

## ***Interactive comment on “Vertical patterns of soil carbon, nitrogen and carbon: nitrogen stoichiometry in Tibetan grasslands” by Y. H. Yang et al.***

### **Anonymous Referee #2**

Received and published: 12 February 2010

#### Review

I agree with the authors and believe that there exists the need to study in detail SOM (C and N) in central Asian highlands, such as Tibetan plateau. I think it is a rel. good paper and suggest accepting the MS after major revision given the large amount of critical comments presented below.

#### I. General comments:

\* The results section is poorly developed. I think the authors should focus more on the new elements this study add to current state of SOM knowledge instead of underlining that the results are comparable to previous studies. Thereby, one might think

C43

at comparison of measured SOC and TN contents with values published for other regions (are they rather high/low? and what is the meaning of this in global C and N budget?) Consequently, the take home message is not always clear. \* I don't like the term “C:N stoichiometry” as this refer to “the calculation of quantitative relationships of the reactants and products in a balanced chemical reaction”. I think it is more correct to use C:N ratio in this context (as you didn't look to reactions). If you agree, please change it throughout the entire document. \* The MS is understandable, but the English (grammar) should be improved. I suggest the authors consult a native speaker. \* Moreover I believe that the structure of the paper can be improved by avoiding unneeded repetitions and by moving some parts of the introduction section to the materials and methods section.

#### II. Specific comments:

##### II.1 Abstract

A good abstract but try to focus more on the new aspects of this studies.

##### II.2 Introduction

Pg2 Lines 16-22: This 2 sentences contain many unneeded repetitions e.g. you use 3 times “high-latitude ecosystems”. I suggest rewriting and making 1 sentence.

Pg2 Lines 23-24: Change “SOC stock in high latitude/altitude ecosystems” into “SOC stock in these ecosystems” in order to avoid the use of this word too much.

Pg2 Line 25 & Pg 3 Line 5 & Pg 3 Line 7: please refer to examples of biogeochemical models.

Pg 3 Line 6: what kind of “global change”? “global climate change”? or “global environmental chang”?

Pg 3 Line 23-24: change “in high altitude ecosystems” into “in these ecosystems”

Pg 4 line 14-20: move to beginning of Materials & Methods section (e.g. 2.1. Study

C44

area)

Pg 4 line 25: replace “we investigated” by “we aim to investigate”

Pg 4 line 25 – Pg 5 line 5: Research objectives should be clear and short. (e.g. deleting the sentence from Pg 4 line 28 – Pg 5 line 1).

Pg 4 line 26-27: I don't think you should mention here: “using data of 405 soil profiles obtained from a regional soil survey conducted on the plateau during 2001-2004”, as it will be mentioned in the Materials and Methods section. Deleting this section should allow you to merge 2 main sentences of the research objectives as follows: “. . .alpine grasslands, by relating SOC and TN. . .”

Pg 4 line 27: what kind of “changes” do you mean? Temporal changes? I think you should use another word (than changes) to clarify. . .

Pg 5 Line 1: Use present to describe research objectives, you can for example rephrase the sentence as follows: “Specifically, in this study, we aim to”

### II.3 Material & Methods

Add description of study area (i.e. replace it from intro to beginning of Materials and Methods section).

I suggest adding a map (Topo - DEM - state borders?) to locate your study area with annotation of sample locations.

Pg 5 Line 14: what do you mean by “a ball mill”? Please explain.

Pg 5 Line 15: Is this the Walkley and Black method (1934) or a modified version of it? Did you use a conversion factor to correct for incomplete oxidation own to this method? If yes, mention.

Pg 6 Line 1: please, mention the units of the “(amount per volume)” e.g. g C cm<sup>-3</sup>.

Pg 6 Line 1-2: The exponential relationship is the most used function to describe SOC

C45

distribution with depth. So I believe that you should refer to other studies using this relationship, either than saying that you established this relationship.

Pg 6 Line 3: Please explain why you refer to equation 3 (to calculate SOC mass by surface unit for specific depth increment?)

Pg 6 Line 5: Not clear to me what you mean by “effect of total SOC content on the vertical distribution”. Please clarify or reformulate.

Pg 6 Line 11: Change “In such analyses” into “In these analyses”

Pg 6 Line 17: It seems to me somewhat strange to use “h” as symbol for depth and Ch for volume % of > 2mm fragments (as C is quite often used to refer to carbon). I suggest using “d” and “Cd”.

Pg 6 Line 18: replace “organic carbon (g kg<sup>-1</sup>)” into “organic carbon concentration (g C kg<sup>-1</sup>)”

Pg 6 Line 19: replace “(g cm<sup>-3</sup>)” by “(g C cm<sup>-3</sup>)”

Pg 6 Line 20-21: Change “organic carbon content for each profile (g C cm<sup>-2</sup>)” into “organic carbon mass by surface unit for specific depth increment of the profile (g C cm<sup>-2</sup>)”

Pg 6 Line 25 – Pg 7 Line 1: How are they interpolated/what kind of interpolation technique was used?

Pg 7 Line 5 - 11: This section can be eventually moved to “2.1. Study area”

Pg 7 Line 13: ANOVA is mentioned here in the text but in fig 1 & 2 you mention Tukey test. Nevertheless, I believe that ANOVA can be used to test effect of interactions of input variables or to test the effects on different depth increments. Moreover you should mention in the Material and Method section (and explain or refer to statistical handbook which explains) all the statistical test/analysis, so as well the Tukey test.

C46

Pg 7 Line 14-15: Why did you use 'reduced major axis' as regression method?

Pg 7 Line 16-18: this is evidence. Did you use specific analysis? If yes mention this otherwise I suggest deleting it.

#### II.4 Results

The results are poorly developed. Please give (and interpret) the results of (table of) ANOVA. Moreover, you mentioned in Materials and Methods section that you applied exponential model to describe the vertical heterogeneity of the studied soil properties. So you should give parameter values (with 95% confidence limits) and I believe you can integrate these curves in Fig 1 and 2.

Pg 7 Line 25: You mention that this difference is significant @  $P < 0.05$ , but I don't agree as on the figure it seems that  $\sigma = 10$ , so we have 95% confidence limits ( $\pm 2\sigma$ ) of [26 – 66] which contains 38 and so the difference is not significant. Or did you use other statistical test to examine (sig.) difference of SOC and TN between these classes? Please explain and show results (in tables/graphs).

Pg 8 Line 2-3: OK, not significant but there is some trend (please mention this as well in the MS, as you will come back on it later in the Discussion section)

#### II.5 Discussion

Pg 8 Line 16-17: Please use more references and values to state this.

Pg 8 Line 22-24: Please explain why.

Pg 9 Line 3-11: I believe you can make this section more clearly by shortening it.

Pg 9 Line 23: Is figure 2 the right figure to refer to? (Should it not be fig 3?)

Pg 9 Line 24-29. These 2 sentences contain more or less the same information. Please delete overlap and merge them.

Pg 10 Lines 3-12: This analysis is carried out regardless land use (vegetation cover).

C47

I believe you should do it land use depended to make comparison with other studies possible. (Maybe ANOVA can be useful statistical tool in this context)

Pg 10 Line 18: Please explain what you mean by: "may exhibit divergent dynamics along environmental gradients"

Pg 10 Line 20-22: I agree for climate variability, but not for soil type. Moreover you should not mention "(personal communication with Prof. Pete Smith)" but use reference to article(s) or formulate it just in a hypothetical way.

Pg 10 Line 22-25: Reformulate this section in order to avoid unneeded repetition.

Pg 11 Line 4: I suggest replacing "(0-20 vs. 20-80 cm. 0.39-11.20 and 0.02-4.52 kg m<sup>-2</sup>)" by "(i.e. 0.39-11.20 and 0.02-4.52 kg C m<sup>-2</sup> for 0-20 and 20-80 cm, respectively)"

Pg 11 Line 13: Replace "As a result," by "The results show that".

Pg 11 Line 17: What is an "isometric relationship"? What do you mean by this term? I believe it's better to use the term "linear relationship" in this context.

Pg 12 Line 3: Insert "that" between "indicates" and "carbon".

Pg 12 Line 10-13: How and why?

#### II.6 Figures

Fig. 1: I believe you can add the fit of the exponential model in these graphs, eventually with 95% confidence model error bounds. The later will be useful to show difference between measurement and model uncertainty (=how good you catch the trend).

Please mention as well in the Material and Method section that the Tukey test was used and explain/refer to statistical handbook which explains this test.

Change units in label of vertical axis into "(kg C m<sup>-2</sup>)".

Fig 3: Change units in label of vertical axis into "(kg N m<sup>-2</sup>)".

C48

Fig 4: Why are sub-plates (d) and (h) upside down given? I think this should be a lay-out mistake, so please correct.

Fig 5: Please mention units of axis (i.e. horizontal axis = "kg N m-2" and vertical axis = "kg C m-2"?)

---

Interactive comment on Biogeosciences Discuss., 7, 1, 2010.