



# THE LABORATORY OF TREE-RING RESEARCH

presents a talk by

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## *Large contribution from anthropogenic warming to an emerging North American megadrought*

Wednesday, February 12, 2020 - 12:00pm to 1:00pm

Room: Bannister 110

Over the past two decades much of western North America experienced persistent drought with little to no respite. Consequences were widespread, including declines in river flow and reservoir storage, over-extraction of ground water, explosion of forest-fire activity, and massive bark beetle outbreaks. Water-balance calculations make clear that 2000–2018 was easily the driest 19-year period in the past century. To what degree if at all is human-caused climate change responsible and what is the future trajectory of water supply in western North America? Any discussion of the effect of modern climate change on water resources in western North America should be couched within the broader knowledge that this region's capacity for natural hydroclimatic variability is extreme. During CE 800–1600, tree-ring records indicate a series of so-called medieval megadroughts that dwarfed anything observed in the 1800s or 1900s. These events are infamous for their impacts on regional hydrology and indigenous societies, and viewed today as worst-case scenarios for water management.

In this talk I will use observations, hydrological modeling, global circulation models, and tree-ring records to present two major findings: Soil moisture in western North America from 2000–2018 was statistically tied with the driest 19-year periods of the most severe regional megadroughts in at least 1200 years and this recent and possibly ongoing drought would not have achieved its megadrought-like trajectory without the drying effect of anthropogenic warming. Attributing soil-moisture drought to anthropogenic climate change is a contentious business, with recent debates focused on the limitations of commonly used drought indices and the importance of poorly-understood processes such as CO<sub>2</sub> effects on plant water use and land-atmosphere feedbacks. I will explore these uncertainties and make the case that the general findings stated above are robust across a comprehensive range of methods. The fact that anthropogenic warming has forced an otherwise moderate drought to develop along a megadrought-like trajectory serves as an ominous early-warning sign. The global warming process is still in its infancy and future naturally-occurring droughts will be superimposed on an increasingly dry baseline that, based on this work, can now be monitored in real time.