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Academic Grant Research Summary

n-Alkanes are long-chain hydrocarbons that have great potential for paleoecological studies. They remain relatively stable over geological timescales and are found in the plant cuticle, a layer of wax that plays a significant role in maintaining the equilibrium between water loss through transpiration and root water uptake. Furthermore, plants are capable of adapting to local environments and as a component of the first barrier between plants and their environment, *n*-alkanes have the potential to record that adaptation. The distributions of different *n*-alkane chain lengths (21 to 34 in modern plants) are hypothesized to favor longer chain lengths in warmer climates to increase cuticle hydrophobicity, which limits water loss. Therefore, *n*-alkane distributions could be a valuable proxy of past climate conditions and indicator of the effects of current climate change, but this has to be tested in modern plants before it can be applied to fossil data.

I examined *n*-alkane chain length distributions in two different ways: analyzing modern maple (*Acer saccharum*) leaf samples along two different transects and analyzing alkane data from published primary literature. In the first study, there was no significant difference between ACL values or other designated alkane ratios (i.e. C31:C29, Long Chain A, and Long Chain B) and latitude, longitude, and climactic variables (i.e. MAT, MAP, MAX). Chain length distribution might be unrelated to MAP here because these plants were grown in arboreta, which means they were watered regularly. This could also obscure the relationship between chain length and temperature. In the second study, however, the same measurements of alkane distribution differed significantly with latitude and climactic variables. Figure 1 illustrates the general trends and Table 1 shows the r^2-values from linear regression analyses. This correlation increased when focusing only on data with a "very high" confidence rating, suggesting the potential for a stronger correlation with a higher quality data set (Table 2). Because data used in this project were not originally corrected to test the relationship between *n*-alkane chain length distribution and climate, further analysis of other aspects of climate and more systematic sampling is necessary to assess the details of this relationship.

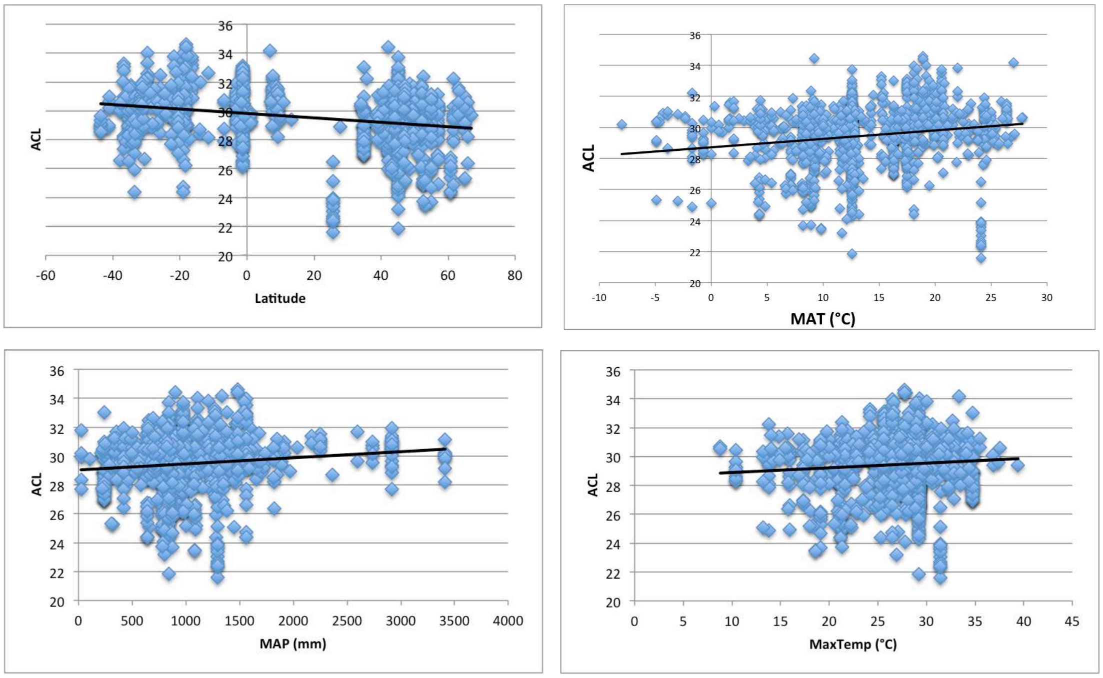

Figure 1: Graphs of correlations between ACL and (a) latitude, (b) MAT, (c) MAP, (d) MAX.

	Mosses	**Woody Gym.**	**Woody Ang.**	**Forbs**	**Graminoids**	**Succulents**	**Total**
Latitude	0.0267	0.0225	0.0378**	0.0838**	0.0355**	0.1020	0.0658**
Longitude	0.1295*	0.1058**	0.0011	0.0074	0.0429*	0.2370	0.0030
MAT	0.0162	0.0532**	0.0297**	0.0315**	0.0936**	0.0251	0.0275**
MAP	0.0353	0.0717**	0.0504**	0.0005	0.0198	0.0490	0.0113**
MaxTemp	0.0089	0.1002**	0.0003	0.0012	0.0049	0.0742	0.0063**

Table 1: R^2-values from linear regression analyses of ACL values and various climate factors within different plant groups. *p<0.01 **p<0.005

	Woody Gym.	**Woody Ang.**	**Graminoids**	**Total**
Latitude	0.1308	0.2915**	0.1755**	0.2132**
Longitude	0.0130	0.1106**	0.2153**	0.0560**
MAT	0.1885**	0.2534**	0.2533**	0.1771**
MAP	0.3254**	0.1683**	0.2280**	0.0418**
MaxTemp	0.0001	0.0215	0.0786*	0.0236*

Table 2: Using “very high” confidence ratings only. R^2-values from linear regression analyses of ACL values and various climate factors within different plant groups. *p<0.01 **p<0.005