

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

A. A. Larionova et al.

Received and published: 18 September 2007

1. By definition, a starting point will open more questions than it answers. Hereby, it should clearly state (a) its objectives, (b) its achievements and, most importantly, (c) open questions and possible ways to address them. Point (c) should be extended.

- Open questions have been added to the text of Discussion section, p.10-11.

2. As I understand, the parameter V_{max} , as determined in this study, reflects the maximum respiration rate of a soil sample when glucose is not limiting. As such, V_{max} is the product of microbial biomass and respiration rate per unit biomass. The response of respiration rate to glucose addition was determined within 30 minutes after substrate addition. Thus, the effect of substrate addition on microbial growth is not reflected in

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

the reported values of V_{max} . However, when glucose is not limiting, microbial biomass easily doubles within 24 hours (Figure 2). Would V_{max} then not increase equally fast under such conditions? If so, would the cancelling of V_{max} and K_s not be short-lived and of limited ecological importance?

- The reported values of V_{max} reflect the respiration of both growing and non growing microbial biomass. The long 6 h lag phase of microbial growth (Fig.2) evidences that the portion of growing biomass is very low. Hence, the respiratory contribution of growing microorganisms to V_{max} is negligible small. When glucose is not a limiting factor, V_{max} increases in 24 h proportionally with microbial biomass. We expect increased time delay of parameter response in the order $V_{max} < \tau_{max} < K_s$, since K_s change was found only by long term pure cultures cultivation in substrate limiting conditions (see review of Kovarova & Egli, 1998). Time scaling of adaptive response of V_{max} and K_s for soil microbial community is still an open question. In reality we have never observed substrate unlimited growth in soil under natural conditions. Even in soil domains with increased substrate concentration, e.g. in rhizosphere or on surface litter, glucose addition increased microbial respiration by 2-5 times (Larionova et al, 2006). Therefore S_n is usually lower than K_s , and the canceling of V_{max} and S_n is not short-lived. The importance of the canceling effect as the main factor controlling temperature dependence of soil respiration is restricted by the phenomenon of S_n temperature dependence and, in this connection, by very strong effect of S_n values on respiration rate.

3. Or, the other way round, could there be situations when glucose is not limiting in soil (or remains well above K_s) while microbial growth is inhibited?

-Microbial growth in C substrate unlimited conditions is inhibited by the shortage of available N and P concentration, but the effect of nutrients shortage is less than C-limitation.

4. Considering this issue may lead to a clearer differentiation between parameters

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

which are important in the short-term and those more relevant in the long-term. A distinction between processes and parameters most relevant on either time scale would be helpful. It might also help to improve the structure of the discussion.

- The paragraphs concerning the importance of acclimation and parameters obtained at short-term and long-term scales have been added to the text of Discussion sections, p. 10.

5.Linguistic improvements would further help to make the valuable thoughts presented in this paper more easily accessible to readers.

-The new version of our ms has been checked through by a native speaker.

Interactive comment on Biogeosciences Discuss., 4, 2007, 2007.

BGD

4, S1405–S1407, 2007

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper