

Interactive comment on “Impact of climate and land use/cover changes on the carbon cycle in China (1981–2000): a system-based assessment” by Z. Gao et al.

Anonymous Referee #1

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General comments China's ecosystems have long been influenced by human disturbances. Study of the impact of climate change on carbon cycle of Chinese ecosystems must consider the changed land use and land cover. Regional studies and preliminary national works about the impact of land use change on carbon in Chinese vegetation have been reported, but a comprehensive synthesis is further needed. This manuscript attempted to analyze both impacts of climate change and land use on carbon cycle in China based on model simulation. It is a valuable assessment. However there are still some questions that must be worked out before publication.

The key question the reviewer concerned is about the model. The paper used only one

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model, the CEVSA, to simulated carbon cycle of Chinese ecosystems. The CEVSA is of course a good model and has been validated in global and regional scales, but it still has some disadvantages. For example as said in section 4.1 the model has no simulation of soil physical structures and the ecosystem process, hasn't considered the hydrological cycle, and likely no fire simulation. All of parameters used in this study are default. How robust is the simulation? Why must readers believe the results from this model rather than other models? Using a group of models to simulate the impacts of climate and land use changes on China's carbon cycle would be a better solution. Although the paper compared its results with ones from other models (in section 4.2), the reviewer doesn't think all of models used the same driving data.

The second question is about the land use and vegetation data. I think that the land use data was from Liu et al. 2005 a,b rather than the authors' own work. In section 2.2 it said that the land cover data was generated based on the Landsat TM images. It has originally 25 land cover classes and these classes were aggregated into six land cover categories. However the vegetation cover was generated using the AVHRR data. The number of vegetation types was not mentioned. What are the differences between these land cover and vegetation distribution datasets? Why were they generated from different remote sensing sources? What is the difference between the classification systems of land use and vegetation? How to match them? How to deal with both the land cover and vegetation distribution in the same model runs?

Data sources are usually missing: What is the source of Landsat TM images in section 2.2? Where did the AVHRR data come from? Although many people know about these data sources, it's still better providing the references or web pages. In section 2.3 the authors listed several datasets, but the sources of these datasets are not available, for example, the daily climate data from 671 weather stations and the soil texture data. Are there any references for these datasets? In addition, what is the exact method of climate interpolation, the Hutchinson method or the GIS module?

Model evaluation: The CEVSA model has been successfully used in global and re-

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gional carbon simulations and has been evaluated at different spatial and temporal scales; the authors of this paper therefore followed this model. However this doesn't mean that the model does not need further evaluation in this study because the driving conditions have been changed. An evaluation of model results produced in this paper is still needed.

The impacts of climate changes on the carbon storage and carbon flux: In section 3.1 there are only two climate factors separately considered: the mean annual temperature and precipitation which are correlated to carbon storage and flux, significantly or not significantly. However the joint effects of heat and water on China's carbon cannot be ignored because vegetation distribution in China is mainly controlled from the southeast to the northwest by the combination of temperature and precipitation, e.g. the moisture/aridity index and the ratio of actual to potential evapotranspiration. The extreme climate conditions are other important factors which influence carbon flux. In addition to climate changes, fire is another key factor.

Specific comments

Title: what does it mean here about the 'system-based'?

In section 2.3: The first model run used actual meteorological data for every 10 days from 1971 to 2000, but the second model run used actual meteorological data of every 10-day period from 1981 to 2000. Why was climate data of different time periods used? The reasons given in the last paragraph in section 2.3 seem not true.

In section 3.2 second paragraph: the LUCG was cited from Liu et al., 2005 (or 2005a). Is this the real land cover change that the previous study presented or the current paper showed? In line 8 there is a wrong percentage (11.9.9%).

The comparisons of carbon storage and carbon flux simulated by different models: it is better providing the driving data of each model. Further comparisons, especially with those based on inventory and observations, must be considered.

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Table 3. Changes of NEP -0.0005 PgC (not -0.0009). The values of NPP, HR and SOC don't match.

Figure 2. The top is LUCG in 1990s, bottom is the difference between 1980s and 1990s, the caption is between 1990-2000. Which one is correct?

Figs 3-5: The changes of temperature and precipitation and carbon are mainly in national level. What about the regional changes?

References: These two papers should have the same contents but in different languages: Li, K. R., Wang, S. Q., and Cao, M. K.: Carbon storage in China's vegetation and soils, *Sci. China*, 33(2), 72–80, 2003. / Li, K. R., Wang, S. Q., and Cao, M. K.: Vegetation and soil carbon storage in China, *Sci. China*, 47, 49–57, 2004.

Recent papers of Piao SL et al. published in *Nature* are helpful.

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