(second revision) Comment on "Wind turbine load dynamics in the context of turbulence intermittency"

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Thank for your reply – I have additional comments added in red...

Comment from Referee 1:
Exactly how is this correlation constructed?
How is the associated coherence related to atmospheric turbulence?
Authors response:
The focus in this work is on the temporal statistics of the wind. We were able to generate time series with very specific properties and faced the challenge to assemble wind fields based on these very time series.
In one of the extreme cases we prescribe one and the same time series in every of the wind fields grid points in the rotor plane (fully correlated). In another extreme case (delta correlated) we prescribe completely independent time series in every of these grids points, which results in an uncorrelated or delta-correlated field (delta correlated). In order to provide wind fields in between both of these two extreme scenarios, we designed fields in which sub-regions of the grid in the rotor plane are defined, in which we prescribe fully correlated fields. For example, the grid can be sub-divided into 9 regions of a thee by three grid. In these regions the exact same wind time series will be prescribed.
The resulting correlations and coherence must be understood as a simplification of atmospheric turbulence, since atmospheric turbulence features a varying range of temporal and spatial scales.

I still believe that some a little more explanation is needed in the manuscript (you did not add anything) – for example – I don't find the information that the time series are fully correlated within each 3*3 block and zero correlated with the rest - as you state in your comment here – just add two lines... Also, I respect that the study is theoretical and hence focuses on specific mechanisms – but since the conclusions will be used and referred to in many future studies some lines on its relation to realistic atmospheric turbulence (length and time scales) are recommended in order to add relevance for general readers.

Comment from Referee 1:
P6,l25. Can you say something about the physical time scales in the wind model (here defined with constants of physical units). How does for example the integral timescale compare to characteristic time scales of velocity fluctuations in the atmospheric boundary layer like ~10min.
Authors response:
We believe some of the aspects you are asking for are addressed in section 2.1.2. The time series are correlated for roughly 12 seconds, which in comparison to atmospheric turbulence is very short. An integral time scale was not calculated. In our opinion the reason for this is a lack of low frequent dynamics in the velocity signal. As can be seen in e.g. Fig. 1 & 2: There are not too much low frequent dynamics present in our signals. The lack of those might potentially affect the presented results quantitively, but not qualitatively, as the differences in the presented results stem from the intermittency.
We tried to incorporate lower dynamics the velocity signals with our CTRW approach, but essentially found that it would have spoiled other properties of our time signals. Important is to keep in mind that it is our highest priority to have highly comparable Gaussian vs. non-Gaussian fields. We therefore had to trade-off some wind field properties.

Nice discussion – why is that not in the paper?

Comment from Referee 1:
P7,l5. 1% error in standard deviations of the wind velocity leads to approx. 1% in fatigus loads .
Can you please elaborate – or add reference. So a linear response? – and for all load channels?
Authors response:
We were aiming to provide some reference for the reader how a 1% change in fatigue load can be understood.
The idea was to give a quantitative estimate on how big an offset in turbulence intensity must be, in order to provoke a 1% difference in fatigue loads. We conducted some test simulations with our set-up and found that a 1% increase in turbulence intensity yields roughly a 1% increase in fatigue loading. This is of course highly dependent on the actual turbine, the load sensor, other wind field etc. This is why we added a footnote to emphasize that this result is simply a rough estimation.

1% increase fatigue loading on all turbine load channels (all moments)? Again – the discussion here is much better than the very short statement in the paper.

Comment from Referee 1:
P7,l13. In principle also in the third moment (zero in gaussian stat).
Authors response:
Both of our wind signals (the Gaussian and the non-Gaussian) feature zero skewness. Strictly speaking this is another simplification and deviation from atmospheric turbulence, however it is the aim of this work to focus on the fourth moment and to have no differences in any of the lower order statistics, including the third moment of the 2P statistics.

Sure, but the third order moment and its 4/5 law in some sense can be regarded as the backbone in K41 turbulence – a note of why this is zero in your simulations might me appropriate.