

## ***Interactive comment on “Global soil organic carbon stock projection uncertainties relevant to sensitivity of global mean temperature and precipitation changes” by K. Nishina et al.***

**Anonymous Referee #2**

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General comments:

The potential impact and feedback of global warming on soil organic carbon pool is one of the crucial researches to better predict future climate change. Although this topic have made some progresses recently, it still have a lot of uncertainties. In this study, Nishina et al. analyzed soil carbon storage and its change (basing on seven biome models) under the projected climate change, and try to evaluate the sensitivity of temperature and precipitation on global SOC stock. The study made some valuable results. However, there are some aspects need be discussed or clarified.

specific comments:

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1. The differences of modeled SOC storage among 7 biome models are very large (1090 ~ 2650 PgC). As these initial values of carbon pools will necessarily impact the projected SOC (formula 1), the authors need evaluate these initial carbon pools first, which will be helpful for assessing the results of SOC change and temperature sensitivities. In addition, does the magnitude of initial carbon pool have some statistical relationship with the SOC change or sensitivity?

2. The MS mentioned (Page 12 Line 14~17) that this study used a simple substitution (i.e. setting the global SOC stock in each biome models to equal to the referenced value) to test the impact of SOC on projection uncertainty. How does it be conducted? After all, the values of soil organic carbon in each biome model are related with other state variables (e.g. veg pool) and model parameters (e.g. turnover rate). Did they change accordingly?

3. Why did the authors only analyze the statistical relationship between the global total SOC and global mean temperature? As the output of biome modeles are spatial-explicit, it is possible to get these parameters values (k, beta1, beta2) for different vegetation types (or spatial grids), which should have more spatial information on these parameters and then helpful to assess the sensitivity for different biomes.

Specific technical comments:

1. Page 9 Line 18~19, posterior distributions listed in Table 2, not Table 1.

2. What the meaning of indirect CO<sub>2</sub> fertilizer effect (Page 11 Line 5)?

3. The beta 1 of JeDi model is negative value (Table 2), Why?

4. The change of Veg C (-527 PgC) seems too high (Page 9 Line 8), comparing with the vegetation pool value (493 PgC). It needs some verifications.

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