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Reconstructing hydroclimatic variations using compound-specific hydrogen isotope analysis of biomarkers from a maar lake in the Central Highlands, Vietnam

Kelsey Doiron (1), Lora Stevens (2), and Peter Sauer (3)

(1) Department of Geological Sciences, California State University, Long Beach, United States (Kelsey.Doiron@student.csulb.edu), (2) Department of Geological Sciences, California State University, Long Beach, United States , (3) Department of Geological Sciences, Indiana University, Bloomington, United States

Monsoonal variation in Southeast Asia affects a significant portion of the global population, but knowledge regarding response of the monsoon system to changing boundary conditions is limited. The paleoclimatic tool of compound-specific isotope analysis(CSIA) provides the ability to reconstruct past precipitation using a diverse set of biomarkers preserved in the sedimentary record. Limited proxies in tropical southeast Asia and difficult site access have led to a deficit in paleoclimate records. Ia M'He (14˚10'45" N, 107˚52' E) is a shallow volcanic crater (maar) lake, approximately 57 ha, located in the Central Highlands of Vietnam. Precipitation in the Central Highlands is sensitive to reorganizations of major climatic features, such as the migration of the ITCZ and the coupled Indo-Asian monsoon, ENSO and related shifts in the Pacific Walker Circulation and typhoon frequency. To examine this complex behavior, this pilot study aims to provide a 500-year record of effective moisture inferred from CSIA of hydrogen isotopes on biomarkers. Carbon/nitrogen ratios and carbon isotope ratios indicate that bulk organic matter is a combination of algae and C_3 vegetation, offering the potential to use compound-specific hydrogen isotopes of aquatic and terrestrial organic matter in tandem. Preliminary analysis of the core shows dominant alkane chain lengths of C_{27} and C_{29}, associated with terrestrial plant leaf waxes. The hydrogen isotope ratios of the plant wax components provide a proxy for paleo precipitation in a region where rainfall and droughts heavily influence population dynamics and create social discord. The CSIA record is expected to correlate with records from northern Vietnam, the South China Sea and Indonesia, with greater precipitation during the Little Ice Age. The degree to which evaporative modification of lake water (i.e., seasonal drying) occurs will be estimated by comparing the terrestrial CSIA values indicative of meteoric water with aquatic CSIA values, which will capture the hydrologic balance of the lake itself.