**AmeriDendro 2016 – Abstract submission form**

|  |  |
| --- | --- |
| **Type of presentation:** | Oral |
| **Session or Symposium** | S3. Tree rings and dynamic vegetation models: Interdisciplinary research to improve forecasts of past and future forest dynamics |
| **Title of the presentation** (max. 20 words) | Combining tree-ring and forest plot data to infer climatic niche: a hierarchical Bayesian approach |
| **Authors** (the presenter’s name is bolded and underlined)**:** | **Evans, Margaret**1; Holsinger, Kent2; Arizpe, Alex3; Swetnam, Tyson4; Babst, Flurin5; Falk, Don4 |
| **Affiliations:** | *1. Laboratory of Tree-Ring Research and Department of Ecology & Evolutionary Biology, University of Arizona; 2. Department of Ecology & Evolutionary Biology, University of Connecticut Storrs; 3. Laboratory of Tree-Ring Research, University of Arizona; 4. School of Natural Resources and Environment, University of Arizona; 5. Dendroclimatology Group, Department of Landscape Dynamics, Swiss Federal Research Institute WSL and Department of Ecology, Institute of Botany, Polish Academy of Sciences.* |
| **\* Principal author email** | mekevans@ltrr.arizona.edu |
| **Abstract  (max. 300 words)** | The forest biome is expected to shift geographically with anthropogenic climate change. To build species-specific, process-based models for forecasting how trees' geographic distributions will change under future climate scenarios, we see a need to combine two major, complementary sources of information on individual tree performance in response to climate variation: tree-ring and forest plot data. The annual resolution of the former make them the gold standard for inferring climate effects on growth; the latter are more numerous, spatially extensive, and are unbiased with respect to tree size (i.e., comprehensive national forest inventory programs). Our objective here was to test a model combining these two data types at a single exceptionally well-studied site - Monument Canyon in the Jemez Mountains of New Mexico, U. S. A. Increment cores were collected from 100 trees across size classes in 2014, and measurements of diameter at breast height (DBH) were made on all trees >20cm DBH (n=500) in 2004 and 2014, in 16 plots ranging from *Pinus ponderosa*-dominated to mixed conifer forest. Analysis of the tree-ring data revealed negative sensitivity to temperature and positive sensitivity to precipitation at the end of the previous year’s growing season (Sept-Oct) and in the arid foresummer months of the current growing season (Apr-Jun). Analysis of the DBH data offered limited insight on climatic niche (i.e, growth response to 10-year average climate, a typical forest inventory census interval). We combined tree-ring and DBH data together using a hidden process model that treats both as observations of the common process of individual tree growth, and asked, by removing increasingly more of the tree-ring data, how the inference of climatic niche degrades. This analysis offers insight into how much tree-ring data are needed to complement forest inventory plot data to infer climatic niche. |
| **Keywords** (up to 5) | Data fusion; Ecological forecasting; Forest inventory plot data; |