A Bicentennial Reconstruction of Tropical Cyclone Rainfall Variability Derived from Longleaf Pine (*Pinus palustris* Mill.)

(Published in *Climatic Change* 2016, 135:311-323)

Paul Knapp, UNC-Greensboro, Justin Maxwell, Indiana University, Peter Soulé, Appalachian State University

- Records of tropical cyclone precipitation (TCP) in the USA are insufficiently long to fully understand the natural range of TCP variability.

- We used longleaf pine (*Pinus palustris* Mill.) latewood chronologies from two study sites in North Carolina and a combined chronology as a proxy for TCP during AD 1771–2014 as the latewood growth period of June 1–October 15 coincides with 93% of annual TCP.

- We correlated latewood radial growth with TCP during 1953–2014 based on days when tropical cyclones tracked within a 223 km rain field: \( r = 0.71, p < 0.01 \).

- We created three radial-growth groups (low, near-average, high) and found that corresponding TCP values were significantly different \( (p < 0.05) \) between groups. Low radial-growth values were a strong marker (91% occurrence) of below-average TCP years, with high radial-growth years (73% occurrence) also being good indicators of above-average TCP years.

- The high fidelity between longleaf pine latewood growth and TCP coupled with the geographic distribution of the species throughout the southeastern USA where tropical cyclones are common suggests the utility of this species to help better understand the temporal variability of precipitation delivered via tropical cyclones.

- We postulate the high fidelity between latewood growth and tropical cyclone precipitation is a result of oscillating water tables, with tropical cyclones creating a basin-wide recharge of the water table to the height of the longleaf pine taproots (Figure 3).

- Five significant \( (p < 0.05) \) latewood growth regime shifts were identified (Figure 7), with the most prominent regime of 1836–1877 corresponding to a distinct period of reduced TCP. This period of reduced latewood growth was present in all cores, suggesting a pronounced and severe period of low TCP (Figure 8).

- The 1815 Tambora eruption is coincident with the onset of a multidecadal period of below-average TCP (Figure 9).

---

Project partially funded by a UNCG Faculty First grant.