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Interactive comment on "Impacts of droughts on carbon sequestration by China's terrestrial ecosystems from 2000 to 2011" *by* Y. B. Liu et al.

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This manuscript is a study aimed at analyzing the impacts of droughts on terrestrial carbon sequestration in China, which is important for recognizing the spatial heterogeneity of NEP's response to droughts, and the accumulative and lag effects of drought on carbon sequestration also is interesting. Nevertheless, there are still have some minor revisions should be considered:

Authors' response: Thank you for your constructive comments. We will seriously revise the manuscript following the comments point by point.

1. As an important indicator for drought evaluation in this research, SPI should be

given more detailed description or explanations: (1) Algorithm (2) What are the "temporal flexibility and spatial consistency" of SPI? (3) Why only 1, 3, 6, 9 and 12 months SPIs were selected for evaluation? (4) How the site-observed precipitation data was interpolated into each pixel?

Authors' response: We will give more detailed description on the algorithm and characteristics of SPI.

The SPI is based only on precipitation and can be calculated on any timescale. Because of its normal distribution, the frequencies of the extreme and severe drought classifications for any location and any timescale are consistent (McKee et al., 1993; Hayes et al., 1999).

The SPI is calculated by standardizing the probability of observed precipitation for any duration of interest (1, 2, 3, 6, 9 and 12 months) (Ji and Peters, 2003; Quiring and Ganesh, 2010). In previous studies, the SPI was computed at time scales of 1, 2, 3, 6, 9 and 12 months by Jain et al. (2010) and at 1, 3, 6, 9 and 12 months by Pei et al. (2013) using monthly rainfall data to indicate droughts, respectively. So, we select 1, 3, 6, 9 and 12 months SPIs to represent different time scale precipitation deficit in this study. Of course, this simplification might blur the lagged effects of drought at other duration periods. In the revised manuscript, we will discuss this issue.

The site-observed precipitation data was interpolated into spatial grid data using an inverse distance weighting (IDW) method (line 5-9, P17476). The interpolation accuracy of the IDW method depends on the spatial variability and density of the observation. In summer, the spatial variability of precipitation is large, especially in complex terrains. In addition, no precipitation meteorological data was available in Taiwan province, and precipitation observations were sparse in the northwestern area. These limitations in the observational precipitation data would inevitably induce uncertainties in interpolated meteorological data, and consequently in simulated carbon cycle. We will indicate this issue in the revised manuscript.

2. This manuscript pointed out that "In drought years, the reductions of NEP might be caused by a larger decrease in gross primary productivity (GPP) than in respiration (RE) (2001 and 2011), a decrease in GPP and an increase in RE (2009), or a larger increase in RE than in GPP (2006)" both in result and abstract, however, why the effects of drought on NEP are so different within different years and different regions still do not have strong explanations or discussions in the article.

Authors' response: Thank you for your suggestion. NEP is the residual of GPP minus respiration (RE). The effect of drought on NEP depends on the response of GPP and RE. Drought in grow season cause GPP to decrease. Therefore, the impact of drought on annual GPP depends on the season in which drought occurred. The influence of drought on annual RE is even more complex. RE consists of autotrophic respiration (Ra) and heterotrophic respiration (Rh). The influence of drought on Rh is related to the state of soil water content prior to the drought due to the inverse parabolic response of heterotrophic respiration to soil water content.

In the revised manuscript, we will analyze why drought has different effects on NEP within different years and different regions.

3. The article described that Radiation is a key factor driving the interannual variability of productivity (Nemani et al., 2003), which might be a possible cause of NEP decrease to some extent in humid Southeast and South China. Comparing the variation of radiation with NEP should support the authors' consideration.

Authors' response: Thank you for your suggestion. We will analyze the effects of radiation on NEP through comparing the interannual variations of radiation and NEP in humid Southeast and South China and comparing the findings with previously reported results.

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