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***Interactive comment on “Spatial and temporal patterns of CH<sub>4</sub> and N<sub>2</sub>O fluxes in terrestrial ecosystems of North America during 1979–2008: application of a global biogeochemistry model” by H. Tian et al.***

**H. Tian et al.**

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Received and published: 24 June 2010

First of all, thank reviewer for the positive comments on our manuscript. For the five questions, we would like to answer them as following; 1) We have compared our results with Kort et al’s continental-level estimate (Kort et al., 2008b). The spatial distribution of CH<sub>4</sub> and N<sub>2</sub>O are quite correlated between Kort et al’s study and ours. The difference between two studies is the CH<sub>4</sub> emission from wetland. Our model study assumed that one single grid is occupied by one biome, so the spatial coverage of CH<sub>4</sub> source is limited, compared to Kort et al’s study. So a fractional simulation to show the CH<sub>4</sub> flux

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are necessary, we are currently working on this effort and will compare it with Kort et al's results and CH<sub>4</sub> fluxes derived from satellite imageries (Bergamaschi et al., 2007; Bergamaschi et al., 2009) and empirical model (Bloom et al., 2010). 2) Thanks for the suggestion; examination of the factorial contribution of all global change factors is very important for policy making because it could provide direct suggest for mitigating emission of gases. We have finished this effort and one manuscript partitioning CH<sub>4</sub> flux to global change factors has been accepted to publish in Biogeosciences Discussion, and another manuscript partitioning of N<sub>2</sub>O flux to all global change factors is under review in the journal Global and Planetary Change. 3) Yes, we agree that both temperature and precipitation are two key controllers for CH<sub>4</sub> and N<sub>2</sub>O fluxes (Conrad, 1996; Mer and Roger, 2001; Xu et al., 2008a). In current study, temperature and precipitation were combined as one global change factor, climate change. It will be an important contribution if the contribution from temperature and precipitation could be separated, as Bridgham et al suggested (Bridgham et al., 2006b). We will conduct further study to separate temperature and precipitation's influences on CH<sub>4</sub> and N<sub>2</sub>O fluxes in near future. 4) The consistency between Xu et al (Xu et al., 2008a) and our study suggest that our study captured the continental level N<sub>2</sub>O flux. The dominant role of climate variability (mainly temperature and precipitation) on the inter-annual variability in CH<sub>4</sub> and N<sub>2</sub>O fluxes has been confirmed in our study (section 4.3.Environmental controls on CH<sub>4</sub> and N<sub>2</sub>O fluxes). Yet it does not mean temperature and precipitation solely control CH<sub>4</sub> and N<sub>2</sub>O flux on which Xu et al's study was based (Xu et al., 2008a). Our current study also considered the influence from atmospheric CO<sub>2</sub>, nitrogen deposition, ozone pollution, and land use change etc. 5) All the correlations between fluxes and temperature and precipitation are based on continental-level average. It might not totally represent site-level results. We conducted this analysis is to show the potential effects of climate change on continental-level fluxes of CH<sub>4</sub> and N<sub>2</sub>O. The controlling of precipitation on terrestrial fluxes of CH<sub>4</sub> and N<sub>2</sub>O is due to the high dependence of CH<sub>4</sub> and N<sub>2</sub>O production on soil moisture. The temperature also exerts control on the CH<sub>4</sub> and N<sub>2</sub>O production; the insignificant correlation between CH<sub>4</sub> and temper-

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ature at continental-level does not mean the temperature did not influence CH<sub>4</sub> flux. It might due to spatial variation of the temperature control on CH<sub>4</sub> block the correlation at continental-scale. Grid-level correlation has been found between CH<sub>4</sub> flux and temperature for majority of continental North America.

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Interactive comment on *Biogeosciences Discuss.*, 7, 2831, 2010.

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