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Biogeosciences Discussions

Interactive comment on "Large regional-scale variation in C3/C4 distribution pattern of Inner Mongolia steppe is revealed by grazer wool carbon isotope composition" *by* K. Auerswald et al.

Anonymous Referee #3

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Review of Auerswald et al. Large regional-scale variation in C3/C4 distribution pattern of Inner Mongolia steppe is revealed by grazer wool carbon isotope composition.

General: This manuscript provides a detailed assessment of the suitability of d13C analyses on sheep wool to document the spatial patterns in C3 versus C4 grass species distribution, applied here to Inner Mongolia. While the idea behind this approach may not be novel in itself, this study thoroughly tests the suitability of the approach at different scales and provides the basis needed for its application in other study areas. As such, it is a valuable contribution to the literature and would fit well in Biogeosciences. I do have a number of suggestions and comments, but overall

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recommend publication after minor revisions.

Detailed comments: P546L10: 13C enrichment of 2.7 per mil: provide estimate of variability on this average. P546L18: "was significantly higher above and lower below the 22°C isototherm": if it's higher above, then it's obviously lower below: one of both statements can be omitted P546L19-20: "which was averaged from high-resolution ...": perhaps rephrase to e.g., "which was obtained from annual high-resolution maps and averaged over the different sampling years" ?

P547L1-2: merge these two sentences P457L9: here perhaps you should introduce other factors that may influence soil d13C ? E.g. move the 2nd paragraph on P548 to this section ? P547L18-19: rising atmpospheric CO2 stimulates C3 photosynthesis more than C4: needs relevant references here.

P548: this section assumes that no significant variations in d13C signatures of C4 plants occur, but this assumption is not mentioned explicitely. There are in fact environmental conditions (and taxa-specific differences) but these are not mentioned here and are only reported much further in the ms (section 4.3) -mention should also be made here. P548L28: "when... and post-ingestion fractionation of C isotopes is known": yes, but also assumes that this is similar for a C4 and C3-based diet ?

P549L7 "How is the C3/C4 pattern... " :rephrase, e.g.: How are C3 and C4 grass species spatially distributed in ...

P550L9-11: this is not very clear: "Bulked leaves were collected within approx. 1000 m^2 on a reduced scale of apparent species-level contribution to total standing biomass" That could be anything. P550L21: "ten sites beyond the periphery": mention why sites outide the study area were sampled (is done only in section 2.8), and if/where the data are presented further on ?

P551L12-14: how are the different sections of wool assigned to a specific period ?

P552: "with d13Ca continuously decreasing over time": Yes, there is a long-term de-

BGD

6, S532–S534, 2009

Interactive Comment

creasing trend in d13C of atmospheric CO2 but a few more words on this would be useful + relevant references.

P553: Again, this approach assumes that the d13C of the C4 end member is constant – but this assumption is not mentioned explicitely untill section 4.3. P553 L22: "can be estimated from Eq (1) from d13C-c or from ..." : first part of this phrase is confusing

P554L1-3: so here, the dietary shift in 13C is not assumed to be similar for C3 and C4-based diets ?

Section 2.8 is a tough read for those not familiar with geostatistial techniques.

P556L1-3 and corresponding legend of Figure 2 are somewhat confusing : the data on "vegetation from wool (farm scale" on panel 2B are clearly calculated, but the data on which the 2.7 per mil offset is based are not shown here (right?) –> perhaps it would be useful to have an additional figure to show the farm-scale dataset on which this offset is based. Also: X-axis on Figure 2: most negative d13C are commonly placed on the left side ?

Figure 3: is this essential ?

P557L10: needs a comma between "evident" and "the" P557L13: "On average of all wool samples..." awkward, rephrase

P559L6: Though: –> However

P560 L5: "Differences ... between C3 and C3 plants": should be "C3 and C4" P560 L6-8: "Nonetheless, several studies ..., the opposite was also reported": awkward, rephrase.

P562L4-5: something wrong with this sentence. P652L27: “enormous”: a high…

Interactive comment on Biogeosciences Discuss., 6, 545, 2009.