

Interactive comment on “The impacts of drainage, nutrient status and management practice on the full carbon balance of grasslands on organic soils in a maritime temperate zone” by F. Renou-Wilson et al.

Anonymous Referee #1

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This paper presents the complete net ecosystem carbon balance (NECB) for three grasslands on organic soils in Ireland. The NECB included all the measured, estimated and modelled parameters usually determined in these types of studies, and also included the fluvial (waterborne) component of C loss, which is still a novel addition to NECB studies. The sites were selected to compare drainage (deep and shallow annual average water table), nutrient status (added fertilizer with low intensity grazing and low intensity grazing only). Both types of grasslands proved to be net sources of C on an annual basis. The nutrient rich site emitted about 5 times the C as the shal-

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low drained nutrient poor site and the deep drained site was slightly over 2 times the shallow drained one. These results confirmed the expected order of NECB from temperate grasslands when drainage and nutrient status are considered. The magnitude of the nutrient poor sites was lower than that found in other countries, possibly reflecting the low grazing intensity at these types of sites and the maritime influence on the climate in Ireland. In total this paper presents results that can guide future grassland management practices that are aimed at reducing C emissions.

The authors state that the purpose of this research is “to support a progression towards the Tier 2 reporting level in Ireland . . . typical organic soils under grassland.” I submit that by this well-targeted study they demonstrated that such a progression is possible. Repeat this type of study at a few more well-selected sites that are monitored over longer terms, and Ireland should be able to achieve their Tier 2 reporting goal with country-specific emissions data.

The authors used standard methodology for determining gas fluxes, soil parameters, water table, climate variables and light regime. They used well documented models for certain estimated parameters (GPP, LAI and modelled Reco), and provided sufficient referencing for equations and techniques used. The inclusion of waterborne C fluxes is a welcome addition to net carbon balancing and the total (DOC + DIC + POC) waterborne flux proved to be an important component at these sites. Overall the descriptions of the method used in this paper were well-documented. Results seem robust for this type of study and the authors' interpretations seem reasonable. The conclusions appear to follow from the results and interpretations, and are justified. Extensive referencing to recent related work by other researchers occurs throughout this paper and to my knowledge these capture the current understanding in the field.

The title is sufficiently descriptive and the abstract provides a complete, clear and well-structured summary of the paper. I found this paper well-structured and readable. Standard units, abbreviations and formulas were used and they were sufficiently explained. All of the tables and figures are used in the results and discussion sections

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and referring to them proved to be useful and in some cases necessary, so they all should remain in the paper; same for the three formulas. I found the entire text to be tight; there was little or no duplication and each paragraph in the discussion related to separate points. I realize that another reviewer suggested that the discussion section could be reduced; and I re-read it with this in mind, but I could not find anything that I would call superfluous.

Technical/typographical corrections:

P5560 line 9: Consider “Presently” instead of “Nowadays”, and on the same line delete “s” from areas

P5572 lines 18-20: It is slightly confusing to state that the “highest monthly NEE value . . .” is a negative number. Consider re-wording to “highest monthly CO₂ uptake . . .”

P5574 lines 19-21: The mean values are higher in Year 2 not in year 1 – but I would say that both years are not significantly different (Fig 8 and Table 4).

P5575 lines 17, 18, 22: Consider replacing “total C flux” with “waterborne C flux” or “fluvial C flux”.

Section 3 Results overall: In some cases the variability of a result is indicated by a number in brackets () - e.g. 265 (27) - and in other cases as +/- - e.g. 1.3 +/- 1.09. The caption to Table 4 explains the meaning of the () values. If the others are the same, then be consistent.

P5576 line 16: Checking the values from Table 4 the NECB for Site ad (Year 1) should be 358 not 342 as stated here and listed in Table 4. The others are correct.

P5577 line 2: use “among sites” instead of “at each site”

P5577 line 20: add “s” to year

P5579 line 16 and 23: replace “between” with “among”

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P5579 lines 22 & 23: Change “explain the variation in Reco between sites” to “explain the differences in Reco”.

P5587 line 29 and P5588 Line 1: It’s a small point but to avoid confusion with the publication date of the IPCC report which is 2014, change the first part of this sentence to: As per the updated IPCC guidance, a 90% . . . [correct citation appears at end of sentence]

P5588 line 15: Similar to above change phrase to “IPCC 2013 Wetland Supplement”

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