The Emergence of a New Streamflow Regime in Northern Canada

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Changes in streamflow observed across the circumpolar north have been attributed to a variety of forcings. The Precambrian Shield landscape is common across Canada, Scandinavia and Russia and all have been experiencing changes to winter flows. A possible shift from a nival to a combined nival/pluvial regime has been discovered in the northwestern subarctic Canadian Shield. Since the mid-1990’s, late summer rains have commonly produced runoff events that peak in early winter and rival the spring freshet. Although this process manifests differently across scales, it is apparent that the change is impacting the nature of regional winter streamflow. An investigation of monthly climate trends in the northwestern subarctic Canadian Shield implies precipitation rates are increasing in September and decreasing in October. This is the time of year when the 0°C air temperature isotherm is being crossed. The result is that precipitation is falling in the form of rain, rather than being stored in the form of snow. The argument will be made that changes to the hydrological regime is due to subtle changes in the predominant synoptic climatology that have resulted in more late summer rain to the region. These results highlight how much a subtle but consistent change in event scale phenomenon can impact longer term hydrological regimes. Recognition of hydrological processes, and the short time scales and landscape context in which they operate, is important. There are implications for permafrost and hydrogeochemical fluxes with a change in runoff and streamflow regimes, and these are being investigated.