Geoscientific
Model Development
Discussions

Interactive comment on "MAgPIE 4 – A modular open source framework for modeling global land-systems" *by* Jan Philipp Dietrich et al.

Anonymous Referee #3

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General Comments

This paper describes the model MAgPIE 4, its history and release as an open source modelling framework. It serves as an introduction to the modelling framework as it is released, and as such it is well-suited as a citation for future users. There is good explanation of the structure of the model, including its modularity and references to further documentation. However, the effects of running modules under different setups is not explored. The article also presents a case study with a focus on Brazil that demonstrates the regional flexibility of the framework and how different regional definitions may affect results. This last topic is particularly interesting and deserves to be expanded a bit. In particular what may be behind the different results that arise from changing regional definitions. Finally, the absence of any description of the objective

function of the model framework is an omission that should be corrected.

Therefore, I recommend that this article be accepted with minor revisions as detailed below.

Specific Comments

There is much emphasis on the modularity structure of the framework, but the article does not go beyond description of this modularity. It lacks any mention of how choices of modular setup may affect results. For example, how does a module behave in standalone versus integrated mode? Or how does changing a specific module realization affect other modules? This analysis should be included here as, for example, a case study of one specific module. Even if this is performed in a separate article or online documentation resource, a quick summary of the results of such an experiment should be included for illustrative purposes.

The optimization methodology should be better explained. There is only a brief mention of the method in the description of the optimization module, which states that the model "minimizes total system cost" (p7, l14). How is this done? Is the model dynamic recursive? This has been explained in other articles using MAgPIE, but it should be included here, either in the main text or the appendices. A description of the objective function and the optimization method is in order.

Another important issue is the expansion of the discussion on what drives the changes in results from different regional aggregation. In particular, the difference in global forest cover changes by about 10% when using the Brazil setup should be explored in more detail. Even if it is simply the result of coarser resolution in the ROW region, it would be interesting to hear more about the interpretation of these results. Is 10% an acceptable uncertainty level? Which global regions are most affected by the changing the regional definitions? Why? This would expand the discussion section as well.

Also, the initial land cover map most likely plays an important role on the future projec-

tions. As such, it would be advisable to include a figure with the base year land cover map, even though this may be extracted from Hurtt et al. (2018). In fact, land cover maps for other milestone years the authors deem important may also help the user to understand model dynamics.

Technical Comments

P13 l4: repeated "with"

C3