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Interactive comment on “Differential long-term effects of climate change and management on stocks and distribution of soil organic carbon in productive grasslands” by A. M. G. De Bruijn et al.

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Final response: Differential long-term effects of climate change and management on stocks and distribution of soil organic carbon in productive grasslands. Published online on January 24, 2012.

Response to referee #1, comments posted on March 29, 2012

We would like to thank referee #1 for her or his comments on our manuscript. In response, we suggest following improvements:

Introduction:

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1. Page 1057, line 4: Table 1: please state the soil depth for these numbers. 8kg/m^2 is for what depth?

IPCC does not specify a depth here. Presumably mentioned SOC is ascribed to the whole rooting depth. We will add the depths considered in table 1 in our final submission.

Is it possible to state also in Table 1, the % of SOC?

Unfortunately, densities were not mentioned in any of the papers mentioned. We will add a remark of this sort in our final submission.

2. Page 1057, line 15: Rewrite the sentence . . . Further consideration. . . . _SOC requires further consideration for deeper soils.

In our final submission, we will change this sentence to: There are indications that SOC in deeper soil has received insufficient attention.

Materials and Methods: 1. Page 1060, line 1: “daily”, is this the 24 hr day, if so please state so.

We will change this sentence to: The OGM model uses daily (24h) time steps.

2. Page 1060, line 25: replace “confirms “ with conforms

We will replace confirms with conforms.

3. Page 1060, line 16: the word “century” should be in Capitals CENTURY

We will replace century with CENTURY.

4. Page 1060, line 16: need a reference to verify the assumption that E is negligible when LAI is $> 1\text{ m}^2/\text{m}^2$.

Evaporation (E) and transpiration (T) are difficult to estimate in isolation. Some estimates given for example by Ham et al, (1990) suggest that $T \gg E$ in almost all stages of a developing vegetation, which indicates that E from a developed canopy is very

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small. However, $T = 0$ by definition when $LAI = 0.0$. An sharp, exponential decrease of E/PET from 1.0 to 0.0 with increasing LAI is therefore appropriate, but due to a lack of measurements of T , we simplified to $E/PET = 1.0$ when $LAI < 1.0$, or $E/T = 0.0$ when $LAI \geq 1.0$. Some estimates indicate that this approximation may underestimate E with maximum 10% when $LAI \sim 1.0$. In view of the magnitude of uncertainties we are dealing with in modeling biogeochemistry of a field site, we feel that this is acceptable (Ham et al, 1990, Saugier and Katerji, 1991, Merta et al, 2006).

We will add this explanation to our final manuscript.

(References)

Ham, J., J.L. Heilman, and R.J. Lascano. 1990. Determination of soil water evaporation and transpiration from energy balance and stem flow measurements. *Agric. For. Met.*, 52: 287-301.

Merta M, Seidler C, Fjodorowa T. 2006. Estimation of evaporation components in agricultural crops. *Biomedical and Life Sciences* 61:280–283.

Bernard Saugiera, Nader Katerjib, Some plant factors controlling evapotranspiration, *Agricultural and Forest Meteorology*, Volume 54, Issues 2–4, April 1991, Pages 263–277

5. Page 1070, line 17. Before GSD, insert the words. . . .growing season drought.

We will change GSD to Growing Season Drought (GSD).

Results 1. Page 1072, line 6: inadequate caption to Fig. 2. State which line is model and which is observation

We will include a legend to Fig 2 to show which is model and which is observation. Using a legend instead of the figure captions, we feel, is more consistent with other graphics in our manuscript.

2. Page 1072, line 8: Figure 3. The caption to Fig. 3 is totally inadequate. Please

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identify the different subplots as, (a), (b) etc and then in the caption be explicit about the graph content. For example, in (a), there is: EXT and INT, and then measured and modeled. . . but only two lines in the graph. The different horizontal scales are really absurd. Suggest possibly making two figures: one for 2004 (with all its detail) and the second figure for the period 2002 to 2009. It is a great pity that the authors did not spend time doing a proper set of figures to represent in adequate detail what is contained in Fig 3. The text in the results section from page 1072, line 7 to page 1073, line 20, are a very difficult read and almost impossible to verify the numbers given in text with the data shown in Fig 3. The information in Fig 3 and the highlighted text above (page 1072 and 1073) is excellent material but poorly presented. I strongly urge the authors to redo this section and Fig 3.

We will use characters (a-e) to identify the subplots in our final submission. We are willing to split fig 3 in to two graphs with time scales 2002-2009 and 2004-2005. We agree that sections 3.1.1. and 3.1.2. merely sum up the numbers that are given in the graphs and tables. We feel however, that the sentences are limited in length, and that the points that are made in these two sections are straightforward and easy to understand. Unfortunately, reviewer #1 does not specify exactly how she/he would want to see these sections improved. Hence, we are more than willing to consider any suggestions on this point, but we feel that we are currently unable to suggest ways to improve these sections.

Response to referee #1, comments posted on March 12, 2012.

Thanks again for your comments.

Interactive comment on Biogeosciences Discuss., 9, 1055, 2012.

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