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Heterogenous Patterns in Leaf Phenology Across a Climate Gradient in Maritime Canada Observed through Phenocams

Lynsay Spafford[1] and Andrew H. MacDougall[2]
[1]Memorial University of Newfoundland, Faculty of Sciences, Environmental Sciences, Antigonish, Canada (lspaffor@stfx.ca)
[2]Saint Francis Xavier University, Faculty of Science, Climate and Environment, Antigonish, Canada (amacdoug@stfx.ca)

Leaf phenology, the timing of leaf life cycle events, is a vital indicator of terrestrial biosphere function. The influence of global change upon leafing phenology in mid to high latitude regions is uncertain due to a complex interaction of drivers and lack of temporally and spatially resolved baseline data. Leaf phenology has been observed manually for millennia, and through satellite platforms for decades. A novel technique of monitoring leaf phenology known as near remote sensing employing time-lapse photography at the canopy level (or phenocams) allows for objective observations with high temporal and spatial resolution. We deployed 13 solar-powered time-lapse camera stations across a climate gradient in Nova Scotia, Canada to observe leaf phenology of locally abundant species including more than 300 individuals over the 2019 and 2020 growing seasons. To examine the influence of thermal, photoperiodic, and genetic drivers, our remote phenology monitoring stations were situated in comparative edaphic and topographic contexts and complemented with relative humidity and ambient temperature sensors. We observed variability in the timing of leaf budburst, peak of season greenness, redness, senescence, and abscission between and within species, despite similar degrees of environmental forcing. Moving forward, we will apply our insights to develop species specific process based models of leaf phenology, and test the wider application of our techniques to observational records from other regions. This work demonstrates the complexity of environmental influence upon leaf phenology, as well as the utility of phenocams in monitoring leafing phenology in remote regions of Maritime Canada.