The Laboratory of Tree-Ring Research

presents a talk by

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Combining tree-ring and forest plot data to infer climatic niche: a hierarchical Bayesian approach

Wednesday, April 20, 2016 - 12:00pm to 1:00pm
Room: Bannister 110

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 Research Natural Area in the Jemez Mountains of New Mexico, U. S. A. Increment cores were collected from ~160 trees across size classes in 2014, and measurements of diameter at breast height (DBH) were made on all trees >20cm DBH (n=600) in 2004 and 2014, in 16 plots ranging from Pinus ponderosa-dominated to mixed conifer forest. A Bayesian model combining these two data types generated climate response functions that are essentially the same as a traditional dendroclimatic analysis - 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). In addition, the model suggests increased growth on pumice- and alluvium-derived soils, following thinning and prescribed burning treatments, and a positive influence of topographic wetness. Because the data from Monument Canyon lack a space-for-time aspect, they don't allow us to demonstrate the advantages of combining the two types of data per se. We briefly introduce a more geographically extensive dataset to which we will be applying this approach: increment cores and remeasurement data collected in Forest Inventory and Analysis plots in the northern half of Arizona.

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