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SENSITIVITY OF HYDROLOGICAL VARIABLES IN THE ARCTIC WATERSHED, COPPERMINE RIVER, NWT, CANADA DUE TO HYPOTHETICAL CLIMATE CHANGE

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ABSTRACT
The hydrological sensitivities to long-term climate change of the Coppermine River watershed in the Arctic region of Canada were analyzed using a watershed runoff model. This model describes an interdependent tank - cascade model that uses a mass balance coupled with linear reservoir concepts. It is physically based and uses climatological considerations not possible for watersheds. Mean annual and seasonal runoff resulting from a range of hypothetical climate changes were compared and evaluated. Water balance modelling techniques, modified for assessing climate effects, were developed and tested for a watershed using climate change Scenarios from state of the art general circulation models and a series of hypothetical Scenarios. In general, changes in precipitation had a larger effect on changes in runoff than changes in temperature. Changes in precipitation had significant effects on runoff during all seasons. Changes in temperature primarily affected the temporal distribution of runoff throughout the year. The changes in temperature affected the timing of snowmelt and the ratio of rain to snow. The effects of temperature were particularly significant during the spring and summer seasons. On an annual basis, increases in temperature led only to slight decreases in runoff. The effects of an increase in mean annual temperature of 1oC on annual runoff could be offset by an increase in annual precipitation of 10%. The magnitude of natural climatic variability was large and might mask the effects of long-term climate changes. These results raise the possibility of major environmental and socioeconomic difficulties, and have significant implications for future water resource planning and management.

Reference: *Bobba, A.G., T.D. Prowse J.Y. Diiwu, and D. Milburn. 2005. Sensitivity of Hydrological Variables in the Arctic Watershed, Coppermine River, NWT, Canada due to Hypothetical Climate Change, Journal of Environmental Hydrology, Vol. 13, Paper 22.*

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