

Examining cross-scale influences of forcing resolutions in a hillslope-resolving, integrated hydrologic model

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Despite the efforts made, this paper's objectives are vague. The overarching goal of this study is to assess the impact of the atmospheric forcing scales on hydrologic state variables such as snow water equivalent and soil moisture to potentially establish requirements for hydrologic modelling and observation system design". To make strengthening this paper, I'd recommend that the authors make their objectives straightforward and narrow into specific objectives and hypotheses. In this paper, the important words to set up the objectives have been missed namely: what, where, when, why etc.?

General comments and recommendation

In this study, the authors designed numerical modelling experiments to analyze forcing resolutions in a hillslope-resolving, integrated hydrologic model. They used ParFlow-CLM to simulate the soil water and snow melting to assess the impact of the atmospheric forcing scales on hydrologic state variables. They modelled and compared the experiments at 30m, 90m and 250m of Hydraulic Resolution and 1 km, 3 km and 9 km of Atmospheric Forcing Resolution.

First, the manuscript needs further editorial work to improve the paragraph structure and some vague expressions. Many sentences in this article are long with complicated structures and parenthesis in the middle, which makes it extremely difficult for the reader to follow and understand. I hope the authors make a change to improve the manuscript's clarity and this improvement in clarity will lead to better uptake and use of the ideas in the paper. Also, some references have not been provided, and the current references are not used consistently. Besides, there are many examples that are written in the parenthesis that could be brought out of the parenthesis. The comments are detailed in the technical issues.

Secondly, some verification of the data is needed. Meaning, the finite element methods should be clarified. For example, if the incremental Jacobian method is the basis of the calculation, it should be mentioned and parametrized like shown in Figure 3. Also, it is better to parameterize the elements for the initial conditions of forcing data generated by the WRF model. To verify the method, calibration of the parameters and obtaining a more compatible diagram for Soil moisture, figure 7, can consolidate and support your results. Finally, the atmospheric model was not discussed in the Methodology, and references to other articles are used to prove the validation. Even though this area is well known and well used, you need to mention how you used the equations in your study.

Lastly, I think you need to clear that this paper is methodly paper or a processing paper. If this is a processing paper, more results should be presented in the abstract instead of focusing on the

methodology. Also, the abstract is too long, with about 480 words. A regular abstract usually includes 250 words. It would be best to rewrite the abstract and provide a concise of your achievements in this study.

Technically I have some comments that might be useful for improving this study and manuscript:

P1, L6, "This class of models is" is correct

P1, L7-9, You have Used too many "and". You can use the comma instead of 'and.'

P1, L11-14, The used sentence is long and heavy, and it could be broken into two sentences to be read easily. For instance, "Here we investigate the hydrologic impact of discrepancies between distributed meteorological forcing data. We can do this by exhibiting a range of spatial scales consistent with a variety of numerical weather prediction models when used to force an integrated hydrologic model associated with a corresponding range of spatial resolutions characteristic of distributed hydrologic modelling."

P2, L32-34, Rewrite the sentence in an active voice, move the reference to the end (or be consistent in using of references) and correct Havana et al. (phi is not in the characters)

P2, L35-37, The sentence is not clear for the calibration of parameters.

P2, L41, You do not need parenthesis for each example.

P2, L43, Use 'has' instead of 'have.'

P2, L44-45, Provide a reference for the statements. Also, you do not need parenthesis for each example.

P2, L49, Provide a reference for the paragraph.

P2, L56, Use 'difference' instead of 'different.'

P2, L58, Eliminate 'to' in "captured to within" in the beginning line and provide a paragraph reference.

P3, L67, 'There are a few studies that examine' seems a better start instead of 'Even fewer of these studies examine.'

P3, L75, Use estimation instead of estimate.

P3, L76, Use investigates instead of 'investigate.'

P3, L75-77, This sentence is not correct and necessary. There might be other studies that you have neglected.

P3, L76-78, The sentence is too long and please rewrite it again in a simple way.

P3, L82, Add 'and' after the word terrain.

P3, L83, 'and also' is wrong. 'Also' is enough.

P3, L89, 'that through a series' you can omit that.

P3, L92, Which allows

P3-4, In the last two paragraphs, the goals are divided into two parts, and it is better to be continuous. For this, you can shift the paper organization (L96,97) before the goals at the first of the paragraph.

P5, L126, You do not need parenthesis for Prein et al., and you can rewrite the sentence for having a better look

P5, L130, Have shown is correct.

P5, L145, You do not need the parenthesis for the examples.

P5, L152-153, You do not need to write, i.e. for the different conditions.

P6, L165, Suggested value is correct

P6, L177, "Decided arbitrary" does not seem proper in this sentence.

P7, L188, "hydrologic variables of importance" does not seem proper in this sentence.

P7, L191, Please provide a reference for equation 3.

P7, L195, Where is equation 3.2

P7, L198, Please rewrite the sentence. For example, "respectively. ρ and μ represent ..."

P7, L200, What does "It" refers to?

P7, L207, Please provide a reference for the equation.

P8, L212, Please provide a reference for the equation.

P8, L214, In the sentence 'volume of the water l and ice i.' you can delete i and l or put them into parenthesis.

P9, L260, I think it is better to define the initial condition for any finite element method based on the parameters you have specified in the last part. In other words, write the equation with initial conditions in a mathematical way for each initial condition. It can make the method more precise.

P10, L277, Wrong spelling of discrepancy.

P10, L277-281, This is not the article's purpose, but this is where you verify your simulation and show your method is compatible with the experimental data. The time differences are acceptable in figure 7, but I think the calibrations could help your data competence.

P10, L296, Omit “of” and “in.” “Produce of” and “across in.”

P11, L299, Keep the units of the horizontal axis in figures 9, 10, 11 consistent (mm or Cm)

P11, L302-303, This sentence seems wrong. “The comparison shows topography?” Also, you used too many “on the other hand” expressions that are not necessary.

P11, L317, What is (11) in the line?

P12, L345, What is “It is” in the middle of the line?

P12-13, L356-371, This part is discussion. You can use others' expressions and ideas and references them, but writing two paragraphs in the literature review style is not correct. What you have written is a part of the literature review.

P13, L372, I think “Lie in” is not a proper verb in this sentence.

P12, L376, I think “open avenues” is not a fair statement grammatically nor professionally.

P13, L380, Please put a dot at the end of the sentence.