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Understanding ecohydrological pathways in an Arctic Finland watershed: Continuous *in-situ* stream water, vapor, and precipitation isotope (δ^{18}O, δ^{2}H) measurements

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Understanding the changing Arctic water cycle has new urgency as sea ice, moisture sources, and precipitation patterns are rapidly shifting due to climate change. In July 2018, we installed a Picarro Continuous Water Sampler and isotopic analyzer to a second-order stream in Pallas-Yllästunturi National Park, Finland. This new integrated system enables us to continuously measure the stable isotope geochemistry (δ^{18}O and δ^{2}H) of stream water *in-situ* with exceptionally high-frequency (10/min) allowing us to reveal patterns and processes previously out of reach with standard campaign sampling. Coupling these data with standard measurements of stream water discharge, temperature, DOC and pH, as well as event-based precipitation and continuous real-time water vapor isotope measurements places watershed and regional isotope hydrology into a new realm of understanding. Initial results indicate that during the prolonged mid-summer 2018 drought, mean stream water δ^{18}O and δ^{2}H values were -14 $\pm$ 1 ‰ and -99 $\pm$ 2 ‰ respectively. These values reflect the fundamental recharge of the basin being mostly driven by snow melt water (typical snow δ^{18}O $\sim$ -17 ‰). Our baseline drought measurements allow us to partition and quantify hydrologic threshold for enrichment of stream water isotopes as precipitation was detected in the system later in fall 2018, and further for depletion as isotope values decreased when moving towards winter. Continuous high-frequency measurements of stream isotope geochemistry will provide insight into how water is mobilized in the catchment on different seasons and an assessment of how future changes in precipitation patterns and seasonality of flow regimes will affect Arctic watersheds. These data will further allow more accurate hydrograph separation and provide the basis to investigate changing watershed scale ecohydrological pathways through seasons, including in-stream biogeochemical and biological processes.