Seasonal production and δD composition of *n*-alkanes and *n*-alkanoic acids in a temperate forest

ERIKA J. FREIMUTH*[1], AARON F. DIEFENDORF[1], THOMAS V. LOWELL[1]

[1]University of Cincinnati, 500 Geology-Physics Bldg, Cincinnati, OH 45221-0013 (*correspondence: freimuej@mail.uc.edu)

The hydrogen isotopic composition of plant waxes (δD_{wax}) in sediments is an important proxy for the δD of past precipitation (δD_p) and thus paleohydrologic conditions. However, several areas of proxy uncertainty remain. First, sedimentary δD_{wax} records may be biased toward the season of wax synthesis in plants. Second, *n*-alkanes and *n*-alkanoic acids may differ with respect to abundance, timing of synthesis, and δD fractionation of source water. Lastly, apparent fractionation (ε_{app}) between δD_p and δD_{wax} can vary widely among diverse catchment vegetation. To address these areas of uncertainty, we determined δD values of *n*-C_{29} alkanes and *n*-C_{28} alkanoic acids, as well as xylem and leaf water (δD_{lw}) at 12 points between March and October 2014 from 2-3 individuals of each of the deciduous angiosperm tree species (*Prunus serotina*, *Acer saccharinum*, *Quercus rubra*, *Quercus alba*, and *Ulmus americana*) that dominate the temperate forest at Brown's Lake Bog, Ohio, USA. *n*-Alkanes were generally produced in the 2-3 weeks following leaf emergence and at up to 30-fold higher concentrations than *n*-alkanoic acids, which were produced over the entire growing season. During leaf emergence and maturation, changes in δD_{lw} and metabolic status were key drivers of δD_{wax}. The two compound classes fractionated common source water to different extents, with ε_{app} approximately 19‰ greater for *n*-C_{29} alkanes (-107‰) than for *n*-C_{28} alkanoic acids (-88‰). We assess net analytical uncertainties and biological noise in forest-level ε_{app} to estimate the sensitivity of sediment-level δD_{wax} to δD_p changes.