Dear Dr. Eyal Rotenberg,

Please find the revised version of the manuscript. We have revised the manuscript and have carefully provided more evidence to support our model results.

In the revised manuscript the addition of new texts are highlighted in bold black font.

Our replies to the comments are highlighted in bold. We are looking forward to your decision,

Best regards,
Dushyant Kumar and co-authors

Responses to Editor's comment

Comments to the Author:
Dear Authors,

Thank you a lot for resubmitting your work and your efforts to address the reviewers' comments. Considering the amount of reviewers comments, their profoundness, their importance for the holistic view of the manuscript and your extensive replies, I find the revisions by the reviewers a necessarily step forward.

Reply: We thank you for finding our revision promising. We have addressed both concerns on temperature-CO_2 sensitivity for biomass, and model prediction for phenology change. We have revised the manuscript and have added more details and evidence to support our model results.

As already mentioned in my previous stage comments, many of the replies to comments you are considering that those effects included in the aDGVM2 model (e.g., temperature sensitivity) and that in current submission it is better described how the model treat those comments. I would suggest to provide further evidences substantiating the way of modelling of these effects, based, as much as possible, on field observations or others models for this or others regions.

Reply: We have added the following paragraphs to section 4.2:

"The sensitivity of biomass to temperature and CO_2 change has been investigated in many studies (Norby and Luo, 2004; Jian et al., 2019; Sperry et al, 2017). A meta-analysis by Lin et al. (2010) showed that warming significantly increased biomass by 12.3% (with a 95% confidence interval of 8.4–16.3%) across all the terrestrial plants included. This observation is consistent with our model results. Biomass showed a positive relation with MAT which did not change with mean annual precipitation or experimental duration or CO_2 enrichment (Lin et al., 2010). These findings are also supported by previous studies by Rustad et al. (2001), Dormann Woodin (2002) and Walker et al. (2006) which have revealed that warming generally increases terrestrial plant biomass, indicating enhanced terrestrial carbon uptake via plant growth.

Previous modeling studies using Biome-BGC (Running and Hunt, 1993), Cen-

tury (Parton et al., 1993), and TEM (Tian et al., 1999) have shown an increase in productivity when both climate change and CO_2 effects were considered. However, the increase was smaller when only climate change effects were considered and both Biome-BGC and TEM suggest that without CO_2 fertilization, average productivity would decline relative to current annual average as shown by our result (Fig. 6d)."

An example for such comment reply: Reviewer 1 stated that: "... the manuscript under discussion, line 349 (page 12), predicts the expansion of woody forests compared to Savannas in mountainous regions. Similarly predicts that in Deccan plateau may change to evergreen forests from deciduous forests" and he continue "... these situations and the conclusions drawn seem to be quite simplistic without applying appropriate knowledge in the forestry sector." Your reply is that: "A transition from deciduous to evergreen forests has been simulated for the mountainous regions, i.e., the Himalayas and the Western Ghats." Can you provide any observations/model results others than your model to support your claim?

Warm regards and wish you healthy days in those scary period, Eyal

Reply: We have added the following paragraphs to the discussion in section 4.1:

"Phenology change as a result of climate change has already been observed (Buitenwerf, Rose Higgins, 2015; Cleland et al, 2007). In Scheiter et al. (2020), we showed that climate change supports transitions to tall evergreen vegetation in tropical Asia and found increases in the abundance of evergreen plants and decreases in the abundance of deciduous plants in mainland Southeast Asia, central India, and Pakistan. This relative advantage of evergreen plants over deciduous plants under elevated CO_2 in aDGVM2 can be explained by the fact that increased intrinsic water use efficiency under eCO_2 in evergreen plants are higher than in deciduous plants as demonstrated by Soh et al (2019).

Previous modeling studies also support aDGVM2 result showing transitions from deciduous to evergreen vegetation. With the BIOME4 model, Ravindranath et al. (2006) simulated the response of forest to SRES A2 and B2 scenarios and reported similar changes toward evergreen phenology. A study by Chaturvedi et al. (2011) using the IBIS model also predicted transitions toward evergreen forest.

Woody encroachment in many ecosystems is attributed to rising CO_2 and this is supported by studies based on both field observations (e.g., FACE experiments) and satellite data (Brienen et al., 2015; Archer et al., 2017; Stevens et al., 2016; Piao et al., 2006; Schimel et al., 2015). The aDGVM2 also supports these findings i.e., increasing canopy cover and woody biomass under the eCO_2 condition and agrees with the reported greening trend in South Asia during the last three decades (Wang et al., 2017)."

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