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Interactive comment on “Is average chain length of plant lipids a potential proxy for vegetation, environment and climate changes?” by M. Wang et al.

Anonymous Referee #1

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This manuscript asks the question “do woody and non-woody taxa growing at the same site have different n-alkane ACL values?” This is a subset of the larger question asked in Bush and McInerney 2013 (GCA), “Do different plant groups have different ACL values?” Bush and McInerney found that woody and non-woody vascular plant taxa did not have different ACL values. However, they did not test within sites to see if at a single location, woody and non-woody taxa have different ACL values. This is the focus of the current study. If the ACL of plants is plastic and varies with environment, it is possible that there would be no systematic difference in plant groups when sampled at a larger spatial scale (as in Bush and McInerney, 2013), but there could be a systematic difference at a single location.

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This study measures n-alkane or n-alkanoic acid ACL in woody and non-woody plants at two sites (Northeastern USA and Tibet) and draws from the literature from an additional 24 sites. The vast majority (73%) of the within-site comparisons did not record any difference between woody and non-woody taxa. This result suggests that there were not differences that were masked in the study of Bush and McInerney in which samples were examined both at a global and regional scale, but not at a local scale. Instead, it supports the conclusion of Bush and McInerney (2013) that “The variation in chain-length abundances within most groups is large, even when accounting for factors such as region and photosynthetic pathway. This makes it inadvisable to use n-alkane chain-length abundances as chemotaxonomic indicators for broad plant functional groups. ...”

The authors of this study fail to place their results in the context of the previous study by Bush and McInerney (2013). I think this paper would be more interesting if they highlighted the potential importance of looking within a site and then directly compared their within-site results to those of the regional and global sampling by Bush and McInerney (2013). Bush and McInerney 2013 is cited once in the introduction, where it is largely mis-represented (see comment for 5479 Line 10), and once in the methods because this manuscript draws the majority of literature data from the on-line supplement of Bush and McInerney. Unfortunately, Bush and McInerney (2013) is not referenced in the discussion, when in fact this previous paper tackled the same questions and problems, with much of the same data, at a different spatial resolution. The results and interpretation provided in Bush and McInerney (2013) should be referenced here and the new site-specific analysis placed in the context of this previous work.

This paper also does not articulate well why this is a new finding, given the results of Bush and McInerney (2013). Its novelty comes from the within site comparisons, and the potential for them to reveal differences that were not evident in the global and regional analysis of Bush and McInerney. The authors should explain clearly why this is important and interesting and why they might expect to get a different result from

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what was found in Bush and McInerney.

The question posed in the title “Is average chain length of plant lipids a potential proxy for vegetation, environment and climate changes?” is not actually addressed in this paper. The paper addresses only whether plant lipids serve as a proxy for woody vs non-woody vegetation. It is misleading to suggest that it also addresses climate and environment in its analysis.

Multiple other citations are incorrect or incomplete. If previous work were properly acknowledged, and a persuasive case were made for the importance of site-specific analysis such as performed here, this paper would make an interesting contribution. As it stands, it is not publishable due to its failure to properly recognize previous work and its failure to highlight what is new about this analysis.

Specific comments

5478, Line 25- Cranwell 1973 is not an appropriate reference here. This paper looked only at sediments and peats, not plants, and considered peatlands vs forest not grasslands. This paper is frequently incorrectly cited in the literature (as pointed out in Bush and McInerney 2013). 5479, line 6- Cranwell 1973 is once again an incorrect citation. They were not examining woody vs non-woody plants. They examined sediments, not plants. 5479 Line 10- Bush and McInerney 2013 is presented as if it only considered graminoids and woody plants but in fact it also considered forbs, mosses, ferns, succulents and aquatics. In addition, it examined woody gymnosperms and angiosperms separately. The woody and non-woody taxa have overlapping ranges, which is fundamental to the question being asked here. This should be more clearly summarized. See figure 2A from Bush and McInerney 2013. 5479 Line 12- This part of the introduction could be better argued that, although Bush and McInerney (2013) compared groups globally and within regions (Temperate zone and Africa – Figure 5 and 6)), they did not compare woody and herbaceous taxa within sites. The question you address with this paper should be, “do the global (figure 2, Bush and McInerney 2013) and

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regional (Figure 5 and 6, Bush and McInerney 2013) patterns of overlapping ranges in n-alkane distributions hold true when examined at individual sites?” This is what is the new question and should be highlighted here. Section 3.1 and table 2. Why are n-alkanoic acids reported here rather than n-alkanes? I thought that Hou et al. 2007 measured both n-alkanes and n-alkanoic acids. The new data presented for Lake Ranwu is for n-alkanes and the literature data is all for n-alkanes. Why bring in n-alkanoic acids for one site? Page 5484 Line 1- Why is it surprising that there is no significant difference between woody and non-woody taxa at a single site? This is what has been observed at a global and regional scale already by Bush and McInerney 2013. Given the available information, this is the expectation, not the surprise. Page 5484 Line 14- Cite Bush and McInerney 2013 here. This is what they showed previously. Page 5484 Line 15- Cite Bush and McInerney 2013 here. This is what they concluded previously. Page 5484 26- page 5485- Why would you expect the two botanic gardens to behave the same? They are most likely growing different plants. So it could be that the plants that differ. Not the watering regime. Page 5485- Section 4.2- There is insufficient and incorrect citation of previous literature that consider the possible climatic effects on ACL. At a minimum, this section should discuss and reference Bush and McInerney 2015 (Organic Geochemistry) Tipple and Pagani, 2013 (GCA) and the discussion in Bush and McInerney 2013 (GCA). Castañeda et al (2009) is an incorrect reference here because this paper looked primarily at algal lipids in lake sediments and did not measure plant waxes in warm and cool regions as implied by the citation. Page 5486, Line 10-13, This section should cite the work of Bush and McInerney 2013 that found no difference in ACL between sun and shade leaf and leaves in different stages of senescence.

Technical Comments Table 2, sample 48 should have a capital C for *Carya* Table 3, please spell out or provide footnote of climate terms. Figures 2, and 4: Terminology in inconsistent and unclear. Figure 4 uses Herb and Woody while figure 2 uses herb, shrub, tree, fern, vine and grass. In text, non-woody is used synonymously with herbaceous which is used synonymously with herb. In addition, herb can refer to a subset

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of non-woody plants, thus the terminology is confusing. Please define terms and use them consistently in text and figures.

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