Interactive comment on "A Framework for Autonomous Wind Farms: Wind Direction Consensus" *by* Jennifer Annoni et al.

Anonymous Referee #2

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This paper proposes an algorithm to estimate the wind direction using a consensus algorithm within relatively small clusters of turbines (∼10 turbines) in a wind farm. The proposed algorithm is based on available SCADA measurements of wind direction at the turbine level. The proposed algorithm does not rely of a physics-based model of the turbines or the flow field.

The use of consensus algorithm for this application is interesting. The presentation obscures the contribution. There are high-level issues that start with the title and continue with the presentation of certain material. There are technical questions to be addressed. Lastly, there are minor issues that would need to be considered by the authors.

High-level issues:

-The title does not seemed focused on the problem considered. That is, "wind direction estimation using SCADA data" is the topic of the paper. Thus, why "mention autonomous wind farms? In fact, what do the authors mean by an autonomous wind farm?

-One might guess that the answer is in section 2, but this section is not that relevant to the paper; an autonomous wind farm is loosely defined as one that "self-organizes into groups, monitors, and controls its performance in real time based on existing SCADA data." But this paper has no self-organization and no control.

-Section 2 then goes onto discussing directed and undirected networks. What is the point of discussing directed networks when only undirected ones are used later? This distracts from the main point of the paper. Another point of distraction is the title of section 2.3; there is no control in this paper.

Technical issues

-Elaborate on the selection of rho and lambda. Are these parameters the same for all 10-turbine clusters in the farm?

-How do you use the SCADA data to "interpolate" wind direction at the two met tower locations?

-In section 5 you validate the approach at the sodar location (fig. 5). This is a good idea and it would be helpful to know the sodar location.

-After comparison with the sodar, there is comparison between estimated wind direction and SCADA measured direction. You use consensus amongst 10 turbines to mitigate errors at the single turbine SCADA measurement. Thus, this is confusing to me. Can you clarify? Can you present the uncertainty in the SCADA data? How does the result of the consensus algorithm compare with averaging the wind directions obtained from some of the turbines in a cluster (which is simpler)?

-It would help to review the literature from the meteorology community on the topic of

wind direction estimation from multiple sensors.

Minor issues:

-Equation (8), check the variable being optimized.

-What do you mean by x being non-convex after equation (11)?

-Where are the sodar and met towers in Fig. 2(a)? (4th sentence in paragraph one of section 4.)