Review of the manuscript:

Khaled Yassin, Arne Helms, Daniela Moreno, Hassan Kassem, Leo Höning, and Laura J. Lukassen:

"Applying a Random Time Mapping to Mann modelled turbulence for the generation of intermittent wind fields"

General comments:

The intermittency of atmospheric wind fields has already been examined in many studies in the past. The working group in Oldenburg has been working for a long time on the investigation of the influences of intermittent wind fields on the aerodynamic properties of airfoils and wind turbines and the development of methods for the synthetic generation of wind fields taking intermittency into account. The present manuscript represents a further contribution to this topic. It proposes the combination of the CTRW-based approach suggested by Kleinhans with the established Mann model for turbulence generation, in order to utilize the spatial correlations considered in the latter model. The differences to the original Mann model are exemplified by a generated wind field and the load statistics for a 1.5 MW turbine calculated with BEM by means of FAST. It could be shown that mean values and variances of the wind fields and loads agree well. However, the extended approach, denoted time-mapped Mann model, shows intermittencies, both, in the generated wind field and in the calculated loads except for the flapwise blade root bending moment. The consideration of shear, as foreseen in the Mann model, obviously requires further, considerable development effort in the CTRW approach and is still pending. The present results are therefore limited to a wind field without shear.

The manuscript is concisely written and contains a good and broad overview of the specific state of research. However, unconventional nomenclature, partial lack of introduction of variables in the text and inconsistent use of variables complicate readability. The results show some peculiarities in the predicted loads that may be attributed to the turbine BEM model rather than to the wind field model. The turbine model should be checked prior to interpretation of the results. In the results section, the authors largely limit themselves to describing the results visible in the pictures without analysing and explaining peculiarities in the results. In this respect the manuscript should definitely be improved. Moreover, I don't see why an Appendix is necessary and suggest to incorporate the content directly in the paper.

In conclusion the study is relevant and I in principle support publication of the manuscript if the following comments are taken into account and the interpretation of the results is elaborated.

Specific comments and remarks:

- Please introduce new properties throughout the document (like e.g. r in L. 104, Δx_2 and Δx_3 in L. 115, …) and use the variables consistently.
- L. 112: „where the double index does not indicate a summation here" is more confusing than helpful.
- L.132: Are u_1 and u_2 velocity fluctuations or absolute velocities? Compare eq. (1) small vs. capital letter.

- L. 138f.: An increasing deviation for reduced τ is hardly visible in Fig. 1 due to the vertical shift. Perhaps this can be made visible by a more appropriate choice of the ranges shown.
- L172: “different” → ” multiple”/”several”
- Figure 2: To use x_2 as vertical component and x_3 as lateral is unusual (cf e.g. Mann, 1998). Please ensure consistency throughout the paper. N as well as the Δ values likely refer to the Mann box parameters. These are not introduced yet, please do so. Using Δx_2 and Δx_3 with a different meaning than in equation (6) confuses. I suggest to use e.g. $\Delta x_{1,M}$ and $\Delta x_{2,M}$ here.
- L. 255ff: Is there a specific reason why you prefer Eq. (21) instead the derivation according to IEC 61400-01 if no shear is considered? $L=0.8*\Lambda$ with $\Lambda=42$m due to $z_{hub}>60$m → L=33.6m
- Table 1: Please justify the choice of the Mann box parameter. How is length n_{x1} chosen? $n*\Delta x$ in lateral direction is not even twice the integral length scale L; is this sufficient to resolve the statistics?
- L. 269ff: As Kleinhans pointed out, one disadvantage of the CTRW approach is the definition of the various parameters (α, c, Δs_t) that control the intermittency. The general validity of the approach is limited in particular by the fact that α depends on the time lag and must be calibrated in order to correctly represent real intermittent wind fields. The values chosen in the present study do not contain a $\alpha(\tau)$ dependency and differ significantly for c, Δs_t but also for α from the values chosen by Kleinhans. Are there any recommendations for selecting these parameters for practical cases and can the authors reason their choice?
- L. 279: Repetition of the statement from L. 276f.
- L. 283: Please include your definition of κ ($=2*\pi*f/U$) and specify U to make sure whether it’s an angular wavenumber.
- Fig. 6: Fig. (a) obviously shows a narrowband spectrum whereas (b) and (c) seem to be smoothed or have large frequency bins. Please justify this inconsistency or align.
- L 291ff: Please rework interpretation of Fig 6 and explain what spectra characteristic was to be expected for the new wind field model (e.g. L. 293: Does the difference between Time-mapped and original Mann in 6(a) for low wavenumber represent intermittency?);
- L. 294f: The statement cannot be followed because the small wavenumber range is not shown in plots 6(b) and (c).
- L296: The number of grid points in vertical and lateral direction is the same for the Mann model and the time-mapped Mann model, Therefore I cannot follow your explanation that the differences result from the grid. Please clarify.
- L. 297ff: The conclusion from comparison to A1 is not obvious. Ranges are different and therefore deviations are hardly comparable. Moreover, changes in grid size and resolution are mixed and hence effects cannot be attributed to a finer discretization for sure. It is still unclear why the size or resolution should explain differences between time-mapped and original Mann model.
- L. 308ff: Please mention the “settings” (Δx_2, Δx_3) also in the text and ensure that this distance values are not confused with Mann box parameters and elaborate the interpretation.

- L. 311ff: Can the authors please interpret this characteristic in more detail and explain the difference to the behavior for the cubic case in Appendix? The plots in A2 are somehow smoothed, please get it consistent with Fig. 7.
- Fig 7: Please do not mix (x,y,z) and (x_1,x_2,x_3) and get it consistent with Fig. 2.
- P. 19, Tab. 3: I assume that the Dynamic Stall and the Dynamic Inflow models were activated in the FAST calculations. To be on the safe side, this should be mentioned. Moreover, does the turbine have tilt?
- Fig. 10: For better differentiation of the figures, the specific moment (RootFlap, ...) depicted in (a) to (d) could be added to the axis labels or the respective figures.
- L. 357ff: Fig. 10 shows interesting results. Fig. 10 (b) - (d) clearly show the influence of intermittency. However, Fig. 10 (a) does not show any impact of intermittency in the results with the new model. This is strange, since I cannot see how the blade bending loads and the thrust (as the sum of the three blade loads in the same direction) differ in their intermittent behavior that strongly. Please conduct further investigations to explain this unusual behavior. Further, in (b) - (d) the intermittency effect decreases considerably faster for larger time lags τ than in the wind field in Fig. 8. The analysis of the causes for these relevant and interesting differences would be an important outcome of the investigations. Here the authors merely refer to future studies. I would, however, expect the authors to make investigations into potential reasons and provide explanations in the present paper.
- Fig. 11: Also in the case of the unusual characteristics of the Kurtosis shown in Fig. 11 (strong drop for smaller time lags, strong peaks at τ=1s, 2s,…), no analysis of the results and indication of possible causes was made. The statement "This might be directly related to the wind turbine and is subject to future research." is not sufficient here. Please check the BEM model and settings and ensure that no tower impact, tilt, gravity etc. is considered and elaborate the interpretation.
- P. 23: It would be interesting to compare the fatigue loads resulting from the original Mann model and the extended model and I suggest including the corresponding results in the paper to show the intermittency has a relevant impact on the loads.
- Conclusion: It would be nice if findings on the conversion of the intermittent wind field to the turbine loads and the fatigue loads could be added, see comment above.
- Figs. A1/A2: The thin grid lines and axis ticks are barely visible (in the printout). The lines in Fig. A2 should be thicker.

Typos:

- L- 152: Pope (2001) → (Pope (2001))
- L. 190: (s) / (t) → no brackets
- L. 250: space after „area.“
- L. 270: „c=20“ → „c=20s.“ + math mode in latex
- L. 321: “τ Fig. 9” → “τ. Fig. 9”
- Tab. 4, caption: for consistency “Rel.Diff.” → Rel.Diff”
- L. 369: “sec” → “seconds”
- L. 406: „…= 1“ → „…= 1m“