

***Interactive comment on “Temperature sensitivity of soil respiration is dependent on readily decomposable C substrate concentration” by A. A. Larionova et al.***

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This paper describes an experiment, where the response to temperature of three factors regulating microbial growth in soils. Three different approaches, two short term and one longer term (1 year) are also used. A novel aspect in this paper is the emphasis on the possible temperature dependence of substrate availability. The authors should consult a recent paper for a theoretical back-up of their analysis (Ågren GI, Wetterstedt JÅM. 2007. What determines the temperature response of soil organic matter decomposition? Soil Biology Biochemistry 39:1794-1798).

I would suggest that the authors write the paper in a more general tone considering

that the temperature response of soil respiration results from a combination of several temperature dependent factors, the specific aspect that some of these factors may counteract each other is important but should be given a less prominent role.

Although the general approach is interesting, the presentation requires considerable revision.

The standard separation of results and discussion into separate sections is suggested.

In the Methods sections the three approaches are given in one order but as results they come in the opposite order. The same order should be used throughout and I would suggest having them in the order eq (4), eq (3), and eq (2); the equations should then be renumbered.

Specific comments: Introduction, first paragraph. I think it is important to understand the difference between steady state temperature responses and transient effects. The Giardina Ryan paper is based on steady state assumptions whereas some of the others refer to transient responses, see also Ågren GI, Bosatta E. 2002. Reconciling differences in predictions of temperature response of soil organic matter. *Soil Biology Biochemistry* 34:129-132. The Eliasson et al paper does not "confirm the overestimation"; it demonstrates the effect of transient responses.

Eq (1). There is a + -sign that should be removed.

Eq (4) should be introduced already here in connection with the Sikora and McCoy paper.

I suggest deleting the parts about r- and K-selection and copiotrophic and oligotrophic components, as such aspects are not covered by this analysis. This applies also to other parts of the manuscript.

Section 2.1. The description of the respiration measurements must be more detailed. In particular, how was the initial measurements made, cf. Table 1. The parts with the growth conditions in Section 2.2 belong to Section 2.1.

Eq (2). There must be errors in this equation.  $1 - kt$  in the exponents should be  $-kt$ ?

Section 3.1, paragraph beginning "The changes in glucose ..." The canceling effect of temperature in  $V_{max}$  and  $K_s$  occurs whenever  $K_s$  is (much) larger than  $S_n$ .

Section 3.1, paragraph beginning "If substrate concentration ..." It is only when  $S_n \gg K_s$  that the half-saturation constant plays no role (see also previous comment).

Section 3.2, first paragraph. The reference to Liski et al must be treated with caution because it is based on some strange model assumptions (see Ågren GI. 2000. Temperature dependence of old soil organic matter. *Ambio* 29:55).

Should not  $v_u$ , Eq (3), and  $V_{max}$ , Eq (4), be equal? The  $v_u$  from Fig 2 does not appear to equal  $V_{max}$  in Table 1. Why? Is this an indication of methodological problems?

Table 1. In this table  $S_n$  decreases more at 12 °C than at 22 °C. I can understand this as a result of depletion of the substrate corresponding to  $S_n$  and a decrease in the substrate corresponding to  $S_n$  with temperature. However, in the arable soil  $S_n$  increases with time at 22 °C. This has to be explained. There is also the problem with the initial sample, where the measurements have not been described. And how reliable are the initial measurements given that soil preparation as done here introduces a strong temporary disturbance?

The following is the correct spelling of names (some appear more than once): Ågren, Strömngren, Kätterer, Andrén, Mäkelä, Westman.

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