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Comment

Interactive comment on “A fertile peatland forest does not constitute a major greenhouse gas sink” by A. Meyer et al.

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In eqn. (5), the authors define heterotrophic respiration (R_h) as the sum of decomposition from soil organic matter (R_{som}) and aboveground (R_{ll}) and belowground (R_{lr}) litter:

$$R_h = R_{som} + R_{ll} + R_{lr} \quad (5)$$

The text between eqns. (6) and (6a) reveals that by this division they mean that R_{som} is decomposition of organic matter accumulated before afforestation of the site. R_{ll} and R_{lr} then result from the decomposition of organic matter that has accumulated from the aboveground (L_l) and belowground (L_r) litter of the tree stand since afforestation. Then, in eqn. (10), the measured CO_2 efflux from trenched plots without ground vegetation

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(ECO₂) is defined as the sum of R_{som}, decomposition from the cut roots+mycelia (R_{decay}) and R_{ll}:

$$ECO_2 = R_{som} + R_{decay} + R_{ll} \quad (10)$$

Then, the work continues to deduce R_{som} (eqn. 12) that can then be entered to eqn. (6a/6b) that results from the “quasi steady state” assumption of litter production and decomposition.

Yet, with the definition of R_h (eqn. 5), eqn. (10) should be:

$$ECO_2 = R_h + R_{decay} = R_{som} + R_{ll} + R_{lr} + R_{decay},$$

meaning that measured CO₂ efflux otherwise equals R_h, but there is extra decay from cut roots+mycelia. R_{lr} must be included: R_{decay} only removes the problem of the extra root input due to trenching; Decomposition of the accumulated partly decomposed root litter is still included in ECO₂.

With this small correction, eqn. (6) changes to:

$$NEE = AGB_{inc} + BGB_{inc} + LI + L_r - R_h = AGB_{inc} + BGB_{inc} + LI + L_r - (ECO_2 - R_{decay})$$

This can then simply be used to compare EC based direct NEE estimation and the bottom up estimation. L_r can be estimated from the measured root masses (already done for the R_{decay} estimation) applying turnover ratios. This makes eqns. (6a), (6b), (10a) and (12) unnecessary, which is good. This removes two other problems: 1) With the development of the tree stand, litter production usually gradually increases and the “quasi steady state” assumption does not necessarily hold. 2) In eqn. (12), current aboveground litter production and average long term litter layer accumulation are compared. For the current NEE, average long term litter layer accumulation is not a relevant measure.

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