

## ***Interactive comment on “Climate Change Projections of Terrestrial Primary Productivity over the Hindu Kush Himalayan Forests” by Halima Usman et al.***

### **Anonymous Referee #2**

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An interesting study focusing on a region expected to be sensitive to climate change. The study takes advantage of existing global model experiments from a previous study with a more detailed regional assessment. The manuscript is generally well written and presented but unfortunately there are key gaps in the detailed assessment necessary to reach the conclusions and assessments.

The authors are taking advantage of an existing ensemble so it is with reluctance that I suggest additional runs are required to attribute the drivers of changes in nbp. I would recommend following the C4MIP/LUMIP/TRENDY protocol of runs fixing components. In particular additional experiments with: Fixed PI or PD land-use Fixed PI CO<sub>2</sub> con-

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centrations. If not, more detailed assessment of the single runs is certainly required. In my assessment major revisions are required.

Major comments: 1. The climate model data is downscaled and bias corrected to a half-degree resolution using the CRU TS3.0 data. However, observations for the region are very sparse with considerable uncertainty in precipitation and other important fields. The interpolation of data to higher resolution elevation data is also potentially important and a possible advantage of this study. What confidence do you have in the application of the bias correction approach to a region of complex topography and sparse observations? How does the baseline CRU data compare to other observational estimates?

2. Climate uncertainty – the HKH is a region of high uncertainty in future climate response. For instance, there is uncertainty in the sign of change in western disturbances and monsoon affecting the HKH region. How do the available GCMs sample this uncertainty? It would be useful to see how representative these models are.

3. Detailed assessment of the components and drivers of changes in nbp and its components is generally missing. Analysis of the main results is generally thin.

Minor comments: Figure 1: White appears both within the HKH region and the rest of the region. What does it represent?

Spinup – can you confirm nbp is zero over the region at the end of the spin-up period? Are the PFT fractions prescribed or dynamically spun-up?

Figure 2: What period is covered here?

3.1 Can you explain why there are differences in the historical BC period?

3.2 What confidence do you have in the MODIS data set?

3.1/3.2 A key landclass of concern is EBF. It's not clear whether you are prescribing the vegetation cover or simulating interactively. Are there are insights here? It would be

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useful to have some assessment of the PFTcover if it is dynamic particularly in regard to the application of the land-use data.

3.3 You suggest land-use change fLuc is the cause of the decline in nbp but I miss any analysis of the nbp components that would justify this basis. It would be very useful to plot and analyse time series of the components. You mention crops and pasture but not how they are harvested and grazed. There is also no assessment of soil carbon and respiration which is a component of nbp.

3.3 Units are surely incorrect: 'The total VegC (averaged for all models) was estimated to be 7400 kg C m<sup>-2</sup> by 1950'

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