Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.32132

Millennial-scale variability of *n*-alkane D/H ratios in response to Dansgaard-Oeschger cycles, Eifel Volcanic Field, Germany

PAUL D. ZANDER[1,2], FRANK SIROCKO[3], XIAOJING DU[4], CHIJUN SUN[5], FLORIAN RUBACH[2], GERALD H. HAUG[2,6] AND ALFREDO MARTINEZ-GARCIA[2]

[1]Lawrence Livermore National Laboratory
[2]Max Planck Institute for Chemistry
[3]Johannes Gutenberg-University
[4]George Mason University
[5]University of California, Davis
[6]ETH Zurich

Dansgaard-Oeschger (D/O) cycles during the last glacial period caused extremely rapid warming events in the North Atlantic region, providing a partial analogue for modern warming due to comparable rates of warming. The effects of these events on the climate of Europe remain uncertain. In particular, the role of changing seasonality is debated, and little is known about changing hydroclimate conditions due to a lack of continuous water isotope records during the glacial period. In this study, we investigate D/O cycles in central Europe via measurement of carbon ($\delta^{13}C$) and hydrogen (δD) isotopes in *n*-alkanes (leaf waxes) extracted from lake sediments from the Eifel Volcanic Field, Germany, spanning the past 60,000 years. In contrast to modeled precipitation isotopes and previously published carbonate oxygen isotopes from Europe, δD_{wax} becomes relatively depleted during warm interstadial phases. The mechanisms that control δD_{wax} are explored via comparisons of proxy system models with an isotope-enabled transient climate simulation (iTRACE). The results suggest that δD_{wax} is not only influenced by the δD of annual precipitation, but also by the timing of the growing season and relative humidity. Our results suggest that interstadials featured an earlier onset of the growing season due to warmer spring temperatures, and more humid conditions compared to cold phases. We propose that proxy system models that incorporate changes in the timing of the growing season and changes in relative humidity can improve comparisons of climate models with δD_{wax} and lead to more accurate interpretations of δD_{wax} records.