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Temperature effect on leaf wax n-alkanes abundance and distribution along the 400 mm isohyet in China

Jia Wang (1), Ergu Axia (2), Yunping Xu (3), and Guoan Wang (4)

(1) Beijing Key Laboratory of Farmland Soil Pollution Prevention-control and Remediation, Department of Environmental Sciences and Engineering, College of Resources and Environmental Sciences, China Agricultural University, Beijing, China (wangjia220281@sina.com) , (2) Beijing Key Laboratory of Farmland Soil Pollution Prevention-control and Remediation, Department of Environmental Sciences and Engineering, College of Resources and Environmental Sciences, China Agricultural University, Beijing, China (584680069@qq.com), (3) Hadal Science and Technology Research Center (HAST), College of Marine Sciences, Shanghai Ocean University, Shanghai, China (ypxu@shou.edu.cn), (4) Beijing Key Laboratory of Farmland Soil Pollution Prevention-control and Remediation, Department of Environmental Sciences and Engineering, College of Resources and Environmental Sciences, China Agricultural University, Beijing, China (gawang@cau.edu.cn)

Long chain n-alkanes are among the most recognizable and widely used plant biomarkers and vary with environmental conditions. Temperature is an important influential factor for composition of terrestrial plant leaf wax; however, to date the meaning of shifts in abundance and distribution of leaf wax n-alkanes across temperature gradients remain unclear. This impedes interpretation of variability of leaf wax n-alkanes in sediments and reconstructions of paleoclimate and paleoecology. In this study, the effect of temperature on abundance and distribution of leaf wax n-alkanes was evaluated by a thorough and intensive investigation of hundreds of species (625 plant samples) from 51 sites across a temperature gradient along the 400 mm isohyet in China. The data revealed similar distributions of total n-alkane content (TNC) for most plant functional types; the same was true for carbon preference index (CPI) and average chain length (ACL) as well, suggesting neither TNC or CPI or ACL was a trustworthy proxy for reconstructing paleovegetation. After minimizing the effect of precipitation on leaf wax n-alkanes, this study showed a generally negative correlation between TNC and summer mean temperature (SMT), while few obvious correlations between TNC and mean annual temperature (MAT) was found; CPI values were not related with either MAT or SMT; ACL values increased significantly with increasing both MAT and SMT. Our results suggest that TNC is an indicator of summer temperature and that ACL can be used for paleotemperature (including SMT and MAT) reconstruction.