

Geosci. Model Dev. Discuss., author comment AC1  
<https://doi.org/10.5194/gmd-2022-123-AC1>, 2022  
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## Reply on RC2

Peichao Gao et al.

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Author comment on "CLUMondo-BNU: Adaptive determination of conversion orders in CLUMondo for simulating land system changes with many-to-many demand-supply relationships" by Peichao Gao et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2022-123-AC1>, 2022

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There are many models for simulating land changes, but CLUMondo is a featured one as it considers many-to-many demand-supply relationships. That means in CLUMondo, users can not only set the demand for different types of land use/cover but also the demand for multiple services provided by different land systems. In this view, the original version of CLUMondo developed by Peter H. Verburg et al is of great use, and improvement and/or modifications should be welcomed.

This study proposed an adaptive method for automatically setting one important parameter in CLUMondo, namely the so-called conversion orders. And this proposed method was coupled by the authors into the original version of CLUMondo, resulting in the so-called CLUMondo v2. Such a topic falls into the scope of "Development and technical papers" of this journal, which is "describe technical developments relating to model improvements such as the speed or accuracy of numerical integration schemes as well as new parameterizations for processes represented in modules." In this manuscript, the proposed method is clearly described and all source code has been released.

More importantly, the experiment is comprehensive as it involved two study areas with quite different characteristics and tested the key feature of CLUMondo (note that in many studies, CLUMondo was treated simply as CLUE-s, without any many-to-many demand-supply relationships). Also, experimental results demonstrated the effectiveness of the proposed method. Therefore, I suggest accepting it for publication after some revisions.

Re: We would like to thank the reviewer for his/her kind appreciation of our work.

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### Specific comments

It can be seen that the authors have fully understood the mechanism of CLUMondo and its source code. The descriptions of the mechanism are impressive and will facilitate future improvements.

Re: We would like to thank the reviewer for this comment.

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I also read the open comment carefully. I agree with the comment that it is better not to refer to the new model as CLUMondo v2. The authors can propose a new name. In fact, although the original version of CLUMondo requires setting the so-called conversion orders manually. It is a way of coupling expert knowledge and should be kept for users as an option. The proposed method in this study serves as important assistance for users, but users should have the option to input their settings. Users can be guided by the results of the proposed method.

Re: Similar suggestions were also made by the first reviewer. These suggestions have been adopted in this study. In the revised version of the manuscript, we distinguished our model from the official version of CLUMondo by changing its name from CLUMondo v2.0 to CLUMondo-BNU.

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In the experiment, the simulation results were assessed by Kappa statistics. It is good as many simulation results by CLUMondo and other models had even not been assessed. Kappa statistics are still quite popular (e.g., Integrating the CLUMondo and InVEST models to assess the impact of the implementation of the Major Function Oriented Zone planning on carbon storage), but the authors can also consider other statistics to improve the reliability of the results or provide another view.

Re: We would like to thank the reviewer for this insightful comment. We included the total disagreement in the revised version of our manuscript (please see the metric description in Section 4.4 and the updated results in Section 4.5). This metric was proposed in a paper entitled "Death to Kappa: birth of quantity disagreement and allocation disagreement for accuracy assessment." In that paper, the authors suggest employing two new metrics: quantity disagreement and allocation disagreement. The authors referred to the sum of these two metrics as total disagreement. This newly added metric also demonstrated the effectiveness of the proposed method.

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Other possible improvements of CLUMondo should be discussed.

Re: According to this comment, we suggested improving CLUMondo models by considering the spatial heterogeneity of land system services. Actually, this is not the unique disadvantage of CLUMondo but all land change simulation models.

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It is also suggested for the authors to provide a manual on how to use their software/source code.

Re: This suggestion is very useful! We have added a manual for users. We mentioned the manual in the Section "Code and data availability."