

**Title:** Climate Warming Projected to Cause a Large Increase in Amazon Windthrow Disturbance This Century

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**BER Program:** ESS

**Project:** NGEE-Tropics (led by Berkeley Lab)

**Project Website:** <https://ngee-tropics.lbl.gov/>

**Project Abstract:**

Forest mortality caused by convective storms (windthrow) are major disturbances in the Amazon, which shape forest structure and affect the regional carbon balance. However, the linkage between windthrow at the surface and convective storms in the atmosphere is poorly understood. In addition, the current Earth system models (ESMs) lack mechanistic links between convective wind events and tree mortality. Here we show that a simple proxy that is well simulated by global climate models (GCMs) – convective available potential energy (CAPE) – explains 57% of the variance in the spatial density of windthrow events encompassing 30 years in the Amazon. Using remote sensing and climate reanalysis data, this relationship builds connections between strong convective storms and forest dynamics for the first time in the Amazon. An analysis of 10 GCMs predicts a significant increase of CAPE with a warming climate, and our models using CAPE project a  $65 \pm 43\%$  increase in windthrow density over this century. These results augur significant changes in tropical forest composition and carbon-cycle dynamics under climate warming.