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Interactive comment on "Global spatiotemporal distribution of soil respiration modeled using a global database" *by* S. Hashimoto et al.

O. Hararuk (Referee)

ohararuk@nrcan.gc.ca

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The manuscript presents the global distribution and the long-term global trend of soil respiration, obtained by assimilating multiple field observations of soil respiration into a semi-empirical model, which represented soil respiration as a function of air temperature and precipitation. The manuscript is very well written and timely in supplying the modeling community with the data (and uncertainties) for benchmarking the global carbon cycle models.

Although the model used by Hashimoto et al. did not include the detailed carbon cycle and therefore did not provide information about net carbon change, as the authors mentioned in section 4.1, I still think it is worthwhile to investigate the trends in terrestrial ecosystems' carbon storage capacity on the global scale. A possible approach

would be to compare long term trends in global NPP from Nemani et al. (2003) and Zhao and Running (2010) to trends in heterotrophic respiration. Important assumptions for this comparison would be that relationship between total soil respiration and heterotrophic respiration had stayed the same, and that litter layer was not removed when soil respiration was measured. Additionally for their analysis Nemani et al. and Zhao and Running used climate data from National Center for Environmental Prediction, so it would be necessary either to show that the CRU and NCEP are very similar or use NCEP data. Nemani et al. (2003) reported that NPP was increasing in the period from 1982 to 1999 at the rate of 0.18 Pg C/year, whereas soil heterotrophic respiration in the same period was increasing at the rate of 0.06 Pg C/year (calculated from Table S3), suggesting that global terrestrial carbon storage capacity increased. From 2000 to 2009 there was a negative trend in global NPP (-0.055 Pg C/year), and no significant trend in heterotrophic respiration, which meant that carbon storage capacity decreased over those years, but was still higher than in 1982. I think such analysis along with the figure illustrating the trend in global and regional NEE from 1982 to 2009 will be a great integration of authors' analysis into the current knowledge about terrestrial carbon storage capacity.

Lastly, some clarifications are necessary. For instance, it was not clear how exactly the Hashimoto et al. informed the model with the observations from the Bond-Lamberty dataset. The Bond-Lamberty dataset contains monthly and/or annual respiration data for different years and often for multiple years. Was monthly or annual observed soil respiration assimilated into the model? Were the observed years aligned with the model years or were the averaged observations used? Were plot level measurements assumed to be the observations of a 0.5-degree grid? Or was the calibration performed at plot data with the observed monthly temperature and precipitation? I suggest complementing section 2.3 with this information.

Below are few minor suggestions:

P4336, L24: "of it is limited" P4340, L16-17: typo: years are squared in the superscript

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P4341, L12-14: “The RH and RA were nearly equivalent to each other, but in the regions of high RS, RH was greater than RA; and in the regions with low RS, RA was greater than RH”. Figures 7 and 8 show the opposite, please correct. Figure 1: I suggest including uncertainties to the functions to give an idea about the sources of uncertainties in global soil respiration

Figure 9: it is inconvenient for the reader to open a supplementary file to identify the model in this figure; I think the figure will be improved if you put the model names on the x-axis rotated by 90 degrees or include the key in a separate panel of the same figure

Nemani RR, Keeling CD, Hashimoto H et al. (2003) Climate-Driven Increases in Global Terrestrial Net Primary Production from 1982 to 1999. Science, 300, 1560-1563. Zhao M, Running SW (2010) Drought-Induced Reduction in Global Terrestrial Net Primary Production from 2000 Through 2009. Science, 329, 940-943.

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