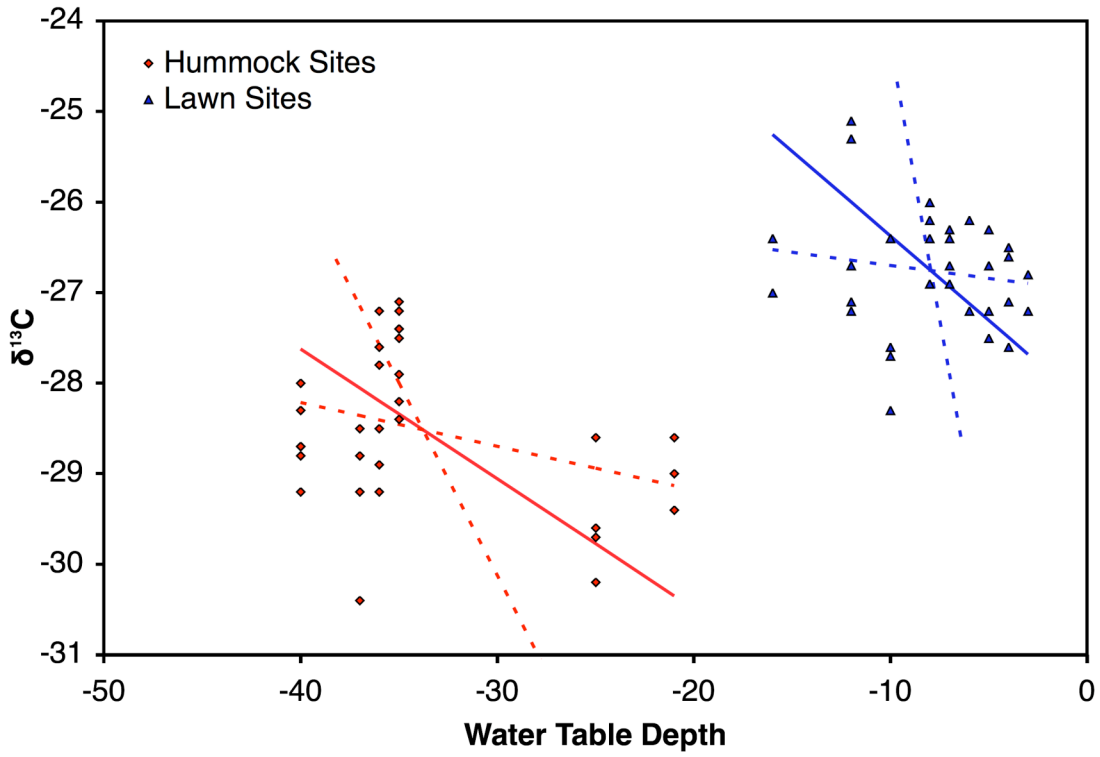
Supplementary Material for: ***Quantitative Assessment of Precipitation Seasonality and Summer Surface Wetness Using Ombrotrophic Sediments from an Arctic Norwegian Peatland***

J.E. Nichols, M. Walcott, R. Bradley, J. Pilcher, Y. Huang

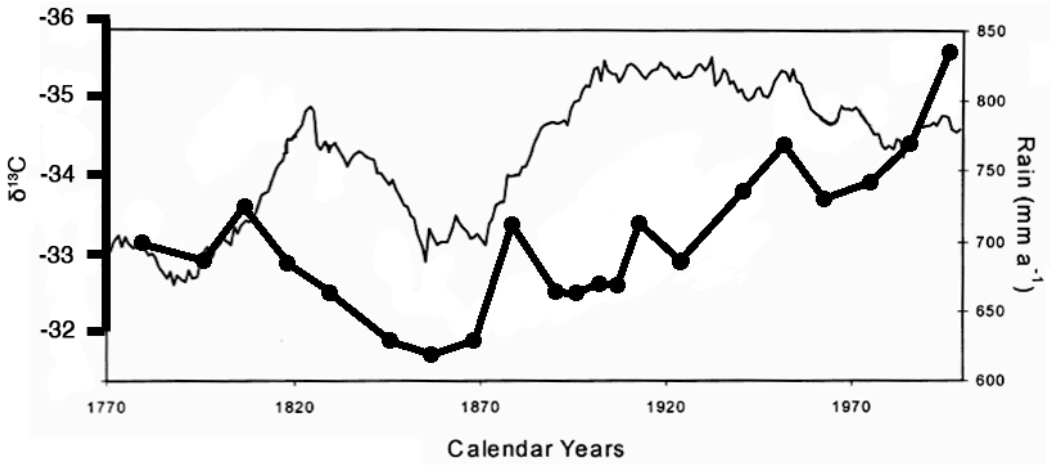
Supplemental Figure 1:



This plot displays all the carbon isotopic data of bulk *Sphagnum* samples published by Loisel et al. (2009). In their original paper, Loisel et al. (2009) conclude, as originally proposed by Williams and Flannagan (1996), that *Sphagnum* plants from the wet lawn sites have higher $\delta^{13}C$ values than those from dry hummock sites as a result of thicker water film. Based on these data, Loisel et al. (2009) suggest that increase in $\delta^{13}C$ values in *Sphagnum* in downcore samples would imply wetter conditions in the past. However, we disagree with this extrapolation of modern *Sphagnum* plants to downcore samples. The disparity between $\delta^{13}C$ values of hummock and lawn *Sphagnum* plants is likely due to a species effect, as different assemblages of species inhabit these two environments (Loisel et al., 2009). Interestingly, when we examine the *Sphagnum* samples separately according to microtopographic designation, we find a general decrease in $\delta^{13}C$ values with decreasing water table depth or wetter conditions (red and blue lines in supplemental Fig. 1). This trend is opposite to the interpretation of Loisel et al. (2009), but consistent with our interpretation. It is reasonable to separate *Sphagnum* from these two microtopographic groups for calibration of a paleoclimate proxy because the

microtopographical designation does not change through time at one particular coring location, i.e., hummocks remain as hummocks irrespective of the overall peatland hydrology (McMullen et al., 2004). In supplemental Fig.1, slopes are calculated as the geometric mean of the slope of the ordinate regressed on the abscissa and the inverse of the abscissa regressed on the ordinate (dashed slopes).

Supplemental Figure 2:



This figure is a combination the carbon isotope ratios of tricosane from Xie et al. (2004) and the precipitation data from Xie et al. (2000). This figure shows that lower carbon isotope ratios of tricosane correspond with times of increased precipitation, supporting our interpretation of the carbon isotope ratios of *Sphagnum* biomarkers.