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comment

Interactive comment on “Air Density Induced Error on Wind Energy Estimation” by Aurore Dupré et al.

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Thank you for your comment.

A. Indeed several researches deal with the impact of air density on the power curve. The literature review has been expanded following the referee's comment and we now detail some of these methods and their performances. In this work, we use the simplest approach in order to demonstrate that even this naive method allows significant improvements and even if the air density variations are weak, the impact remains significant. Of course, some sophisticated methods also lead to significant improvements and even if the comparison with the IEC normalization is not systematic (making comparisons difficult) they are now presented with their associated improvements. The purpose of this work is to highlight the impact of air density (even when variations are statistically low) on power modeling using measurements directly collected on site.

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B. To briefly recall the context, this study targets small structures like wind energy producers with small wind farms. For instance, this work was conducted thanks to a wind energy producer called Zephyr ENR who owns 6 farms with six wind turbines each. In this context, the forecasts accuracy is crucial. Indeed, according to IEC, the density normalization should be applied when the air density differs by more than 0.05 kg m^{-3} from the standard air density. This is not the case for the entire period (3 years) at the considered wind farm. However, we have shown that even if the variation in the air density seems weak over the entire year, it may lead to improvements up to 40% in the wind energy modeling. Consequently, this induced significant errors that should not be neglected. With regard to the power curves, Fig 2 shows the impact on their accuracy with a variation up to 20% in the power output depending on the air density.

C. The strength of this work is the use of in-situ data which is not systematic in the literature even in the latest study and especially for such a long time period. Nevertheless, the literature review has been improved by including the latest papers as suggested by the referee.

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