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TOWARDS SYNCHRONIZING THE NORTH AMERICAN VARVE CHRONOLOGY WITH GREENLAND ICE CORE RECORDS USING METEORIC ^{10}BE FLUX

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Our goal is to investigate the precise time relationship between the North American Varve Chronology (NAVC) and Greenland ice cores using atmospherically-produced (meteoric) ^{10}Be. The NAVC is a floating 5700-year sequence of glacial lake varves deposited in the Connecticut River Valley (northeastern North America) ~18,000-12,500 years ago. This annually resolved record of regional climate and ice-marginal processes was deposited at 40-45° N latitude, near the margin of the retreating Laurentide Ice Sheet (LIS), during the last deglaciation.

Age calibration for the NAVC based on radiocarbon dated plant macrofossils in individual varves implies several relationships between climate events in North America and Greenland, such as an increase in the retreat rate of the LIS during the Bolling warming in Greenland. However, the uncertainly in the radiocarbon calibration is ~+/- 200 years, so a more robust metric is needed to synchronize these records at finer resolution to test these relationships. Meteoric ^{10}Be production and delivery rates are directly related to solar variability, and existing ^{10}Be flux records from Greenland ice cores exhibit solar variability on a range of time scales. Because this variability is globally synchronous, a ^{10}Be flux record for annually resolved NAVC varves can, in principle, be used to align NAVC and ice core timescales.

In the first phase of this research we tested this potential by generating ^{10}Be flux records for two 80-year varve sequences and analyzing them using multi-taper spectral analysis for determination of the short-period (11-year) Schwabe cycle. The results do not support the existence of an 11-year periodicity, however El Nino Southern Oscillation (~4-6 yr) signals were resolved with >99% confidence. These results suggest that watershed processes influenced the retention and delivery of ^{10}Be in the glaciated and freshly de-glaciated landscapes of the Connecticut River Valley and obscured the short-period Schwabe cycle. We use these results to guide sampling for a 1700-year record of ^{10}Be flux record at decadal (15-year) resolution for comparison with Greenland ice core records at centennial timescales.

Session No. 33

T11. Dates and Rates: Two Decades of Cosmogenic Studies in Eastern North America, the Canadian Arctic, and Greenland
Tuesday, 19 March 2013: 8:00 AM-12:00 PM

Dartmouth Room (Omni Mount Washington Resort)

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