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SPATIAL AND TEMPORAL PATTERNS ON TREE-RING DELTA-13C AND TREE GROWTHOVER THE PAST 100 YEARS IN CIRCUM-ARCTIC ECOSYSTEMS

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Arctic and boreal ecosystems are exposed to rapid and strong increases in temperature and related environmental changes under Arctic amplification. Early dendrochronological studies in the region focused on the positive growth of trees to warmth (D`Arrigo and Jacoby, 1993). However, A number of more recent studies have demonstrated a reduced sensitivity of tree growth to rising temperatures (now referred to as " divergence problem ") at least since the 1960s (e.g.,Wilson et al., 2007). Although several studies (e.g., Barber et al., 2000) suggested that temperature-induced drought may limit tree growth under the limited availability of soil moisturestre, the underlying process for the phenomenon is not well understood.

Here, we report an analysis of tree-ring width and delta-13C chronologies (A.D. 1901-2012) over the circum-Arctic ecosystems to investigate carbon-water relationship in trees. We collected tree-ring samples at six forests, along temperature and precipiation gradients; Estonia(59N, 27E), Yakutsk(62N, 129E), Ust'Maya(60N, 133E), Chokurdakh(70N, 148E), Inuvik(68N, 133W) and Fort Smith(60N, 112W). Intrinsic water-use efficiency (iWUE), which is an indicator of internal regulation of carbon uptake and water loss in plants, was derived from tree-ring delta-13C chronology.

Our tree-ring chronologies show that changes in iWUE were consistently positive, but shifts in growth varied widely among sites (1961-1980 vs 1991-2010). In this presentation, spatial amd temporal patterns of these tree-ring parameters, and relationship between the patterns and hydro-meteorological data over the past 100 year in the Arctic and boreal ecosystems will be discussed.