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Title: Tree-ring based history of climate and disease in western Oregon forests

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Abstract

Annual tree-ring width data are often used to make inferences of past climate and the spatiotemporal climate-growth relationships. However, the climatic signal may be confounded with non-climatic signals such as disease or pest disturbances at unknown times in the past. Signal extraction in tree-ring research is considered as a general structural time series problem with components for age-related and climate trends, climatic effects, and disturbances. We present a time series intervention analysis (TSIA) approach to extract the relevant signals in tree-ring data to either reconstruct the history of disturbance adjusting for the climatic signal or develop climate-growth relationships adjusting for disturbances. In the Pacific Northwest, Swiss needle cast (SNC) is an important fungal disease of Douglas-fir (*Pseudotsuga menziesii*) that has increased in severity over the last half-century. The role of climate change and forest management practices in the increase is unclear. We demonstrate the TSIA approach to reconstruct the history of SNC disease impacts on Oregon forests and examine the climatic factors associated with disease and growth based on monthly dendrometer and annual radial growth increment data.