

PEER REVIEW

Introduction

As part of the course Research trends in Physical Geography & Hydrology, students of the master's programme in Earth science at Uppsala University were given the task to perform a peer review of an article of their choice. This peer review was made by Staffan Druid, hydrology student at said program.

Article

The article chosen for this assignment is *Evaluating seasonal hydrological extremes in mesoscale (pre-)Alpine basins at coarse 0.5 and fine hyperresolution* by **Joost Buitink**, **Remko Uijlenhoet** and **Adriaan J. Teuling** of the Hydrology and Quantitative Water Management Group of Wageningen University in The Netherlands. The article was submitted to the journal Hydrology and Earth System Sciences (HESS).

The article can be found in its entirety at:

<https://www.hydrol-earth-syst-sci-discuss.net/hess-2018-407/hess-2018-407.pdf>

Summary

The use of models is a helpful, and in many cases efficient, means to understand and quantify processes in Earth sciences. Therefore it is important to be aware of their applications and limitations. The article delineates the effect of spatial resolution when simulating hydrological parameters (Runoff and Actual Evapotranspiration) in different Swiss river basins at two different resolutions (cells being 40×40 km or 500×500 m). Using a newly introduced metric of comparing the simulated anomalies of the hydrological parameters, the article finds that the high resolution models more accurately simulated the complexity of the anomalies in the basins, especially at seasons with extreme forcing in hydrological parameters. Furthermore, the low-resolution models failed to present the more extreme levels of anomalies compared to the high resolution models.

Review

Overall, the article is well-written and presents interesting results that are relevant for the understanding and choice of models for future research. After a few minor revisions of typos, slightly unclear paragraphs and further motivation of the importance of the results, this article could probably be accepted.

Overall comments

- The article is thoroughly written with a clear structure that is easy to follow. There is continuously good use of the equations, figures and examples that makes the reading interesting and concise. The article does not make assumptions on the reader's background knowledge, but rather explains too much than too little, which is a strong quality; making sure that the reader understands each step of the study is a way to increase the credibility and justifying your results.
- The choice of methods is well motivated and justified. For instance, the thorough explanation of the SPHY model (section 2.3) could have been deemed not as relevant for this article, but the given explanation helps the reader follow the reasoning behind the choice of that model, and ultimately interpreting the results. The same goes for the explanation of the DWD metric (section 2.5), where the prior presentation of alternative

metrics and discussion of their unsuitability strengthens the motivation of using the DWD. Again, one could argue that these alternative metrics are irrelevant for the study, but for the credibility of the results it makes sense to include them. Using figure 3 to visualize the concept of the DWD is important to understand the function the new metric.

- Although the introduction is clear, the abstract is somewhat confusing and overwhelming. Reading it did not give me a sense of the results or the relevance of the article, or introduced the topic or theme of the article. This makes the aim and method slightly diffuse and it's hard to grasp the full picture until reaching the end of the article. Condensing such an extensive article is never easy, but using less technical terms and slightly simpler language could improve understanding and motivate further reading. Of course, this depends on the target audience and desired impression of the authors.
- The results are well presented and seem reasonable, but are not surprising. When comparing models using thousands of cells to models comprised of one (1) single cell, there's bound to be less variation and detail in the latter. Although the low resolution is well motivated (as being common in global-scale models), the choice of basins that in that resolution only consist of one cell is less clearly motivated. Perhaps a somewhat higher resolution (giving the basins at least a few 10's of cells) would be more interesting and nuanced to compare to the high-resolution model results. While it's always important to validate assumptions that are taken for granted, it's hard to say to what extent the results of comparing such extremely different resolutions are useful in the sense of presenting new knowledge.
- References to other studies and up-to-date literature are present throughout the article. The structure is rational and clearly defined, while simultaneously well connected between sections. The language is concise, easy to follow and does not use overly complicated abbreviations or technical terms.

Conclusion

The article is clear, relevant and easy to follow. The use, and thorough explanation, of figures, equations and examples in combination with the excellent level of complexity of the language is the strongest quality of the article. A few minor typos and paragraphs with potential for clarification exist, but are easily fixed and may also just be a matter of personal taste. The abstract and overall aim of the article could be more clearly presented, as well as the motivation for selecting basins that generates models with only one cell. Additionally, the relevance of the (hardly surprising) results for future studies and for the scientific community as a whole could be more thoroughly presented.

Trivial comments

- Typos on page 8: line 5 reads "bimodel" instead of *bimodal*, line 10 reads "5-59% range" instead of (supposedly) 5-95% range.
- The four calibration parameters listed on page 6, lines 10-13 are a bit confusing. Since the third parameter ("a parameter determining the fraction of water that can refreeze in the snow pack"), unlike the others, is not given a name, one might confuse this as simply the description of the second parameter, thereby only listing three parameters in total. This could easily be made clearer by simply attributing the third parameter with a name and not only description.
- Specific basins in figures that are referenced in the text are sometimes not specified by name (e.g. page 9, line 5; page 11, line 1). By naming the basins explicitly in the text, it would be easier for the reader to see the relevant points in the figure as well.

- To further clarify the nature of the basins (Alpine or Pre-Alpine) to the reader, figures such as figure 6 could name the basins with a subscript of abbreviation of the type (such as “Reuss_A” for the Alpine Reuss basin or “Inn (PA)” for the Pre-Alpine Inn basin).