Southern South American wildfires expected to increase: study

August 22 2011

This 2010 photo shows the aftermath of a wildfire outside the town of Futaleufu in southern Chile. A new study by CU-Boulder researchers indicates that wildfires may intensify in southern South America in the coming decades. Credit: Andres Holz

A new University of Colorado Boulder study indicates a major climate oscillation in the Southern Hemisphere that is expected to intensify in the coming decades will likely cause increased wildfire activity in the southern half of South America.

The research team used tree rings dating to 1506 to track past wildfire activity in the forests of Patagonia tied to the Southern Annular Mode, or SAM, a climate oscillation that creates low atmospheric pressure in the Antarctic that is tied to warmer and drier conditions in southern

South America. The tree rings showed that when SAM was in its positive phase, there were widespread fires in both dry woodlands and rainforests in Patagonia, a region that straddles Argentina and Chile, said CU-Boulder Research Associate Andres Holz, lead study author.

"Our study shows for about the past 250 years, the Southern Annular Mode has been the main driver in creating droughts and fires in two very different ecosystems in southern South America," said Holz. "Climate models suggest an increase in SAM beginning in the 1960s due to greenhouse gas increases and Antarctic ozone depletion probably will cause this region to be drought-prone and fire-prone for at least the next 100 years."

A paper on the subject by Holz and CU-Boulder geography Professor Thomas Veblen was published in Geophysical Research Letters.

Holz and Veblen compared past wildfire records for two ecologically distinct regions in Patagonia -- the relatively dry region of southern Patagonia in Argentina and the temperate rainforest of Patagonia in northern Chile. While the tree ring historical record showed increased fires in both regions correlated with a positive SAM, the trend has been less pronounced in northern Patagonia in the past 50 years, likely because of fire-suppression efforts there, Holz said.

But the decades of fire suppression have caused the northern Patagonian woodlands to become denser and more prone towildfire during hot and dry years, Holz said.

"Even in areas of northern Patagonia where fire suppression previously had been effective, record surface areas of woodlands and forests have burned in recent years of extreme drought," said Veblen. "And since this is in an area of rapid residential growth into wildland-urban interface areas, this climate-driven trend towards increasing fire risk is becoming

a major problem for land managers and homeowners."

The two CU-Boulder researchers studied reconstructions of tree rings going back more than 500 years from 432 trees at 42 sample sites in northern Argentina and southern Chile -- the largest available data set of annual, readable tree ring records in the Southern Hemisphere. The tree rings, which indicate climate cycles and reveal the scars of old fires, showed that wildfires generally increased in both regions when SAM was in its strong, positive phase.

Although the Antarctic ozone hole stopped growing in about 2000 as a result of a ban on ozone-depleting gases and now appears to be slowly repairing itself, a 2011 paper by researchers at the National Center for Atmospheric Research in Boulder indicates ozone recovery and greenhouse gas influences essentially will cancel each other out, preventing SAM from returning to its pre-1960s levels.

"Before the Industrial Revolution, SAM intensified naturally at times to create drought situations in Patagonia," Holz said. "But in the last 80 years or so, the natural variation has been overwhelmed by a bias toward a positive SAM phase because of ozone-depleting chemicals and greenhouse gases we have put in the atmosphere."

The research effort was supported by the National Geographic Society, the National Science Foundation, the CU Beverly Sears Small Grants Program and the Council on Research and CreativeResearch of the CU Graduate School.

"As warming and drying trends continue, it is likely that wildfire activity will increase even in woodland areas where fire suppression has previously been effective," Holz and Veblen wrote in *Geophysical Research Letters*.

Provided by University of Colorado at Boulder