Earth Syst. Dynam. Discuss., referee comment RC2
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Comment on esd-2021-29

Anonymous Referee #2

Referee comment on "Wind speed stilling and its recovery due to internal climate variability" by Jan Wohland et al., Earth Syst. Dynam. Discuss., https://doi.org/10.5194/esd-2021-29-RC2, 2021

Review of manuscript ESD-2021-29 entitled "Wind speed stilling and its recovery due to internal climate
variability." by Jan Wohland et al.

Summary:

This paper investigates the impact of internal climate variability on trends in near-surface wind speeds in historic and future climates. Therefore the authors investigate wind speed variability in the MPI-GE climate model for historical and future (RCP 2.6, 4.5, and 8.5) scenarios including land-use changes and a reference simulation with increase of CO2 only. The latter allows to assess the contribution of the "dynamical response" to greenhouse gas forcing to the total change in wind speed. The authors find that in the ensemble mean, the residual change highly correlates with land use change, suggesting a strong contribution of land-use change to overall changes in onshore wind speed. However, investigating decadal trends in 20 year sub-periods the authors find that the decadal trends due to internal climate variability are 10-fold higher than the change due to climate change. This finding is corroborated with the CMIP6 ensemble.

Recommendation:

The paper is overall well written, easy to follow, and the Figures and Table adequate. The study provides novel and insight in the ongoing discussion about "global stilling", clarifying the magnitude of wind speed trends due to internal variability one also needs to expect under climate change. It fits well in the scope of ESD and should be of interest to its readership. I have only one two comment and some small suggestions and recommend to accept after minor revisions.

Main comment:

- the terminology forced change is a bit confusing and needs to be defined properly. Do you mean due to greenhouse gases, land-use change, wind industry infrastructure or all three? The greenhouse gas effect is likely meant by the dynamical response term only. Thus forced relates to the residual, which should be clarified.

- Section 3.2.1 here you relate the internal decadal variability to the "forced changes". While the rate of change for internal variability is nicely shown with data in Fig. 6,7,8 and Europe, the 10x smaller rate for forced changes is not corroborated by data and must be assessed from the global trend in Fig. 5. This is not ideal and a histogram as in Fig. 8 but for the rate of forced changes based on a time-series as in Fig. 5 (but for Europe) would help. (Although this will be a narrow distribution).

Minor comments

Abstract:
- meaning of forced change with relation to wind related infrastructure is explained too late. Later in the paper you also mean land use change (mainly vegetation?). The use of the term forced change must be clarified.

Section 2
- general comment. It would help to have subsections, describing the data and climate simulations first, then the methodology to quantify different contributions to wind speed change, then the trends.
- eq (1). The hyphen is a bit confusing, why is it needed?
- line 106 LUH1 is not defined only LUH in line 70, use consistent abbreviation.

Section 3
- Figure 1 and l 136. What is the unit of land-use change? Is it the change in wind speed due to land-use change? If the latter, it must be stated in the Methods how it is calculated?
- Figure 4: remove the subcaption in the subfigures
- Figure 6: it is confusing that the begin/end of an upward/downward trend or of the same direction can happen in consecutive years (or only with a few years apart. This needs a bit more explanation. E.g. must there be pairs of onset upward, onset downward? I.e. is the onset of a downward trend the end of an upward trend?

- Section 3.2 and Figures 6,7 discuss pre-industrial control, correct? This must be stated more explicitly in Text and Caption.
- Section 3.2.1 Corroborate forced change in future climate with data. See above main

comment above.