Responses to the Referee's Comments

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We are greatly thankful for the constructive comments from the anonymous reviewer. We have carefully studied them and revised the manuscript accordingly. This document contains our specific responses to the comments.

Responses to Anonymous Referee #1's Comments:

1. Based on this first sentence, it seems that the main research question of this study is about this vegetation (NPP) -> climate feedback, but then it is not clear what purpose the next sentence "A few studies focused on feedback evapotranspiration is serving. First, if there are already "a few studies", then what is special (novel) with your study? Do you actually mean "few" instead of "a few"? Second, what is the role of evapotranspiration in addressing NPP -> climate feedback? You need to provide a connection between it and the main research question (NPP -> climate).

The next couple of sentences reporting NPP changes in north and south hemispheres are another jump, without apparent connection with the NPP->climate feedback. The last sentence of the first paragraph of Abstract entirely reverses the question: now you are talking about climate -> NPP.

It is uncommon that an abstract has more than one paragraph. More importantly, you need a sentence or two to connect the content of the second paragraph to the main issue of this study (NPP -> climate). I think the main point you want to make is that vegetation has a feedback to climate through ET.

My main suggestion is that the authors want to first clearly sort out the main logic of this paper. If the main research question is the feedback of NPP to climate, and the main point is that ET is the means of this feedback, then this logic needs to be very clearly presented and all the materials need to be organized around it. Without this big picture in mind, it is easy to get lost in details, e.g., flip back and forth between NPP ->climate and climate -> NPP.

Response: Thanks for the reviewer's good comment. According to the reviewer's comment, we rewrote the abstract as follows:

Abstract: The dramatic increase of global temperature since year 2000 has a considerable impact on the global water cycle and vegetation dynamics. Little has

been done about recent feedback of vegetation to climate in different parts of the world, and land evapotranspiration (ET) is the means of this feedback. Here we used the global 1-km MODIS net primary production (NPP) and ET datasets (2000-2014) to investigate their temporospatial changes under the context of global warming. The results showed that global NPP slightly increased in 2000-2014 at a rate of 0.06 PgC/yr^2. More than 64% of vegetated land in the Northern Hemisphere (NH) showed increased NPP (at a rate of 0.13 PgC/yr^2), while 60.3% of vegetated land in the Southern Hemisphere (SH) showed a decreasing trend (at a rate of -0.18 PgC/yr^2). Vegetation greening and climate change promote rises of global ET. Specially, the increased rate of land ET in the NH (0.61 mm/yr^2) is faster than that in the SH (0.41 mm/yr^2). Over the same period, global warming and vegetation greening accelerate evaporation in soil moisture, thus reducing the amount of soil water storage. Continuation of these trends will likely exacerbate regional drought-induced disturbances and point to an increased risk of drought, especially during regional dry climate phases.

The main logic of this paper:

The dramatic increase of global temperature since year 2000 has a considerable impact on the global water cycle and vegetation dynamics. Clear data on spatiotemporal variations and attributes in global terrestrial net primary production (NPP) in different parts of the world within the context of high variability warming are still lacking. Vegetation and climate changes alter the global land evapotranspiration (ET). In our study, we investigated the following three major points of interest: 1) whether the high volatility temperature of the past decade continued to increase NPP, or if different climate constraints were at play; 2) why NPP variations in the Northern and Southern Hemispheres respond differently to climate changes; and 3) what the spatiotemporal variation of NPP is, and what its effects are on ET.

2) I think the statements you made in the second paragraph are confusing. It seems to me that what you are saying is that no matter NPP increases (in NH) or decreases (in SH), it will lead to drought.

Response: Vegetation greening and climate change promote rises of global ET (Zhang et al., 2015). Specially, the increased rate of land ET in the NH (0.61 mm/yr^2)

is faster than that in the SH (0.41 mm/yr^2). Anomalous warming indicates a general prospective acceleration or intensification of the global hydrological cycle and thus an alteration in the process of ET, but dry conditions have caused a reduction in vegetation productivity and a near cessation of ET growth in the SH.

Figure 5 illustrates the world-wide decrease in soil moisture of four layers (0-10, 10-40, 40-100, and 100-200 cm). Global warming and vegetation greening accelerate evaporation in soil moisture, thus reducing the amount of soil water storage. Continuation of these trends will likely exacerbate regional drought-induced disturbances and point to an increased risk of drought, especially during regional dry climate phases.

References

Zhang, K., Kimball, J.S., Nemani, R.R., Running, S.W., Hong, Y., Gourley, J.J. and Yu, Z.B.: Vegetation greening and climate change promote multidecadal rises of global land evapotranspiration, Sci. Rep, 5, 15956, doi: 10.1038/srep15956, 2015.