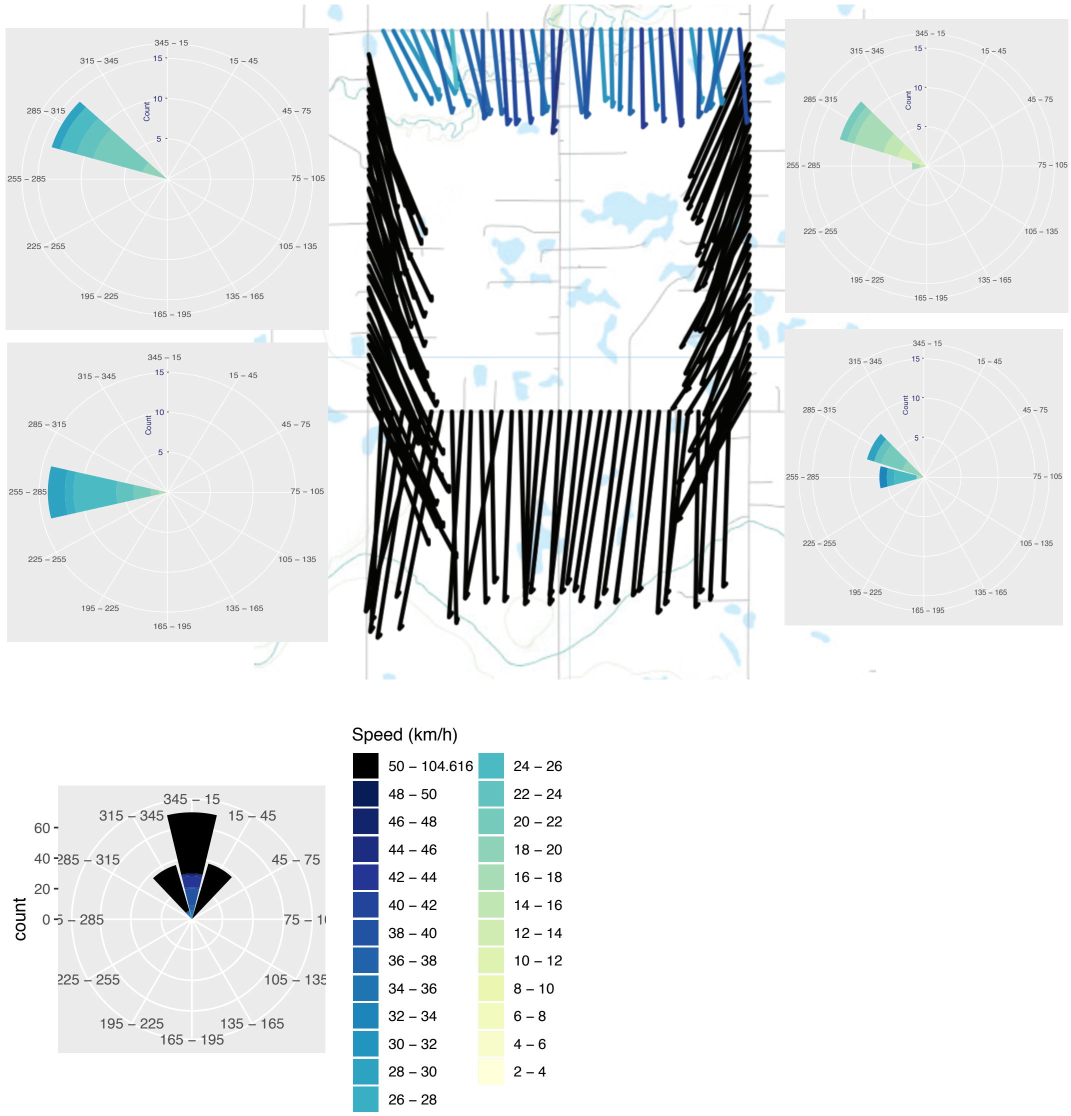



Figure S1: Illustration of using complex exponential form to keep the wind speed and wind direction as one vector, as opposed to separating them into components.

## S1. Method of Vector Translation

Measured wind vectors relative to the vehicle must be translated to true wind vectors relative to the ground. This correction requires working in three different reference frames: the truck frame, the math frame (cartesian or complex), and the geographic frame. We had to first calculate the vehicle vector from the GPS coordinates in the geographic coordinate system, then translate the anemometer wind vector from the truck's coordinate system using the GPS coordinates, before lastly removing the vehicle vector from the anemometer wind vector. We expressed all vectors in terms of the complex plane. In Figure S1, we expressed the wind vector in terms of the magnitude (WS) and angle ($\theta$) in complex exponential form (WS x $e^{i\theta}$). We also used trigonometric functions to display the real component of the vector WS x $\cos(\theta)$ and the imaginary component of the vector WS x $\sin(\theta)$. We expressed all vectors in complex exponential form instead of using trigonometric functions to calculate vector components. To average measurements, we averaged the real and imaginary components to create a resultant vector. The calculated averaged wind speed and wind direction are the magnitude and direction of the resultant vector.

## S2. *Raw Speed Measurements*




(b) Raw wind vector measurements collected when within 2.5 km $h^{-1}$ of 60 km $h^{-1}$.

**Figure S2.** ***Uncorrected anemometer measurements sampled during the 60 km $h^{-1}$ field test.***

Figure S2 shows raw wind measurements to complement figure 8.