Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2020-77-RC2, 2020

Geoscientific Model Development Discussions
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Interactive comment on "The Kinetic Energy Budget of the Atmosphere (KEBA) model 1.0: A simple yet physical approach for estimating regional wind energy resource potentials that includes the kinetic energy removal effect by wind turbines" *by* Axel Kleidon and Lee M. Miller

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Received and published: 17 July 2020

In this manuscript, Kleidon and Miller extend their work on the ultimate recoverable wind resource to a practical tool to estimate that resource using data available from reanalysis data sets, and show that it performs reasonably well compared to a reasonably detailed modeling effort using WRF. The paper is clearly written, and the authors have provided convenient access to the details of the model. The basic result that the

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Discussion paper

realistically achievable wind resource (as determined by WRF!) is clearly related to the boundary layer winds in the absence of the wind farm is encouraging, though perhaps not surprising given the many years of experience the wind industry has in performing and validating pre-construction resource estimates.

I am concerned, however, that the particular range of wind turbine densities studied may make the paper subject to misinterpretation, so I'd like the authors to include a paragraph or so relating the chosen densities (which I recognized they've inherited from Volker et al (2017)) to real-world densities. Typical large wind farms have densities of less than 4.5 MW km^{-2}, averaging closer to 3 MW km^{-2} (see, for example, Denholm et al., 2009, "Land-Use Requirements of Modern Wind Power Plants in the United States"). This is quite close to the least dense "wide" category considered here (2.8 MW km${-2}$), and far from the "intermediate" (6.4 MW km${-2}$) or "narrow" (11.3 MW km${-2}$) categories. A novice, reading those category labels might think that "intermediate" density corresponded to a typical real-world density. Further, since the estimates from the KEBA model seem intended to give a quick sense of the potential generation from wide areas, it's probably worth noting that a "wide" density of wind farms, installed over Iowa, would imply an installed capacity of 400 GW, compared to an actual installed capacity of 10.6 GW as of 2019.

Additionally, I think it would be helpful to re-express the values shown in Table 2 in TWh/a in units of W/m^2, so that the deviation from the simplest hypothesis of a fixed limit in terms W/m^2 is made obvious. Finally, I think a clearer description of how exactly the various input parameters ($v_{in}, and H, for example) are derived from the WRF model (e.g. from which height in the model is v_{in} taken) would be very helpful to the reader.

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