

In eastern Tibetan forest, signs of tree growth amid climate change

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Lucas Silva of the University of Oregon, standing at right, talks with colleagues while in the field on the Eastern Tibetan Plateau. His team found that climate change-induced thawing of permafrost is feeding a species of fir trees with soil nutrients and water, leading to rapid forest growth. Credit: Lucas Silva

Word of mouth from nomadic herders led Lucas Silva into Tibetan forests and grasslands. What his team found was startling: Rapid forest growth in tune with what scientists had been expecting from climatic changes triggered by rising levels of carbon dioxide.

Actual scientific findings to date, however, had been turning up declining growths in many forests in the face of climatic changes. Such had also been the case for Silva, who joined the UO's Environmental Studies Program and Department of Geography in August.

On the eastern Tibetan Plateau—in an area where it was thought that "climatically induced ecological thresholds had not yet been crossed"—Silva's team found that the increasing availability of soil nutrients and water from thawing permafrost is stimulating the chemistry of the wood in a species of fir trees (*Abies faxoniana*).

"Our results confirmed the reports of local herders and showed a recent increase in tree growth that has been unprecedented since the year 1760," Silva said. "These result demonstrate that under a specific set of conditions, forests can respond positively to human-induced changes in climate."

The findings were published Aug. 31 in *Science Advances*, an online, open-access publication of the American Association for the

Advancement of Science.

Nomads had reported their observations to study co-author Geng Sun of China's Chengdu Institute of Biology in Sichuan, China. The research team traveled to the region in eastern Tibet where they found old-growth forests, smaller patches of trees and trees isolated on the perimeter of the forests.

"We wanted to take a long term view of changes in tree growth across this gradient," Silva said. "To do so, we combined tree-ring measurements with laboratory analyses to look for changes in growth as well as chemical signals of climatic change."

Those techniques provided a window on the history of the area's [tree growth](#). Dramatic increases in growth have coincided with pulses of tree establishment just outside of the forest range but apparently not yet on a broader regional scale, he said. Growth was rapid between the 1930s and 1960s, but even more accelerated in the last three decades.

Research involving plants grown in controlled laboratory and greenhouse conditions have shown that rising carbon dioxide levels can speed plant growth, but field studies have shown that [carbon dioxide](#)-induced growth could not counteract the negative effects of rising temperatures and drought stress in many forest ecosystems.

The new findings, the researchers said, suggest that studying the synergy of soil-plant-atmosphere interactions might be the key to understanding the past and predicting future changes in forest productivity and distribution.

"Our findings could have important implications for the conservation and management of many different species," Silva said. "However, it is important to note that we sampled a very small area where forests and

grasslands coexist. A comprehensive survey of changes in plant diversity throughout the region has yet to be performed."

More information: L. C. R. Silva et al, Tree growth acceleration and expansion of alpine forests: The synergistic effect of atmospheric and edaphic change, *Science Advances* (2016). [DOI: 10.1126/sciadv.1501302](https://doi.org/10.1126/sciadv.1501302)

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