Biogeosciences

Discussions

Open Access

EGU

Interactive comment on "Improving the representation of high-latitude vegetation in Dynamic Global Vegetation Models" *by* Peter Horvath et al.

Anonymous Referee #1

Received and published: 30 June 2020

General Comments

The overall objective of this paper was to identify biases in a dynamic global vegetation model (DGVM) and, if possible, to find ways of reducing the biases. The analysis focused primarily on relatively undisturbed landscapes in Norway. The target model output was the within-gridcell plant functional type (PFT) distribution. One unique and valuable aspect of the manuscript was that the PFT distributions predicted by the DGVM were compared to multiple products, including field surveys, satellite products, and the output of species distribution models. Field surveys were much more similar to the satellite products and distribution models than to the DGVM. Improvement to the

DGVM was realized by incorporation of a precipitation seasonality index, although it was clear that this improvement would not be the end of the story.

Given that PFT distribution is an important quantity that is still challenging for DGVMs to predict, I think that the manuscript covers a topic that will be interesting and useful to readers of Biogeosciences. I also appreciated how the DGVM was compared to multiple products and how the distribution model was leveraged. However, I think that the value of the manuscript could be increased by being more thorough with the methods (see below). Also, I think that more could be done to make the manuscript interesting to readers who use models other than CLM.

Specific comments

The title should be modified. It mentions "Dynamic Global Vegetation Models" in the plural, but only one model is discussed. I also think the title is too general. I would suggestion "high-latitude vegetation distributions" rather than simply "high-latitude vegetation".

Lines 83-84: This point is overstated. There are publications that have evaluated PFT distributions from dynamic vegetation models against field-based datasets, at least on regional and national scales.

Methods: I am puzzled by the limitation of the study to only 20 plots. Certainly these 20 plots span the range of mean annual temperature and precipitation, but other factors are also commonly perceived to be important. Indeed, the distribution model seems to take 100+ inputs. Some questions that come to mind is whether the plots span the range of observed precipitation seasonality (identified by this study as an important factor!), soil texture, and soil nutrients.

Line 157: Why not assign the observed soil texture to the 20 plots?

Section 2.4.3: I am concerned that the DGVM and the DM uses different driver data to represent the same phenomenon. For example, does one use SeNorge2 and the

other reanalysis to represent precipitation? Does one use observed soil texture and the other "default" soil texture? If so, might differences in inputs account for differences in the DGVM and DM predictions?

Line 183: Was the DM model previously tuned to these 20 plots? To Norway?

Line 414: Might phenology also be an issue? Further, what is the light compensation point of the PFTs? Perhaps the authors can use the light compensation point to directly evaluate the relative shade tolerance of the different PFTs.

Discussion: Are there lessons for people who use other models? The more the authors can draw out such lessons, the broader the audience this paper would appeal to. The TEM model, which has a more detailed representation of boreal PFT diversity than CLM, immediately comes to mind as one example.

Technical corrections

The manuscript is very readable, but it should still be reviewed for grammar.

Page 3, Lines 43-45: There is a problem with word choice in this sentence. Vegetation distributions are not implemented in ESMs, but rather are predicted by ESMs. The ESM predictions can then be evaluated with satellite products (as done in the present analysis).

Section 2.4.1: It would be useful for the authors to briefly describe how the DGVM determines the amount of area to each PFT.

Data availability: Note that the GitHub link not up yet. I understand if the authors do not want to release the link prior to manuscript acceptance, but it is still important not to forget to release the link.

_____