

Interactive comment on “C / N ratio, stable isotope ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$), and *n*-alkane patterns of bryophytes along hydrological gradients of low-centred polygon of the Siberian Arctic” by Romy Zibulski et al.

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Zibulski and colleagues present the results of their survey of organic geochemical properties of brown mosses collected over hydrologic gradients in the Siberian Arctic. Their survey is impressively extensive, consisting of 400 samples that includes ten species. The parameters that they have measured is also impressive and comprise C/N ratios, stable carbon and nitrogen isotope values, and *n*-alkane distributions. To render some sense out the mass of data that they have generated, the authors performed a principal component analysis. Patterns emerge from the data. Plants from wetter settings have

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somewhat different sets of properties than plants from less wet settings, but intraspecific variability obscures simple conclusions. Although the study was conducted at a somewhat exotic location, it has significance to paleoenvironmental and paleoclimatic studies at many other locations that have important contributions from mosses and is appropriate for publication in Biogeosciences. However, several technical details need attention, and the data in general need more interpretation.

The foremost issue is that the n-alkane data are inadequately presented and interpreted. As correctly noted by the authors, mosses typically have lower concentrations of these wax components than vascular land plants. Nonetheless, the absolute concentrations of all 400 samples should be reported in the supplemental material and summarized in either a figure or a table in the manuscript proper. Furthermore, the relative concentrations of the samples should be compared using some of the well established n-alkane ratios such as the Paq, the ACL, and the CPI. For the ACL, I recommend using an extended range (21-33), similar to the extended range used by Bush and McInerney (2015, *Org Geochem* 79, 65-73). Addition of these ratios will allow better comparison of these new results to results from existing and future studies of wetland biogeochemical records, and it will likely enable the authors to refine their interpretations.

Another issue is that the authors do not make full use of their important documentation of the intraspecific variability in the geochemical properties of these plants. Other studies have found similar variability in both Sphagnum (Huang et al., 2012, *Org Geochem* 44, 1-7) and in vascular plants (Feakins et al, 2016, *Org Geochem* 100, 89-199), and they both discuss its possible significance and mention other reports of intraspecific variability. Better appreciation of this variability is important to better interpretation of the paleoenvironmental significance of these properties, and the authors' data could make a better contribution to such understanding that it presently does.

Yet another issue is that aspects of this study seem to provide answers, at least partial, to some of the questions raised by Andersson et al. (2011, *Org Geochem* 42, 1065-

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1075; 2012, J. Quat. Sci. 27, 545-552) from their study of the changes in C/N ratios, stable carbon and nitrogen isotope values, and n-alkane distributions recorded in the fen-bog transition of a peat sequence in the Russian Arctic. Consideration of these questions and how the new data may address them would enrich both the Introduction and the Discussion of this contribution.

Finally, the authors need to specify in the text and figures whether the C/N ratios that they report are atomic or weight ratios.

Phil Meyers, September 19, 2016

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