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Earth System Dynamics Discussions

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

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We are grateful to reviewer for their corrections and comments. Kindly find the response to the comments below.

1) Line 28: better to cite https://www.esrl.noaa.gov/gmd/ccgg/trends/gl_gr.html; what is 'presently'? during 2000-2019 the rate was above 2 ppm/yr. please give credit to the measurement people on such occasions.

Reply: Change has been made.

2) Line 50: remove "since 1960"

Reply: Acknowledged

3) Figure 2: how some parts are appearing brown in the modelled VegC? how is the quality/accuracy of the GeoCarbon product over the HKH region? Is there a product evaluation analysis?

Reply: The LPJ-GUESS shows some values for the upper part of HKH (such as 0, 0.2, 0.5 etc). However since there is low vegetation present in this area the GEOCARBON does not show any forest inventory based data. Product evaluation is not present.

4) Line 168: I agree with your assessment, but I see something systematic that the model using CCSM4 produce maximum Veg-C, and that using MPI is intermediate and lowest for IPSL. Please discuss the details, e.g., the with respect to the model drivers

Reply: Components of NBP are shown below (at the end). Will be discussed in the revised manuscript. In LPJ-GUESS, the main components and drivers of changes consist of NBP consist of soil heterotrophic respiration, wildfire emission and vegetation NPP (Veg+Est). The time series have been changed to 1851-1880, 1986-2015 and 2071-2100 (RCP2.6 and RCP8.5). The attachments include spatial maps of average flux of soil (figure 1), fire (figure 2), NPP (figure 3) and NBP (figure 4) of HKH region respectively. The future RCP8.5 show a higher soil flux with mean value of 0.51 kg C m-2. Furthermore most of the flux values are the concentrated in the western part of HKH with an average value of 0.68 kg C m-2 in RCP8.5. LPJ-GUESS simulations, show a negative NPP indicating decomposition or respiration is overpowered carbon absorption; more carbon was released to the atmosphere than the plants took in. Furthermore in the revised manuscript, additional graphs on the basis of these figures (spatial and temporal) will be added relating to drivers of NBP of HKH region according to high and low elevation and land use cover.

5) Line 182: you did not define tundra in section 2.1? where are those located

Reply: In this study, the land cover of MOD12Q1 has been utilized. The sentence has been modified and barren area have been incorporated instead of tundra.

6) Line 190: better to say 1-sigma, if true?

Reply: We prefer to use the unambiguous term "standard error".

7) Figure 4: can this plot of NPP be reconciled with the VegC in fig.3? or VegC are a result of cumulative NPP over a longer period of time? need some discussions

Reply: Figure 4 cannot be reconciled with figure 3 as both figures time period is different. Figure 4 time line period is 2000-2010 whereas Figure 3 shows the time line of a single year 2000. However, Figure 7 does show the GPP and NPP according to landcover classes similarly as Figure 3.

8) NOT ENOUGH JUSTIFICATION TO WRITE ONE SENTENCE PER BIG FIGURES, Fig., 4 - Fig. 7. please discuss details if there is something interesting for the readers. else you need to delete most of these

Reply: The text in the manuscript will be expanded in the future revised manuscript related to the figures focusing on the in depth analysis of the variables discussed.

Figure 9: It is a bit suspicious result that NBP increased during âĹij1960-2020 while the natural ecosystem is replaced by pasture. I do not know if this is an artifact of the CCSM4 meteorology or something else. at this point it should be nice to have a simulation case using CRU meteorology as submitted to the global carbon project using the same model. we need a good evaluation of the models for historical period and then discuss the projections, e.g., what you are showing in Fig. 10 in particular

Reply: For clarification figure 10, shows the NBP in three different time periods. However the time period will be changed to 1851-1880, 1986-2015, 2071-2100 (30 year interval) in the revised manuscript. Plots of the temperature and precipitation anomalies for the region from a wider range of CMIP5 GCMs, situating the chosen GCMs here within that ensemble will be included in the revised manuscript.

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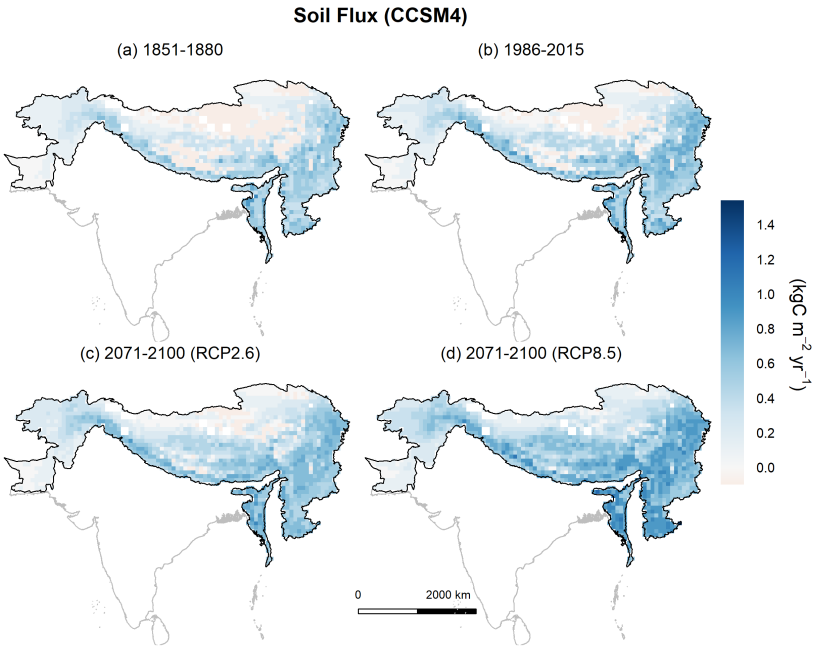

Fig. 1. LPJ-GUESS simulated distribution by CCSM4 of Soil Flux in HKH region under a) past period (1851-1880) b) present period (1986-2015) and future scenario under c) RCP2.6 scenario and d) RCP8.5.

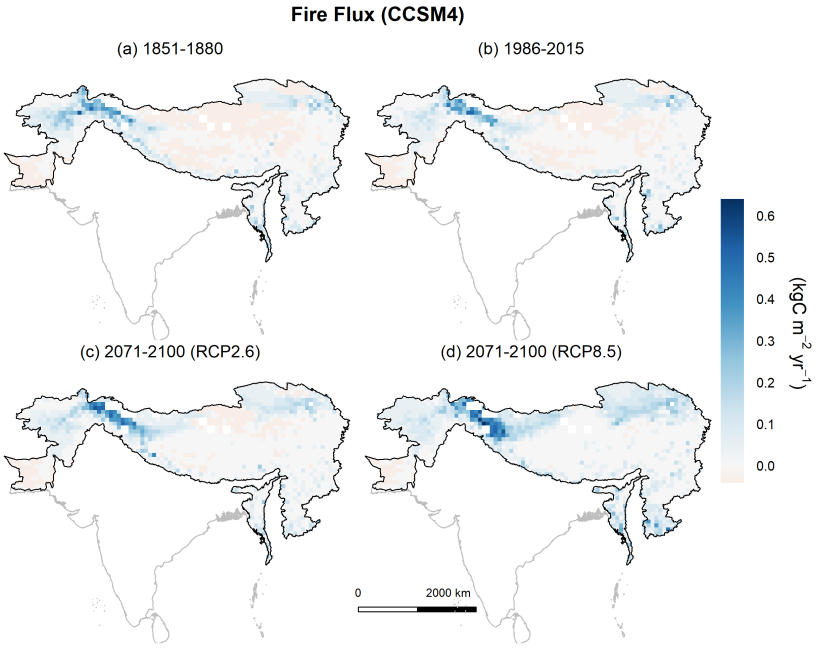

Fig. 2. LPJ-GUESS simulated distribution by CCSM4 of Fire Flux in HKH region under a) past period (1851-1880) b) present period (1986-2015) and future scenario under c) RCP2.6 scenario and d) RCP8.5.

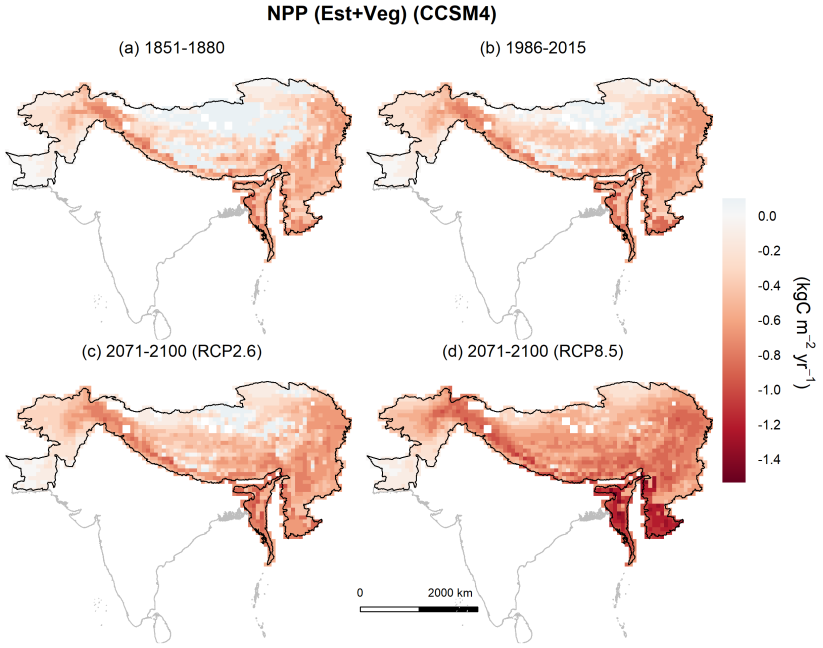

Fig. 3. LPJ-GUESS simulated distribution by CCSM4 of NPP in HKH region under a) past period (1851-1880) b) present period (1986-2015) and future scenario under c) RCP2.6 scenario and d) RCP8.5.

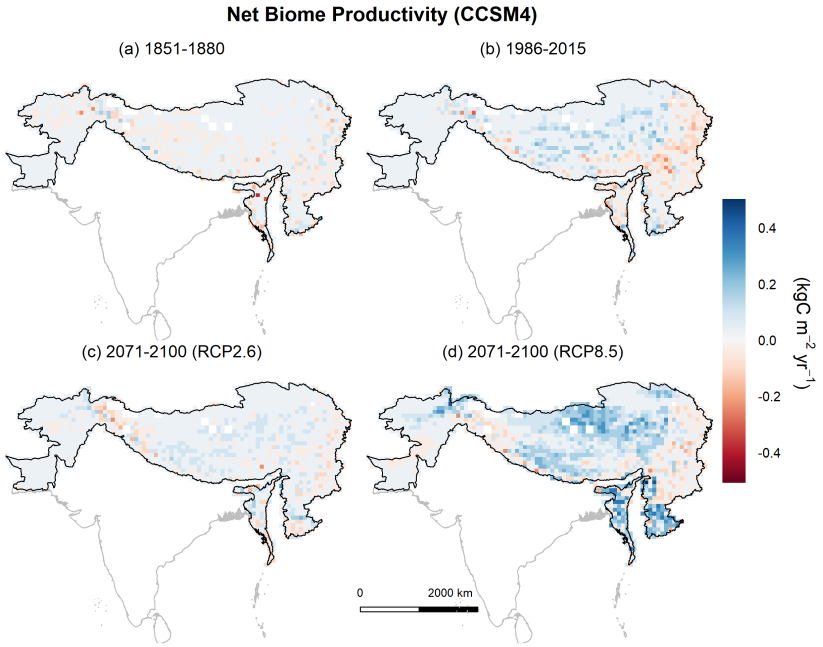

Fig. 4. LPJ-GUESS simulated distribution by CCSM4 on NBP in HKH region under a) past period (1851-1880) b) present period (1986-2015) and future scenario under c) RCP2.6 scenario and d) RCP8.5.