They found that tree growth of delavay fir has been declining since 1950s in the Cangshan Mountains, which is attributed to the combination of increasing temperature and decreasing moisture availability. The declining growth trend can be explained by the negative effects of temperature and positive effects of moisture availability on tree growth. But during the earlier period 1800–1951, there was a stable growth trend.

Additionally, they detected a decreasing trend of leaf inter-cellular CO$_2$ and atmospheric CO$_2$ ratios, suggesting an active response to CO$_2$ rise via reduction of stomatal conductance. Intrinsic water-use efficiency was increasing, especially after the 1950s.

Dual isotopic analyses revealed increasing tree-ring stable carbon ($^{13}$C) and oxygen ($^{18}$O) ratios, indicating a shift from cold/wet to more warm/dry conditions, suggesting a reduction of stomatal conductance, and stable or decreased photosynthetic assimilation rate.

The negative growth trends during recent decades were mainly driven by regional drying trends and/or warming-induced moisture limitations. However, increasing intrinsic water use efficiency did not mitigate the negative effects of warming and drying on tree growth.

“Our results serve as an early warning for tree growth and productivity of A. delavayi forests at the southern distribution limits under the ongoing warming climate,” said Dr. Fan Zexin, principal investigator of the study.
