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Biogeosciences Discussions

Interactive comment on "Direct uptake of organic carbon by grass roots and allocation in leaves and phytoliths: ^{13}C labeling evidence" *by* A. Alexandre et al.

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The manuscript "Direct uptake of organic carbon by grass roots and allocation in leaves and phytoliths: 13C labeling evidence" describes a hydroponic experiment investigating the uptake of 13C and 15N from three dual-labeled amino acids (L-Alanine, Phenylalanine, and Methionine) and 13C from 13C-labeled D-Alanine in tall fescue grass over 14 days. I find the reported data has significant shortcomings, which makes it unacceptable for publication (see below). I therefore recommend that the manuscript is rejected.

General comments: (A) The authors present an experiment where the control is un-

replicated and the treatment has only two replicates. My experience with isotope-labeling studies is that even under very controlled conditions, there will always be variation among replicates. Therefore I am very surprised that the authors choose to conduct a study only with two replicates. The data presented by the authors gives the reader no chance to evaluate whether the conclusions are based on a coincidence or there are in fact differences between bulk plant and phytoliths as stated. The lack of replicates is a major weakness of the study.

(B) The authors refers in several places to "old soil C" and "microbial metabolites" (e.g. p. 19752 l. 8; p. 19754 l. 1; p. 19768 l. 9), but there is no justification given how the amino acids used make a fair representation of old soil C or microbial metabilites. Usually it is found that amino acids cycle very fast in soil - in the range of hours – therefore it is very surprised to see amino acids linked to "old soil C". I disagree with the author's indication in the conclusion that their findings support that plants take up old soil C and "store" it in Si-precipitates – in fact their data would then show that even young soil C is stored this way.

(C) The experiment that was carried studied the uptake of labeled amino acids in grass for 14 days. The authors state that they sealed of the labeling solution from the grass shoot – to avoid uptake of labeled CO2 by photosynthesis, but the authors make no justification of the extent of intact amino acid uptake from the labeling solution. Both 15N and 13C can be taken up in their inorganic forms. In the results section the authors state that 4.5% of supplied 13C and 46.9% of supplied 15N was absorbed by the roots. This must mean that the majority of 15N was taken up in mineral form from the solution, which must mean that inorganic 13C (bicarbonate, carbonate) was also present in the labeling solution and hence could have contributed to the uptake of 13C by the grass.

(D) The authors state that they distinguish between labeling in plant amino acids and in phytoliths, but when I read the method-section it seems to me that analysis of plant amino acids and of phytoliths are two parallel analysis, which implies that in principle it could be the same isotope-labeling the authors measure in the two pool (i.e. the

pools are overlapping). The authors describes 13C enrichment in phytoliths, but make no attempt to determine what type of compounds are precipitated along with Si – in priciple it could be 13C in other organic forms than the added amino acids or even inorganic 13C. Yet, the authors state that the amino acids are bound in phytoliths – they do not show this.

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