

School of Earth and Environmental Sciences Spring 2024 Colloquium Series

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Science Building C-207

Chuixiang Yi, PhD

Professor, SEES, Queens College, CUNY

Bifurcated response of a regional forest to drought

Several lines of evidence suggest that forest growth in many regions is declining due to climate change. To predict the future of forests, a quantitative understanding of how key climate variables—insolation, precipitation, and temperature—interact with forest ecosystems is urgently needed. My group has sought to quantify forest growth in the Southwest United States (SWUS) using a regionally-averaged tree-ring width index (RWIr). Over a period of 90 years, we observed that the SWUS RWIr bifurcated into two distinct trajectories: one representing healthy forest stands and the other indicating declining growth. This bifurcation was strongly associated with shortwave radiation and temperature. We found that the declining branch was overwhelmingly driven by drought, measured by the regionally-averaged precipitation–evapotranspiration index (SPEIr). Our findings provide insights into the differentiated impacts of climate variables on forest growth and help identify key tipping-point control parameters for forest regime transitions.

