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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Modelling Global Tropical Cyclone Wind Footprints" *by* James M. Done et al.

Anonymous Referee #1

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The manuscript proposed a new modeling system for generating tropical cyclone (TC) wind, which consists of a parametric radial profile model, the non-linear boundary layer model (KW01), and the terrain effects. The authors presented a case of hurricane Maria and Wilma and verified the model using landfalling storms. Then, the authors discussed the impact of terrain on the changes of TC winds over the South East US, Taiwan and Eastern China, and Eastern Australia. Overall, I like this approach and can think of many applications of this model. One criticism I have is that the advantage of using KW01 was not shown or discussed with evidence. In Section 2.3, The authors described KW01 as the key advancing component of the modeling system. At many other places, the author says that their system contains more dynamical processes than other existing tools. However, none of the results shown here can isolate the positive impact of using KW01. I suggest conducting additional simulations using Willoughby's wind with an empirical factor applied to get winds at10m height, plus the

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Discussion paper

terrain effect. By comparing these new simulations with the Willoughby+KW01+terrain, we can see the advantage of (or differences caused by) KW01.

Below are a few minor comments and questions

1. Page 4, line 2. While I understand the advantage of using KW01 instead of a simple empirical model, this sentence sounds vague. Please elaborate more on what the additional dynamical effects are.

2. The first paragraph of section 5 (page 11) should belong to Section 2.1.

3. Page 5, Line 15: Please mention the TC boundary layer height used in this study as well. Is the model performance sensitive to the TCBL height?

4. Page 7, L11 'running for 24 hours for each forcing update is computationally impractical.' I am surprised to see that running 24 hours of KW01 is computationally impractical. What is the computational cost of KW01, and how is it compare to the computational cost of 2-km WRF.

I am asking this is because, for assessing wind risk, the most significant advantage of a simplified wind generator v.s. a full-physical model is its low computational cost. If running KW01 is computationally expensive, this system will not be able to use for real risk assessment, which (I thought) is one (and probably the mostÂăimportant one) of motivations of this work. (The other motivation is to understand wind risk over complex terrain using historical cases. For this purpose, we can always run WRF or other mesoscale models which may generate more realistic winds than KW01)

5. Page 9, L24. Do you mean the maximum wind speed recorded at the station during the lifetime of the storm, which is different from the storm lifetime maximum wind speed (which is usually one value per storm)?

6. Page 11, L1: Where is this 20% bias correction factor comping from? Is it universally applied to all simulations?

7. Page 11. L12-14 belongs to the figure caption of Fig. 6, not in the main text.

8. Figure 7 and the related discussion. Did you check the enhanced vertical diffusion and vertical advection in KW01? Can you show some analysis of these enhanced features? There is a lag between the terrain and the wind gradient. Why?

9. Willoughby et al. 2006 is missing in the references.

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