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Author(s):
Su, Jiajia; Gou, Xiaohua; HilleRisLambers, Janneke; Zhang, David; Zheng, Wuji; Xie, Mingmei; Manzanedo, Rubén

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Increasing ENSO variability synchronizes tree growth in subtropical forests

Jiajia Su[1], Xiaohua Gou[2], Janneke HilleRisLambers[3], David Zhang[4], Wuji Zheng[5], Mingmei Xie[6], and Rubén Manzanedo[7]

[1]Guangzhou University, China (sujj2021@gzhu.edu.cn)
[2]Lanzhou University, China
[3]ETH Zürich, Switzerland
[4]Guangzhou University, China
[5]Sun Yat-sen University, China
[6]Guangzhou University, China
[7]ETH Zürich, Switzerland

Rising El Niño–Southern Oscillation (ENSO) variability is expected to influence Earth's forest ecosystems, through changes in how coordinated annual tree growth is across large spatiotemporal scales. However, the mechanisms by which changes in ENSO variability affect tree growth remains poorly understood, especially in understudied subtropical forests. We use a newly built tree ring network collected from 4,028 trees at 144 forest locations across East Asian subtropical forests (EASF) at subcontinental scales (□2,000 km), to assess long-term influences of ENSO on the spatiotemporal variability in tree radial growth across China. Our results demonstrate a west-east dipole pattern of synchronized tree growth in EASF moisture-limited tree populations, with positive growth responses to El Nino in southeastern China, and negative growth responses in the southwestern China. Specifically, trees grew more in El Niño years in eastern populations, but less in western populations. This pattern likely results from the contrasting effects of ENSO on drought limitation along a longitudinal gradient. Our results also show that increasingly severe El Niño/La Niña years have caused a sharp rise in tree growth coherence over past 150 years in these moisture-limited populations. A further increase in climate variability, as is expected with climate change, could destabilize subtropical forest ecosystems by synchronizing tree growth to an unprecedented level. In all, our results highlight the need for further research on the ecological implications of rising synchrony, given its increasing relevance to global forest ecosystems in a time of rising climate variability.