Washington University in St. Louis Washington University Open Scholarship

Spring 2018

Washington University Senior Honors Thesis Abstracts

Spring 2018

Constructing an Isotopic Record of a Sierra Nevada Lake Core

Lauren S. Johnson Washington University in St. Louis

Follow this and additional works at: https://openscholarship.wustl.edu/wushta_spr2018

Recommended Citation

Johnson, Lauren S., "Constructing an Isotopic Record of a Sierra Nevada Lake Core" (2018). *Spring 2018*. 64.

https://openscholarship.wustl.edu/wushta_spr2018/64

This Abstract for College of Arts & Sciences is brought to you for free and open access by the Washington University

Senior Honors Thesis Abstracts at Washington University Open Scholarship. It has been accepted for inclusion in Spring 2018 by an authorized administrator of Washington University Open Scholarship. For more information, please contact digital@wumail.wustl.edu.

Constructing an Isotopic Record of a Sierra Nevada Lake Core Lauren S. Johnson

Mentors: Alexander S. Bradley, Bronwen L. Konecky, and David A. Fike

The isotopic compositions of leaf waxes from laucustrine sediments in the Sierra Nevada Mountains offer an opportunity to gain insight into correlations between paleoclimatological variation, biogeochemical cycles, and climate change. The annual snowpack in the Sierras vary strongly with rainfall and correlate with ENSO (El Niño – Southern Oscillation). In October 2013, a 27-meter core was recovered from Pear Lake, in Sequoia National Park, representing a 13,500 year record (the Holocene Epoch) of lake sediment. We have extracted organic material from ~1 cm intervals of the top 23 cm of this core, which represents a 208.6 \pm 31.6 year record. At each depth we measured the deuterium/hydrogen ratio (expressed as δD) of sedimentary plant waxes, changes in which are interpreted to represent paleohydrological variation.

Analyses of mid- and long-chain alkanes revealed an Average Chain Length (ACL) for n-alkanes to be ~26, increasing slightly from 23 cm to the surface. Furthermore, the Carbon Preference Index (CPI) is ~6.9. δ D varied by >50‰ in the top 23 cm, which represents a 208.6 ± 31.6 year record of the region. Our paleohydrological record demonstrates a strong coupling between hydrogen isotopic trends and ENSO events, but the cause of this coupling is yet to be understood. In our paleohydrological record, when an ENSO event switched from a succession of El Niño events to La Niña events or vice versa, a change in δ D was observed. More negative δ D values were observed during El Niño events, and more positive δ D during La Niña events. These trends in δ D were clear enough to predict the occurrence of ENSO events throughout the core. Refining these predictions are key to understanding hydrological cycles before the records of instrumental data to better predict their effects on future generations.