



Using isotopes to investigate hydrological flow pathways and sources in a remote Arctic catchment

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Stable water isotopes allow for the identification of flow paths and stream water sources. This ability is beneficial in improving the understanding in catchments with dynamic spatial and temporal sources. Arctic catchments are characterised with strong seasonality where the dominant flow paths change throughout the short summer season. Therefore, the identification of stream water sources through time and space is necessary in order to accurately quantify these dynamics. Stable isotope tracers are incredibly useful tools which integrate processes of time and space and therefore, particularly useful in identifying flow pathways and runoff sources at remote sites. This work presents stable isotope data collected from a small (1km²) catchment in Northwest Canada. The aims of this study are to 1) identify sources of stream water through time and space, 2) provide information which will be incorporated into hydrological and transit time models

Sampling of snowmelt, surface runoff, ice-wedge polygons, stream and soil water was undertaken throughout the 2013 summer. The results of this sampling reveal the dominant flow paths in the catchment and the strong influence of aspect in controlling these processes. After the spring freshet, late lying snow packs on north facing slopes and thawing permafrost on south facing slopes are the dominant sources of stream water. Progressively through the season the thawing permafrost and precipitation become the largest contributing sources. The depth of the thawing aspect layer and consequently the contribution to the stream is heavily dependent on aspect. The collection of precipitation, soil and stream isotope samples throughout the summer period provide valuable information for transit time estimates. The combination of spatial and temporal sampling of stable isotopes has revealed clear differences between the main stream sources in the studied catchment and reinforced the importance of slope aspect in these catchments.