

## ***Interactive comment on “Implementation of a roughness sublayer parameterization in the Weather Research and Forecasting model (WRF version 3.7.1) and its validation for regional climate simulations” by Junhong Lee et al.***

**Junhong Lee et al.**

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Received and published: 21 December 2019

We thank all the reviewers for spending their valuable time to review our manuscript. We are also happy to receive constructive comments of the reviewers and please check our responses to your valuable comments below.

### General comments:

Please check the language used in the paper (grammar and spelling; see also spe-

C1

cific comments below). A key argument for the introduction of the roughness sublayer parameterization in WRF is the increase in computational power and the refinement of the vertical layers in the model. However, in the presentation of the simulations, no reference is made to how many vertical levels are used in the offline or real-case simulations. I encourage the authors to add this information. I would also encourage providing a note on how much more compute time is required in WRF, compared to the original MM5 approach.

Reply: As the reviewer suggested, we checked the language in our manuscript. We also revised our manuscript by providing the number of vertical layers and the computing time. In summary, the YSL scheme increased the computing time by only 8% compared to the original MM5 surface layer scheme. We believe that our scheme is promising because of improvement of meteorology simulation described in our manuscript accordingly.

1. line 12 vs line 26: British or American English? line 12, modelling, is British English; line 26, parameterized, is American English. Please agree on one spelling and make the paper consistent.

Reply: We revised the manuscript with consistent English as the reviewer suggested.

2. line 20: for better weather and climate simulations (s in simulations missing)

Reply: We corrected it as the reviewer suggested.

3. line 54: gradient of "wind and scalar" and their corresponding fluxes in the RSL should that be "wind and scalar variables"?

Reply: We corrected it as the reviewer suggested.

C2

4. line 65-66: "to implement it to the SL parameterization" "to implement it in the SL parameterization"?

Reply: We corrected it as the reviewer suggested.

5. line 68: "to incorporate RSL parameterization" "to incorporate the RSL parameterization"

Reply: We corrected it as the reviewer suggested.

6. lines 76-86: this section would benefit greatly from a schematic of the vertical layout (from surface to RSL-ISL interface).

Reply: As the reviewer suggested, we added a schematic diagram and revised our manuscript with a schematic diagram.

7. Section 2: all variables that are used need to be introduced, for example:  $l_m, \beta_N, f, \phi_m$ .

Reply: Please consider that all variables are defined in Appendix A and we clarified this point in our revised manuscript.

8. lines 99-100: "because theoretical consistency" "because of theoretical consistency"

Reply: We corrected it as the reviewer suggested.

9. line 105: "iteratively update  $d_t$  and  $\beta$  using Eqs. (5) and (6)" "iteratively update  $d_t$  and  $\beta$  using Eqs. (5) and (7)"?

Reply: We corrected it as the reviewer suggested.

C3

10. line 106: " $z_0$  is iteratively achieved with an accuracy of 0.0001 using Eq. (7)" " $z_0$  is iteratively achieved with an accuracy of 0.0001 using Eq. (8)"?

Reply: We corrected it as the reviewer suggested.

11. line 113-115: please rewrite this sentence and the short sentence in line 115.

Reply: We revised this sentence as the reviewer suggested.

12. section 4 - vertical layers used in the experiments?

Reply: We provided the information in section 3 and section 4, as the reviewer suggested.

13. section 6 - please check the language in particular in this section.

Reply: We received the English proof service for this section as the reviewer suggested.

14. line 200 - I would make the discussion of the summer season a new paragraph.

Reply: As the reviewer suggested, we made the discussion of the summer season a new paragraph.

15. line 205-206: check language of this sentence.

Reply: We received the English proof service for this section as the reviewer suggested.

C4

16. line 228: "these changes in the climate near the ground surface" - is climate the correct term to use here? also, "ground surface" could be just "ground" or "surface"?

Reply: We revised the sentence as the reviewer suggested.

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Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-242>, 2019.