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## Collaborative Research: P2C2--Winter Climate Anomalies across North America: Benchmarking Instrumental Trends and Model Projections with High Resolution Paleoclimatology

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## Data Management Plan

**Products of research and data types.** The primary data produced will be new 1) tree ring-width time series and chronologies and 2) stable isotope ( $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$ ) time-series and chronologies. Secondary data will include 1) tree sizes, 2) tree locations and 3) time-series of reconstructed meteorological variables.

**Data Protocols.** Each tree or log sampled will be geo-referenced and photographed in-situ when possible. Live trees will be measured for their diameter at 1.2 m. The estimated sampling location (i.e. height within the tree) within logs will be recorded. For tree cores and cross-sections collected the ring-widths will be scanned and measured for ring-widths. In any pieces too difficult to measure with scanned images we will use a Velmex measurement system interfaced with MeasureJ2x software. All data will be recorded to a precision of 0.001 mm. Tree-rings will be visually and statistically cross-dated following established procedures. For stable isotope data the results will be reported in the conventional  $\delta$  notation relative to recognized international standards; Vienna Pee Dee Belemnite (VPDB) or Vienna Standard Mean Ocean Water (VSMOW) for  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$ , respectively.  $\delta^{13}\text{C}$  data will also be converted to carbon isotope discrimination  $\Delta^{13}\text{C}$  before any statistical analyses are conducted on them.

**Quality Assurance.** We will use standard methods<sup>1,2</sup> for quality assurance and quality control (QA/QC), including outlier identification and bias correction, documented in the metadata. Version control will be incorporated in major data tables by time-stamping each file over time as changes are made.

Chronologies developed from ring-width or stable isotope data will use appropriate standardization and de-trending procedures to isolate either of high or low-frequency variation in the time series data. During stable isotope analyses, sufficient internal standards will be included in each tray of cellulose analyzed to assure consistency in analyses among runs. A selection of samples from set of analyses will be run in duplicate to assess any changes in analytical error over time.

Project metadata will be developed in compliance with national standards for metadata (Ecological Metadata Language), NBII Biological Data Profile, and the Federal Geographic Data Commission Content Standard for Digital Geospatial Metadata (*version 2*) for spatial data. These will primarily be statistical de-trending methods used to produce chronologies as well as geolocation and physical attributes of trees sampled.

**Data Access Policy.** Data will be made available to the broader research community as soon as possible. Ring-width data and stable isotope data will be made available to the public, free and without registration, online at the International Tree Ring Data Bank (ITRDB), which is administered by the National Oceanic and Atmospheric Administration

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<sup>1</sup>EPA Order 5360 A1 (May 2000), EPA Quality Manual for Environmental Programs, U.S. Environmental Protection Agency, Washington, DC

<sup>2</sup>U.S. Geological Survey, 2005, National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chaps. A1-A9, available online at <http://pubs.water.usgs.gov/twri9A>.

(<http://www.ncdc.noaa.gov/paleo/treering.html>). These data will be submitted within one year of finishing analyses, which should correspond to the time in which primary publications outlined for this project should be written and submitted. When data are submitted to the ITRDB an announcement will be made on appropriate listservs (i.e. EcoLog, ITRDBFOR and/or ISOGEOCHEM).

Meta-data files as well as any code for the modeling component of the project and/or the statistical analyses of the data collected will be made available upon request. PIs Voelker, Wang and Griffin and the graduate students at each institution will have full access to all data generated and will be expected to invite all the relevant collaborators on the project to take part in any products from the proposed research.

**Data Storage and Archiving.** Tree-ring and stable isotope data and code and modeling products will be shared among our research team using online cloud storage at UM or using a third-party site in some cases (i.e. Dropbox or Google Drive). These data will be stored in working files separated among the institutions and updated regularly -- past versions being saved and time stamped. Upon completion of the project the ring-width data and associated scanned images will be housed on separate servers at USU and UM that are backed up at daily intervals. This will provide redundancy and assure none of the primary data generated are lost. All new data meant for public distribution will be served through the ITRDB website. All cellulose as well as increment cores and wood cross-sections not destructively sampled for stable isotope analyses will be curated/archived at USU in the laboratory of PI Voelker.

**Documentation.** The scientific background of all products generated under this proposal will be documented in peer reviewed publications. This includes site descriptions, models, errors and uncertainties and potential limitations of the approaches described. Data access, data formats, data availability and other technical descriptions will be provided with the data itself. This will be provided as online documentation through the ITRDB website.