Geoscientific Model Development Discussions

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Comment on gmd-2021-271

Anonymous Referee #2

Referee comment on "Predicting global terrestrial biomes with the LeNet convolutional neural network" by Hisashi Sato and Takeshi Ise, Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2021-271-RC2, 2021

This paper presents research into predicting global terrestrial biomes with a CNN using a correlative climate-vegetation approach. The manuscript is of very high standard w.r.t. introducing the problem and motivation, describing the approach, discussing the results and pointing out the limitations. The authors also correctly state that the presented study is not a ground breaking new innovation, but a demonstration of how existing tools can be used in the context of predicting the future of complex systems.

Besides the limitations discussed in section 3.3, a few additional aspects come to mind. Firstly, most climate models have no dynamic vegetation models built in. In addition to what the authors stated regarding the lack of feedback between vegetation and climate, it is also known that large ecosystems create their own climate and therefore changes to the ecosystems - due to whatever factor - may affect the future climate as well. It is also not clear to me how to separate the human effects that are partly, implicitly included in the model (e.g. human-made landuse changes in the training period) and, more important, the ones that are not included. Recent and future rapid development, sealing of surfaces, large-scale deforestation and irrigation, large-scale relocation of humans due to rising sea levels and temperatures, the development and use of genetic manipulated crops etc. are all factors that may influence future terrestrial biomes. It would be nice to see section 3.3 expanded to include some of this in the discussion and, if possible, to include some suggestions on how to incorporate these complex interactions in a next step.

Lastly, there seem to be a bit of a mixup of present and past tense in section 3.1 that should be made consistent. For example, Line 189-190, "The probability of the most plausible biome tend to be ..." (where it should be tends if it is present tense) versus line 184, "... the allocation disagreement was much larger ...".