Climate Change Impacts on Watershed's Streamflow

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Abstract

The purpose of this poster is to present our findings on the impact that climatic factors have on the hydrologic behaviour (streamflow) of watersheds across Canada. In particular, we present the results of a linear regression analysis and conclude that for the vast majority of the watershed stations under consideration, changes in streamflow are most strongly associated with changes in total precipitation.

Introduction

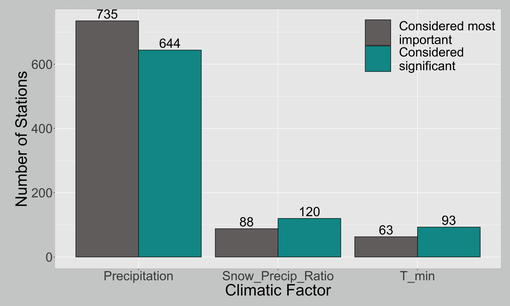
- The main question is whether temporal changes in temperature and snow-to-precipitation ratio have a greater impact in changes in a watershed's streamflow than changes in total precipitation.
- Measurements of streamflow level and the climatic factors of interest have been collected at various watershed stations across Canada between the years of 1909 and 2019.

Methodology

- A linear regression model was fit for each station to model **streamflow** as a function of **total precipitation**, **minimum temperature,** and **snow-to-precipitation ratio**.
- The relative importance of each climatic factor was measured as the proportion of the variability in streamflow explained by the model using the Type III Sum of Squares from an ANOVA.

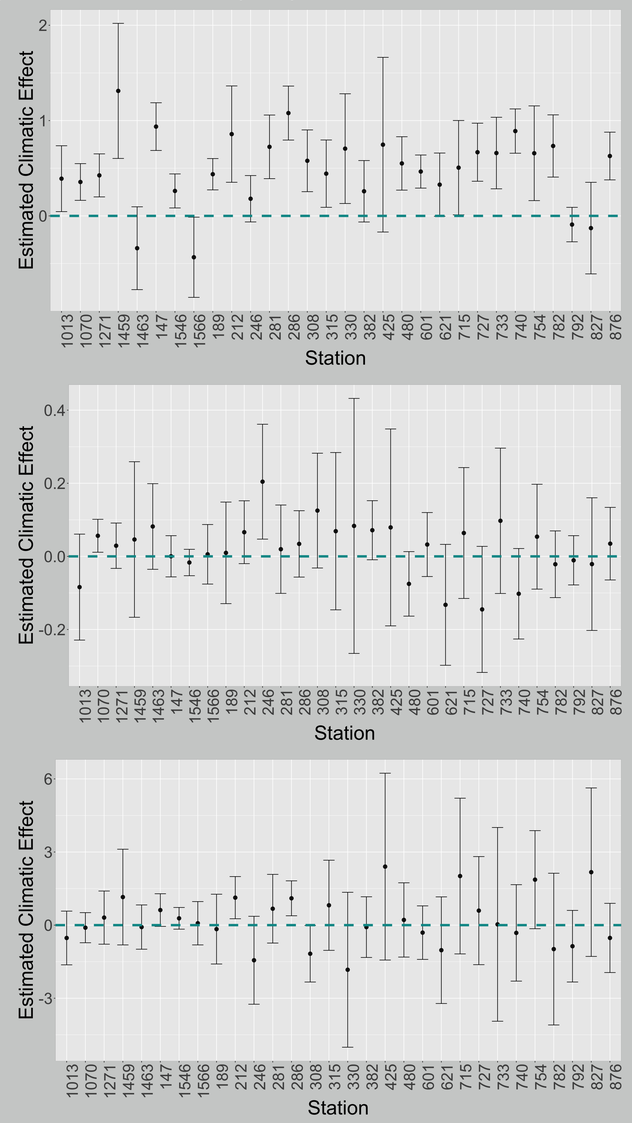
Results

- The bar chart below depicts the number of stations that consider each of the climatic factors as significant (at a 5% level) and the number of stations that consider each of the climatic factors as the most important factor.



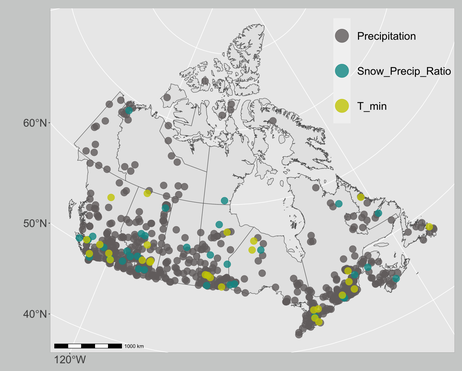
Results (Cont'd)

- The figures below illustrate the 95% confidence intervals of the true effects of **precipitation**, **minimum temperature**, and **snow-to-precipitation ratio** (in that order) for 30 randomly selected stations.
- The plots suggest that total precipitation is considered a significant climatic factor by the majority of the stations while minimum temperature and snow-to-precipitation ratio are not.



Results (Cont'd)

- The map below illustrates the climatic factor ranked as the most important at each station.



- Hydrometric station coordinates within Canada were randomly sampled and assigned to watershed stations for illustration purposes.

Conclusion

- From the analyses of the data with respect to the inferential nature of the question in hand, it can be stated with confidence that, in general, **total precipitation** is the most dominant climatic factor associated with changes in the hydrologic behaviour of watersheds across Canada.

Discussion and Next Steps

- Due to data privacy policies, the true location of the stations could not be incorporated in this study. The true coordinates should be used in further analysis (if of interest) in order to make inference related to spatial location of the stations.
- The impact of other potentially important attributes such as vegetation and other environmental conditions will be studied in future analysis.

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