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Interactive comment on "Improvement of Soil Respiration Parameterization in a Dynamic Global Vegetation Model and Its Impact on the Simulation of Terrestrial Carbon Fluxes" *by* Dongmin Kim et al.

Anonymous Referee #3

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The authors developed PFT-dependent Q10 values for soil organic matter (SOM) decomposition processes using a multiple regression method. They demonstrated that the spatially-distributed Q10 had the potential to improve the simulation of both soil respiration and GPP compared with the CLM4 simulation with a uniform Q10. It's necessary and important to use spatially-distributed Q10 rather than a constant Q10 in global simulations. I would like the authors to further clarify the "multiple regression" method used in this study as I don't quite understand it while reading the manuscript: (1) what are the response variables (Rs?) and explanatory variables (T & M?) in the regression analysis? (2) what datasets at what time-scale are used for regression?

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(3) what is the relation between the equations 4-8 and the regression analysis? (4) how do you calculate Q10 at every time interval as you stated in Line 381? Q10 is temperature-dependent as indicated in Eqs. 2 & 5, do you mean that you will also change Q10 based on the temperature at current time-step? Another concern of mine is related to the calculation of Q10 using soil respiration data. We know that generally soil respiration includes both heterotrophic respiration from SOM decomposition and root respiration (growth + maintenance). It seems the PFT-dependent Q10 is developed for SOM decomposition processes, thus how do you use total soil reparation to determine the Q10 for SOM decomposition?

Minor comments: (1) Fig.5 & Fig. 9: please indicate the units of Rs and Ra. In addition, please explain what are Ra and Rs, i.e., plant autotrophic respiration and soil respiration. (2) Figs.4, 7, 8 & 9: please indicate the units of GPP. (3) Line 304: "The Rs Simulation difference between CTL and EXP is given in Figure 5, in terms of global distribution as well as zonally-averaged distribution". I understand we may identify the zonal difference between CTL and EXP. However, Fig.5a shows the difference between EXP and Hashimoto data, not between EXP and CTL. (4) Line 314: "the difference between EXP and CTL increases with temperature". It may be true for boreal and B_Shrub PFTs. I would suggest doing statistical tests to show whether the relation is significant or not.

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