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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.

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Wang and colleagues consider an important issue that has challenged organic geochemical resolution for several decades - how do the alkyl carbon chain lengths of plant wax lipids reflect the environments in which the plants grow. As noted by the authors, earlier studies have implicated both temperature and humidity, either individually or in tandem, and they have also implicated the carbon assimilation pathway (C3 vs C4) and the woody vs nonwoody natures of the plants. All four of these factors are related to environmental conditions, suggesting that paleoenvironmental reconstructions should be possible through understanding of how the carbon chain lengths record the



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conditions. However, Mother Nature has not cooperated easily with those who have attempted to resolve this issue, and therefore the study of Wang and colleagues is a significant new attempt to improve understanding and hence to open new interpretive pathways to paleoenviromental interpretations.

Their study consists of two related elements. First, they analyze suites of plant samples from two locations that provide comparison of C3 vs C4 and woody vs nonwoody plants from places for which the environmental conditions are known. Second, they assemble an impressive compilation of published plant wax data to seek statistical correlations with the chain length distributions and the growth conditions of the plants. From these comparisons and compilations, they try to come to a conclusion about how environmental conditions affect the chain lengths. Sadly, their "conclusions" are inconclusive. Although a considerable battery of environmental information is available to the authors, they do not seem to make full use of it. The unfortunate consequence is that they fail to resolve this problematic organic geochemical issue, despite their impressive collection and comparison of new and old data.

Two elements are needed to improve this contribution. First, it needs to include the 2015 Bush and McInerney paper that compares plant wax compositions of plants from a north-south transect of North America (Organic Geochemistry 79:65-73). This important paper provides additional n-alkane data and growth condition information that Wang and colleagues can incorporate in their chain length compilation, and it also addresses the temperature - humidity question. Second, the contribution must make better use of the environmental information that is available to the authors to move closer to resolving this paleoenvironmental question. As one example, although woody and nonwoody plants typically dominate different ecotomes, their leaf waxes may respond to temperature and moisture in similar ways. Hence, the important comparison may not be woody vs nonwoody, but of locations of the plants, whether they are woody or not.

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