The study represents an interesting evaluation of the ability of the WRF model to predict offshore turbulence intensity. It makes a valuable contribution, particularly with regard to the validity of combining sub-grid and resolved TKE quantities to estimate TI. There are some areas that should however be addressed before publication:

1) The paper should make it clear that it is focusing on the sensitivity of the results to the use of higher resolution SST data as presumably different PBL schemes will have quite an effect on accuracy, particularly under different stability conditions.

Response: We thank the reviewer for the constructive comment. The choices of physical parameterizations for our simulations are essentially inherited from the setup for the 20-year wind resource dataset released by the National Renewable Energy Laboratory (NREL) (Optis et al. 2020) as the model configuration was determined through a series of model sensitivity experiments. That's the reason why the online TI calculation was implemented within the module of MYNN PBL parameterization in WRF model.

While the sensitivity of prescribed SST data in the model is specifically addressed in the manuscript, we acknowledge there are many other factors including the choice of PBL scheme would give variable results under certain conditions. Hence, we added a few sentence in Section 3.1 (Line 139 to 141 in the revised manuscript) to be more inclusive in consideration of modeling uncertainty for offshore wind.

2) The appropriateness of comparison to lidar measurements should be commented on. Part of the reason that the WRF simulated values under-estimate the TKE (e.g. fig 7) may be down to the sensitivity of a pulsed lidar to measuring TI in unstable conditions. The authors can refer to the paper:

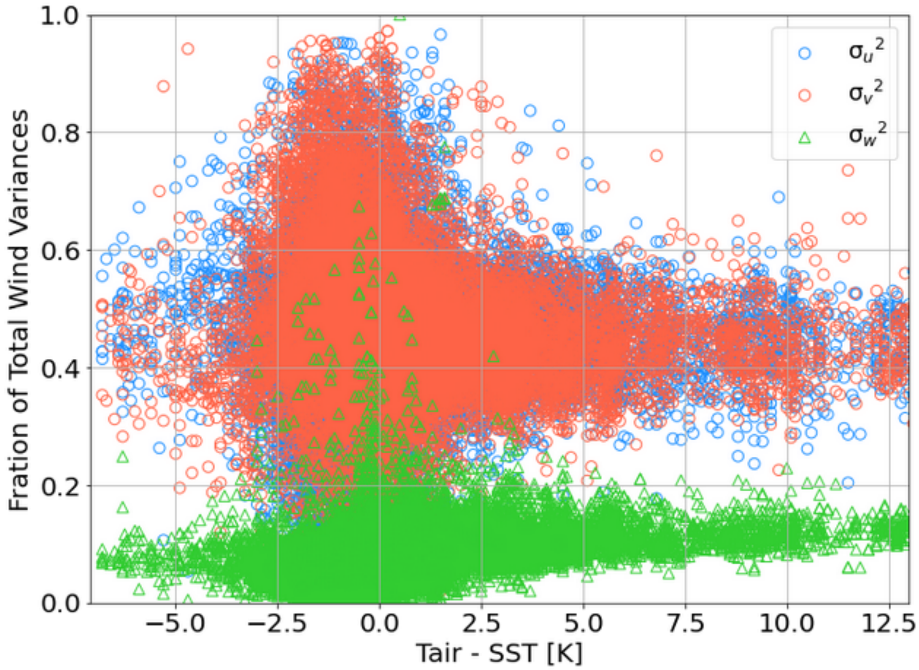
Sathe, A., Banta, R., Pauscher, L., Vogstad, K., Schlipf, D., Wylie, S., 2015. Estimating Turbulence Statistics and Parameters from Ground- and Nacelle-Based Lidar Measurements. IEA Wind Task 32 Expert Report. ISBN 978-87-93278-35-6. This report indicates that pulsed lidars can measure a value of turbulence which is significantly higher than a sonic at 80m above the ground under unstable conditions.

Response: We thank the reviewer for providing the insights into the potential uncertainties in TI modeling from the perspective of lidar turbulence measurement and atmospheric stability. We agree this report is a great reference for us and the readers. We have included a few sentences from Line 421 to 424 in Section 4.2 including the reference to this report.

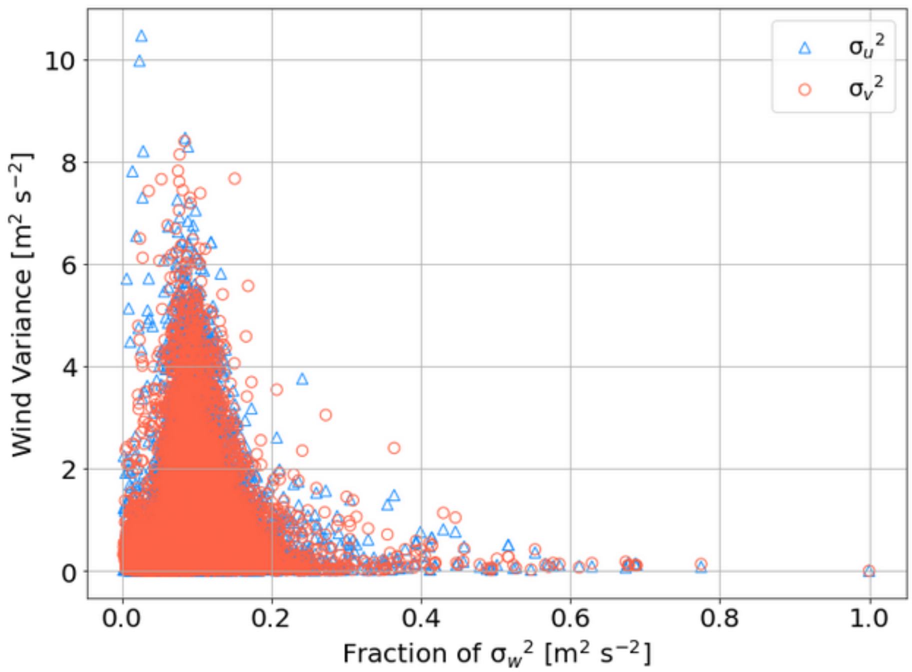
3) The assumption that the vertical component of turbulence can be neglected could be validated from the lidar measurements. This would be especially pertinent under unstable conditions.

Response: We thank the reviewer for the suggestion. To address the comment in relative importance of wind variances, we conducted additional analysis of observational datasets collected at the MVCO ASIT and we used them to characterize the distribution of observed wind variances and summarized results as following:

Figure below shows the fraction of three components of wind variances ($\frac{\sigma_u^2}{\sigma_u^2+\sigma_v^2+\sigma_w^2}$, $\frac{\sigma_v^2}{\sigma_u^2+\sigma_v^2+\sigma_w^2}$, $\frac{\sigma_w^2}{\sigma_u^2+\sigma_v^2+\sigma_w^2}$) normalized by the total variance as a function of stability (using buoy-measured air temperature minus SST as its proxy). The results suggest overall, the fractions of horizontal wind variances (σ_u^2 and σ_v^2) are larger than the vertical wind variance (σ_w^2). In addition, there is no evident correlation between the fraction of σ_w^2 and stability. In most of the conditions, the fraction of σ_w^2 is no greater than 0.2. Only a few data points exceed 0.2 but they mostly occur during neutral conditions (Tair – SST is close to zero).



We further analyze what may cause those data having relatively large fraction of σ_w^2. By looking at the corresponding horizontal wind variances (σ_u^2 and σ_v^2) in function of fraction of σ_w^2 as in the figure below, we find that the relatively large fraction of σ_w^2 (larger than 0.4) is most likely due to concurrently small values in σ_u^2 and σ_v^2 (smaller than 1 $m^2\,s^{-2}$).



A figure (Figure 2 in the revised manuscript) is added to illustrate the observed PDFs of three wind components of variances and their dependency on stability. Corresponding descriptions can be found in Section 3.2 from Line 202 to 261.

Although the paper is generally well written, there are a number of typos and instances of bade phrases that should be corrected by a thorough proof-reading.

Response: We thank the reviewer for the note. We've went through the manuscript and made appropriate corrections on the typos as well as the phrases were not accurately assigned.