General Comments

The manuscript addresses an interesting and timely topic with clear relevance for wind energy and climate-impact studies. The analysis of low-wind events at both 10 m and 100 m heights has the potential to provide valuable insights. However, several methodological choices and explanations require further clarification before the conclusions can be fully supported.

My main concern relates to the use of the same low-wind threshold for both 10 m and 100 m wind speeds. Given that wind speed is generally lower near the surface and higher at turbine-relevant heights, the rationale for applying an identical threshold at both levels is not sufficiently justified. This issue is particularly important because one of the stated objectives of the study is to distinguish between low-wind conditions at these two heights. The current approach may therefore obscure meaningful differences between surface-level and turbine-height low-wind events.

Specific Comments

Section 2.1

This section would benefit from substantial restructuring. While the overview of previous studies is useful, the classification of the literature appears overlapping and somewhat repetitive. For example, the first paragraph already discusses classifications based on low-wind speed thresholds, while similar concepts are revisited in the second paragraph. A clearer and more systematic categorization of previous studies would improve readability and better position the contribution of the present work.

Relevance of Shallow Low-Wind Events

From a wind-energy perspective, the relevance of shallow, surface-confined low-wind events is not immediately apparent. Since wind turbines operate at much higher hub heights, it would be helpful for the authors to explain why the proposed methodology was not applied primarily to turbine-relevant levels. The practical implications of identifying shallow low-wind events should be discussed more clearly.

Lines 119–121

“For wind-energy applications, a surface-confined low-wind event and a turbine-height low-wind event imply very different production risks.”

This statement requires additional explanation and supporting references. The implications of turbine-height low-wind events for energy production are obvious, but the specific risks associated with low-wind conditions confined to 10 m are less clear. The authors should elaborate on the practical significance of distinguishing these two situations and provide relevant references from the wind-energy literature.

Lines 123–130: Wind-Speed Extrapolation

The discussion of extrapolation methods requires clarification. Monin-Obukhov Similarity Theory explicitly accounts for atmospheric stability and can be applied under stable, neutral, and unstable conditions. In contrast, the logarithmic wind profile and power-law approaches are generally based on assumptions that are most valid under neutral conditions.

Therefore, the statement around line 147 does not accurately reflect the distinctions between these methods. If the authors intend to emphasize that operational studies often rely on logarithmic or power-law approaches despite their inability to adequately represent stable and unstable stratification, this point should be stated more clearly and supported with appropriate references.

Line 143: Selection of a 48-Hour Duration

The justification for selecting a 48-hour duration threshold is currently not convincing. The explanation is rather generic and does not demonstrate why 48 hours is preferable to alternative durations commonly used in the literature, such as 72 hours.

The authors should provide a stronger physical or application-based rationale for this choice and discuss how different durations could influence the identified low-wind events.

Figure 2

Figure 2 appears to support the concern that a threshold of 3 m s^{-1} may be too low for 100 m wind speeds, particularly in offshore regions. The resulting high occurrence frequency over marine areas is therefore not surprising.

The authors should provide a more detailed justification for using the same threshold at both heights and discuss whether 3 m s^{-1} corresponds to a meaningful operational threshold for modern offshore wind turbines. It may also be useful to compare the chosen threshold with values adopted in previous offshore low-wind studies.

For example:

Abdelaziz, S., Sparrow, S. N., Hua, W., & Wallom, D. C. (2024). *Assessing long-term future climate change impacts on extreme low wind events for offshore wind turbines in the UK exclusive economic zone*. Applied Energy, 354, 122218.

This study applied different threshold and duration criteria specifically tailored to offshore wind applications, and comparison with this approach would strengthen the methodological discussion.

Given the low threshold used (3 m s^{-1}), the high frequency of identified low-wind regimes over marine areas is largely expected. The authors should discuss whether this threshold corresponds

to commonly used operational cut-in speeds or other relevant metrics in offshore wind energy assessments. If not, the practical interpretation of these results should be reconsidered.

Line 252

Typographical correction:

“The seasonal” instead of the “The Seasonal” wording.

Figure 5

Is the notation ΔU universal standard for vertical wind shear? Please check what is mostly used in the existing literature.

Section 6: Code and Data Availability

Please verify whether the placement of the "Code and Data Availability" section before the conclusions is consistent with the journal's formatting guidelines. In many journals, data and code availability statements are placed after the conclusions or near the end of the manuscript.

Appendix A, Figure A1

Figure A1 provides a useful basis for selecting the low-wind threshold. However, it does not fully address the key concern regarding the use of an identical threshold at two substantially different heights. A stronger physical or operational justification is needed. The appendix would also be an appropriate place to provide additional sensitivity analyses demonstrating the influence of threshold and duration choices (e.g., 48-hour versus 72-hour criteria).

Summary Recommendation

The manuscript addresses an important topic and presents potentially valuable results. However, the methodological choices regarding (i) the use of identical low-wind thresholds at 10 m and 100 m and (ii) the selection of the 48-hour event duration require much stronger justification. Clarifying these aspects, improving the discussion of wind-speed extrapolation methods, and strengthening the connection to wind energy applications would substantially enhance the scientific rigor and practical relevance of the study.