

## ***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.***

**Anonymous Referee #1**

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### Summary:

This paper examined the impact of land use and climate change on SOC stocks and stock changes for two grasslands in central Switzerland – one EXTENSIVE land use, the other INTENSIVE. Using the OGM model, the authors found that: 1) management intensity rather than climate dominates the SOC dynamics for the first 20 years after grassland establishment and thereafter climate dominates; 2) that manure application contributes ~ 60% to the SOC stock; and 3) SOC accumulates in the top 10- 15 cm and decreases below that.

### General:

C511

This is an important paper and makes a timely contribution to the science of SOC change with time. I have little to add to my original review (24/11/2011) except some minor comments listed below and one rather major point. My biggest issue with the paper in its current state, is the presentation of the results. The results are particularly interesting and important but the graphical presentation of the results is poor. I would strongly recommend to the authors that they take the results section and in particular Figure 3, and redo this section. Instead of just one Figure 3, it may need two Figures: one, similar to Fig 2 in the original MS, showing results for all years 2002 to 2009; and a second Figure to show in greater detail, maybe one year (e.g. year 2005), the different results. I would suggest to the authors that they name the subplots as (a), (b) etc. Furthermore, I would suggest that they write more detailed descriptions in the Figure captions, explicitly explaining (a), (b) etc. The Figure captions are inadequate and too brief.

### Abstract:

The abstract is well written and satisfactory.

### Introduction:

1. Page 1057, line 4: Table 1: please state the soil depth for these numbers...8kg/m<sup>2</sup> is for what depth? Is it possible to state also in Table 1, the % of SOC. This reviewer thinks of low C sites as being ~ 1 to 3% SOC, and high SOC soils to be ~ 45 % SOC (peat soils). This requires knowledge of density. This would give the reader the opportunity to think of the soil type if the densities are listed in Table 1.
2. Page 1057, line 15: Rewrite the sentence ...Further consideration. .... $\Delta$ SOC requires further consideration for deeper soils.

### Materials and Methods

C512

1. Page 1060, line 1: "daily", is this the 24 hr day, if so please state so.
2. Page 1060, line 25: replace "confirms " with conforms
3. Page 1060, line 16: the word "century" should be in Capitals CENTURY
4. Page 1060, line 16: need a reference to verify the assumption that E is negligible when LAI is  $> 1 \text{ m}^2/\text{m}^2$ .
5. Page 1070, line 17. Before GSD, insert the words. ....growing season drought

## Results

1. Page 1072, line 6: inadequate caption to Fig. 2. State which line is model and which is observation
2. Page 1072, line 8: Figure 3. The caption to Fig. 3 is totally inadequate. Please 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.

## Discussion

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1. Page 1076, Line 12: replace "extend" with "such an extent"
2. Page 1079, line 14: replace "capable" with "able"

## Conclusions

1. Page 1080, line 8: You state  $\sim 45$  years in the conclusion, while in the abstract you state 20 years. Which is it?
2. Page 1080, line 16: add a note spelling out what happens to SOC at a depth below 15cm. Seems that SOC is redistributed: with gains to the top 15 cm layer and losses at deeper depths. Spell this out in the conclusions.

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