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Western Wildfires Linked To Atlantic Ocean Surface Temperatures

Science Daily — Western U.S. wildfires are likely to increase in the coming decades, according to a new tree-ring study led by the University of Comahue in Argentina and involving the University of Colorado at Boulder that links episodic fire outbreaks in the past five centuries with periods of warming sea surface temperatures in the North Atlantic.

States like Washington, Oregon, California, Colorado, New Mexico, Arizona and South Dakota all had an increased prevalence of wildfires in recent centuries when a phenomenon known as the Atlantic Multi-Decadal Oscillation -- similar but longer in duration than the better known El Nino-Southern Oscillation -- periodically shifted from a cool to a warm mode that lasted roughly 60 years each time, said the study authors.

Warmer waters in the North Atlantic correspond with episodes of drought and subsequent fires in the West as shown by fire scars in annual tree rings studied by the researchers, said Thomas Kitzberger of the University of Comahue, who led the study with researchers from CU-Boulder, the University of Arizona, the U.S. Forest Service and Rocky Mountain Tree-Ring Research Inc., a private lab in Fort Collins, Colo.

Kitzberger, who received his doctorate from CU-Boulder in 1994 under co-author and CU-Boulder geography Professor Thomas Veblen, said the North Atlantic warming trend, coupled with warming temperatures and the earlier onset of spring in the West, poses "an increased hazard for wildfires that may continue for decades." The paper was published the week of Dec. 25 in the Proceedings of the National Academy of Sciences.

While previous tree-ring studies have linked fires in different regions of western North America to drought associated with the warm El Niño phase or cool La Niña phase of the Southern El-Niño Southern Oscillation phenomenon in the Pacific, the new study is the first to correlate the Atlantic Multi-Decadal Oscillation with increased North American fires on such a large scale, said the authors. The team analyzed nearly 34,000 individual fire scar dates from tree rings, primarily ponderosa pine and Douglas fir, at 241 sites -- the largest record of tree rings linked to past wildfires ever assembled.

"This trend of warmer sea-surface temperatures in the North Atlantic appears to be correlated with dry spells we have seen in the West since the late 1990s," said Veblen. "If the trend continues for the next 60 years or so as it has in the past, the degree of fire occurrence in the West could be unprecedented compared to anything in recent memory."

Although the atmospheric mechanisms relating drought in North America to sea-surface temperatures in the North Atlantic are subject to debate among climatologists, there is a strong statistical association of drought and fire in western North America when the Atlantic sea surface warms, said Veblen. The sea-surface temperature of both the Atlantic and Pacific oceans combine to influence the climate of much of the world through a complex web of atmospheric interconnections, he said.

"The key issue is that the Atlantic Multi-Decadal Oscillation persists on time scales of 60 to 80 years, compared to just one year or a few years for El Niño," he said.

Veblen said warmer temperatures in the West since the 1990s have exacerbated outbreaks of spruce and pine beetle populations, which have decimated millions of acres of coniferous forests in the West. "There is good evidence that warming trends like the one we are now seeing is very favorable for the population growth of these beetles."

Fire suppression activities during the 20th century have increased fuels and fire hazard in some forest types, although forest thinning may help reduce the impact of some severe fires by eliminating potential fuel sources, Veblen said. But the effectiveness of such practices pale in comparison to the potential of climatic factors.

"The driving factor influencing wildfires is overwhelmingly climate variation, which is why studies like these are crucial," he said.

"This study underscores the value of building large networks of high-resolution fire history data to better understand how climate may affect fire regimes over large areas of the globe," said Kitzberger. The team used data from the International Multiproxy Paleofire Database that is maintained by the National Oceanic and Atmospheric Administration.

Other study authors include Peter Brown from Rocky Mountain Tree-Ring Research Inc., Emily Heyerdahl the U.S. Forest Service in

Missoula, Mont., and Thomas Swetnam of the University of Arizona.

Note: This story has been adapted from a news release issued by University of Colorado at Boulder.

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