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Shrub sensitivity to recent warming across Arctic Alaska from dendrochronological and remote sensing records

Laia Andreu-Hayles (1), Benjamin V. Gaglioti (1), Rosanne D'Arrigo (1), Kevin J. Anchukaitis (2), and Scott Goetz (3)

(1) Columbia University, Lamont-Doherty Earth Observatory, United States, (2) University of Arizona, USA, (3) Northern Arizona University, USA

Shrub expansion into Arctic and alpine tundra ecosystems has been documented during the last several decades based on repeat aerial photography, remote sensing, and ground-truthed estimates of vegetation cover. Today, summer temperatures limit the northern limit of Arctic shrubs, and warmer summers have been shown to have higher NDVI in shrub tundra zones. Although global warming has been considered the main driver of shrub expansion, soil types, shrub species and non-linear responses can moderate how sensitive shrub growth is to climate warming. Here, we assess the sensitivity of shrub growth to inter-annual climate variability using a newly generated network of 18 shrub ring-width chronologies in the tundra regions of the North Slope of Alaska. We then test whether the dendroclimatic patterns we observe at individual sites are representative of the broader region using remotely sensed productivity data (NDVI). The common period of both satellite and shrub ring data from all sites was 1982 to 2010. Instrumental daily data from Toolik Lake and interpolated products was compared to detrended growth rates of Salix spp. (willow) and Alnus sp. (alder), located on and to the west of the Dalton Highway (~68-70ºN 148ºW). Whereas summer temperatures were found to enhance shrub growth, warm temperatures outside the core of the growing season have the inverse effect in some chronologies. All tundra shrub chronologies shared a common strong positive response to summer temperatures despite growing in heterogeneous site conditions and belonging to different species. In this work we will discuss shrub climate sensitive across Alaska and how NDVI data compared to the shrub ring-width network.