Geosci. Model Dev. Discuss., 8, C539–C544, 2015
www.geosci-model-dev-discuss.net/8/C539/2015/

Geoscientific Model Development Discussions

Interactive comment on "Matching soil grid unit resolutions with polygon unit scales for DNDC modelling of regional SOC pool" *by* H. D. Zhang et al.

H. Zhang

hdzhang@issas.ac.cn

Received and published: 24 April 2015

General Comments:

In this paper, the authors investigated impact of raster resolution of soil map on quantification of soil organic carbon (SOC) simulated by a DNDC model. They figured out optimal grid unit resolutions based on the SOC amounts of soil map polygons and grids. The resolutions for C5 (1:50,000), D5 (1:200,000), P5 (1:500,000), N1 (1:1,000,000), N4 (1:4,000,000), and N14 (1;14,000,000) were 0.2, 0.7, 1, 2, 8 and 17 km, respectively. They also developed a formula to figure out an optimal grid unit resolution from

a map scale. In general, the Materials and Methods is well written and the methods used are interesting. In the Results section, the explanation needs to be more explicit. The manuscript will be of interest to readers of this journal.

R: Thanks for the active and positive comments. As to the Results section, we will give more explicit explanation.

Specific Comments:

1. I checked Yu et al. (2014) which was cited by the authors and understood that the manuscript was written following the method adopted by Yu et al. (2014). The SOC data was different between the two researches (observed and simulated data were used by Yu et al. (2014) and the authors, respectively). However, I am somewhat concerned about the novelty based on the difference, because it is obvious that the optimal grid unit resolutions showed similar values if the model was well validated. There must be some advantages to use the simulated dataset, but I couldn't find any statement from the manuscript.

R: It's an interesting question. The optimal grid unit resolutions showed difference between this and Yu et al. (2014) studies. The reason for the difference is that more soil features data such as soil clay content and pH, climate data and farming data were used in this study to simulate SOC content Ci (g/kg), which were not used in Yu et al. (2014). More Soil features and other environment and management features involved implies more rigorous criteria to assess data consistency between grid unit datasets and their parent polygon unit datasets, and leads to increase of optimal raster resolution further, even if the same indices and criteria were applied as Yu et al. (2014) did. While such difference happened only at the two small map scales of N4 and N14, indicated these features took effect on the assessment of data consistency at the two map scale through simulated SOC content Ci (g/kg) by DNDC modeling, even if the model was well validated. The optimal grid unit resolutions also showed similar values,

indicated these features did not take effect on the data assessment at the four map scales of C5, D2, P5 and N1, and also proved the model was well validated. In fact, there were not advantages to use the simulated dataset. More detail discussion and explicit explanation will be added to the manuscript. Thanks again!

2. The results need to be more explicit. The authors used the words or sentences, "corresponding" (page2664, line5), "differences from each other" (page 2665 line 4 and 11), and "differ distinctly from the others", but it was difficult to know how different from the word and sentences. Detail description of the results shown in the table 1 to 6 would help readers understand the manuscript. Many citations in the Results section are also confusing. Only results should be described in the section.

R: It's a quite good question. The description of the results shown in the table 1 to 6 was not detail; more detail description will be added to the section. For instance, the initial SOC content is the most crucial input parameter to DNDC modelling. The mean values of the SOC at different map scales are different from each other. The value of 15.69 g/kg at N4 scale is smallest and the value of 33.38 g/kg at N14 scale is highest. While the SOC CV at N1 scale reaches highest value (37.61) and CV (31.34) at N14 scale decrease lowest. The mean SOC values of grid units at different resolution are all smaller than their values of polygon units at map scales of C5, P5 and N1, but it doesn't happened at map scales of D2, N4 and N14. In generally, the mean value of grid units varies with grid cell size variation, and their CV does also. Many citations in the Results section is to confirm that results obtained in this study are same or similar as these citations, and can be proved by them. We will improve the section by removing these confusion citations. Thanks for the good suggestion.

3. I think that the reason why not logarithm curve but quadratic curve was adopted to fit the data should be described in the manuscript. The quadratic curve relational expression cannot be used to smaller map scale than 1;14,000,000, though logarithm curve would be available, and logarithm curve seems to be better for the authors' objectives.

R: It's the most constructive suggestion, thanks a lot. Several curves were adopted to fit the data ïijĹFig. 1), but we found the quadratic curve is the best to fit with the highest R2 (0.9994). For our objectives, power function seems to be better: y = 0.0546x0.7999(R^2 = 0.9909) . It will be modified in the manuscript.

Fig. 1

Technical Corrections:

1. Page 2655 line 22 Tonitto et al. (2007) were not listed in the References.

R: OK! Tonitto C, David MB, Li CS, Drinkwater LE (2007) Application of the DNDC model to tile-drained Illinois agroecosystems: model comparison of conventional and diversified rotations. Nutr Cycl Agroecosyst DOI 10.1007/s10705-006-9074-2, 2.

2. Page 2661 line 20 What is five assumptions? Please describe the assumptions.

R: OK! The five assumptions were: (1) Nitrogen fertilizer consisted of 40% urea, 40% NH4HCO3, and 20% NH4H2PO3; (2) 15% of aboveground crop residue was returned to the soil; (3) 20% livestock wastes and 10% human wastes were added as manure to the soil; (4) One midseason drainage and shallow flooding were applied to summer rice; and (5) For the rice-wheat rotation, tillage was conducted twice before 1990 at 20 cm for rice and 10 cm for wheat on the planting dates; No-till was applied for wheat after 1990 (Zhang et al., 2009a, 2009b, 2012, 2014a).

3. Page 2661 line 22 DNDC run for 19 years, but only the data for 2000 seem to be used in the manuscript. It must be mentioned.

R: Thanks. It was mentioned in line 26.

4. Page 2662 line 19 Please add the reason why 20 cm was adopted as the soil depth.

R: Ok. Convention tillage depth reaches to 20cm in this region.

5. Page 2663 line 22- page 2664 line 1, page 2665 line 18-20, page 2666 line 20-21. The sentence should be moved to M&M or Discussion.

R: Ok!

6. Page 2664 line 2-4, 7-14, page 2664 line 22-page 2665 line 2, page 2665 lien 14-16 The sentence should be moved to Discussion.

R: Ok!

7. Page 2669 line 11 - 17 Please clarify the sentences. I couldn't understand why the authors mentioned geomagnetic and magnetospheric terms in it. Phillips (1999) was not listed in the References.

R: Sorry, it's typing errors and cannot be found out.

8. Is there statistical difference between the equations (7) and (8)?

R: No difference.

9. The equation (8) should be deleted.

R: Ok, thanks.

10. Table 1 to 6 would be able to summarize in one table.

R: Table 1 to 6 would be better to summarize in two tables (tables 1 and table 2).

By Dongsheng Yu, corresponding author.

Interactive comment on Geosci. Model Dev. Discuss., 8, 2653, 2015.

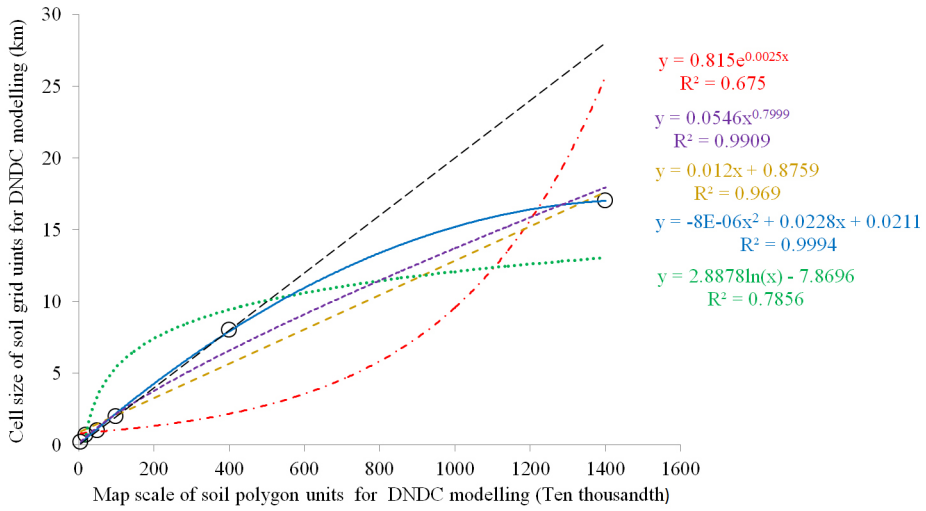

Fig. 1. Fig 1