

Pliocene dynamics of the North American Monsoon

TRIPTI BHATTACHARYA¹, JESSICA E. TIERNEY²

¹Department of Earth Sciences, Syracuse University,
Syracuse, NY 13244 (* correspondence
trbhata@syr.edu)

²Department of Geosciences, University of Arizona, Tucson,
AZ 85721

The Pliocene epoch (5.3 to 2.6 Ma) featured CO₂ concentrations similar to current and near-future values. Available proxy evidence suggests a reorganization of subtropical climate that resulted in mean wetter conditions, including in the American Southwest. Here, we explore the role that changes in monsoon rainfall may have played in the Pliocene hydroclimate of western North America. This work has important implications for understanding the sensitivity of this unique monsoon to global warming.

We synthesize existing data from the western US, and present new measurements of the stable hydrogen isotope ratio of long chain leaf wax alkanolic acids (δD n-acid) deposited in near shore marine sediments from the core monsoon domain. Our previous work with leaf wax δD in the North American Monsoon domain shows that this proxy is sensitive to the seasonal balance of rainfall, or the ratio of monsoon precipitation to rainfall brought by winter storm tracks. We also present new reconstructions of local sea surface temperatures from alkenones. We complement these new proxy data with analyses of climate model simulations to explore the role of changing ocean temperature structure and cloud feedbacks in altering the dynamics of the Pliocene North American Monsoon.