# Impact of climate change on irrigation of Saskatchewan

## Background

Irrigation is an important part of Saskatchewan's agricultural sector and economy.

Future climate change

↓

Water availability change

↓

Should the irrigation projects be developed?

## Objective

To explore the feasibility of future irrigation projects in Saskatchewan affected by the climate change.

## Methodology

**Three statistical methods**

- The stepwise regression method is for quantifying the relationships between climatic variables and streamflow.
- Mann-Kendall test is for determining the statistical significance of trend in future streamflow.
- Theil-Sen's slope estimation is for calculating the magnitude of trend.

Government of Saskatchewan

WCRP World Climate Research Programme

Government of Canada / Gouvernement du Canada

NOAA

## 2. Station locations and corresponding watersheds

The 7 stations marked in red dots are shown in below figure.
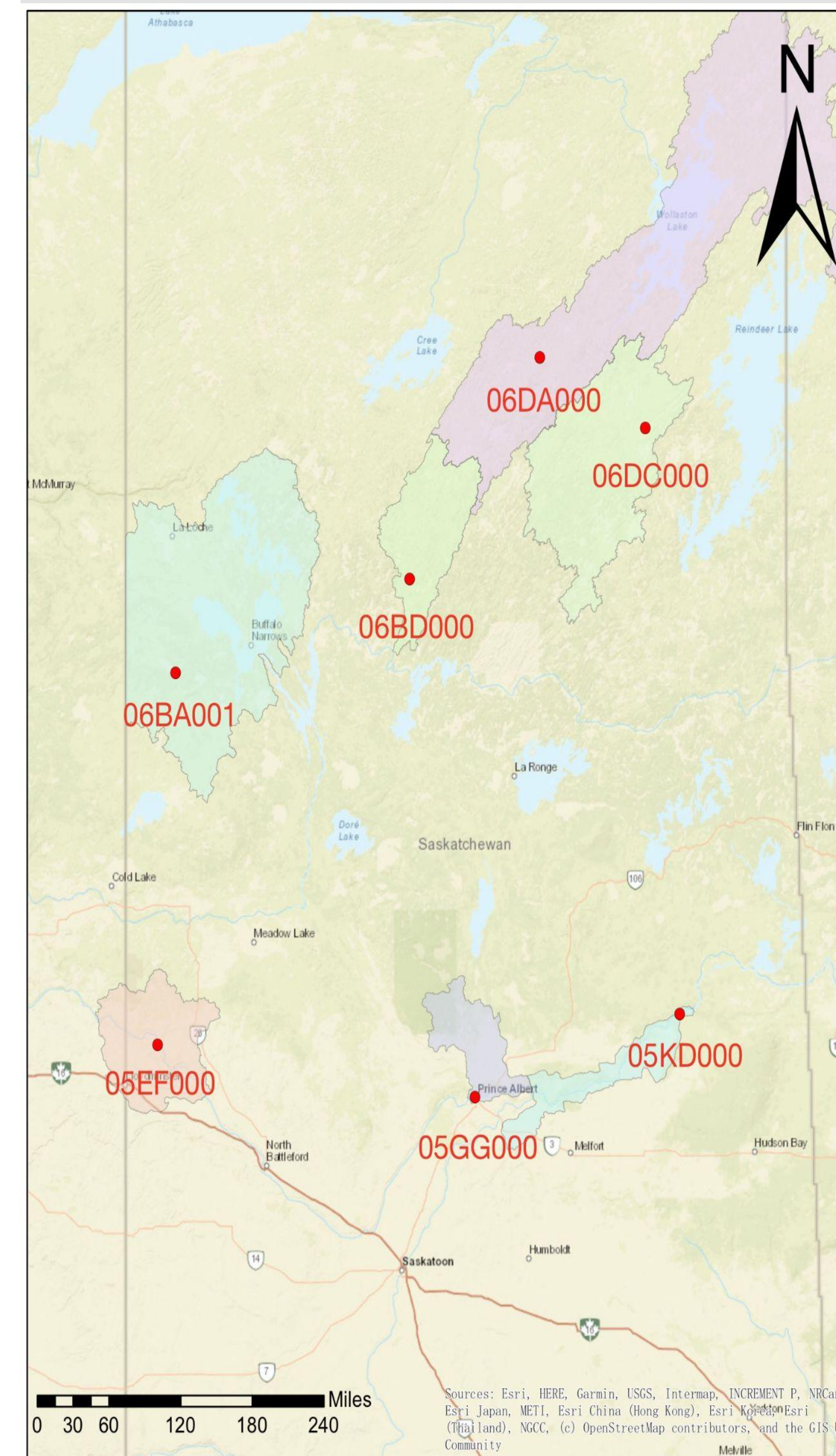


## 3. Mann-Kendall and Theil-Sen's slope test

One of the examples of Mann-Kendall curves shows a significant upward trend.



06BD000 Scenario 585
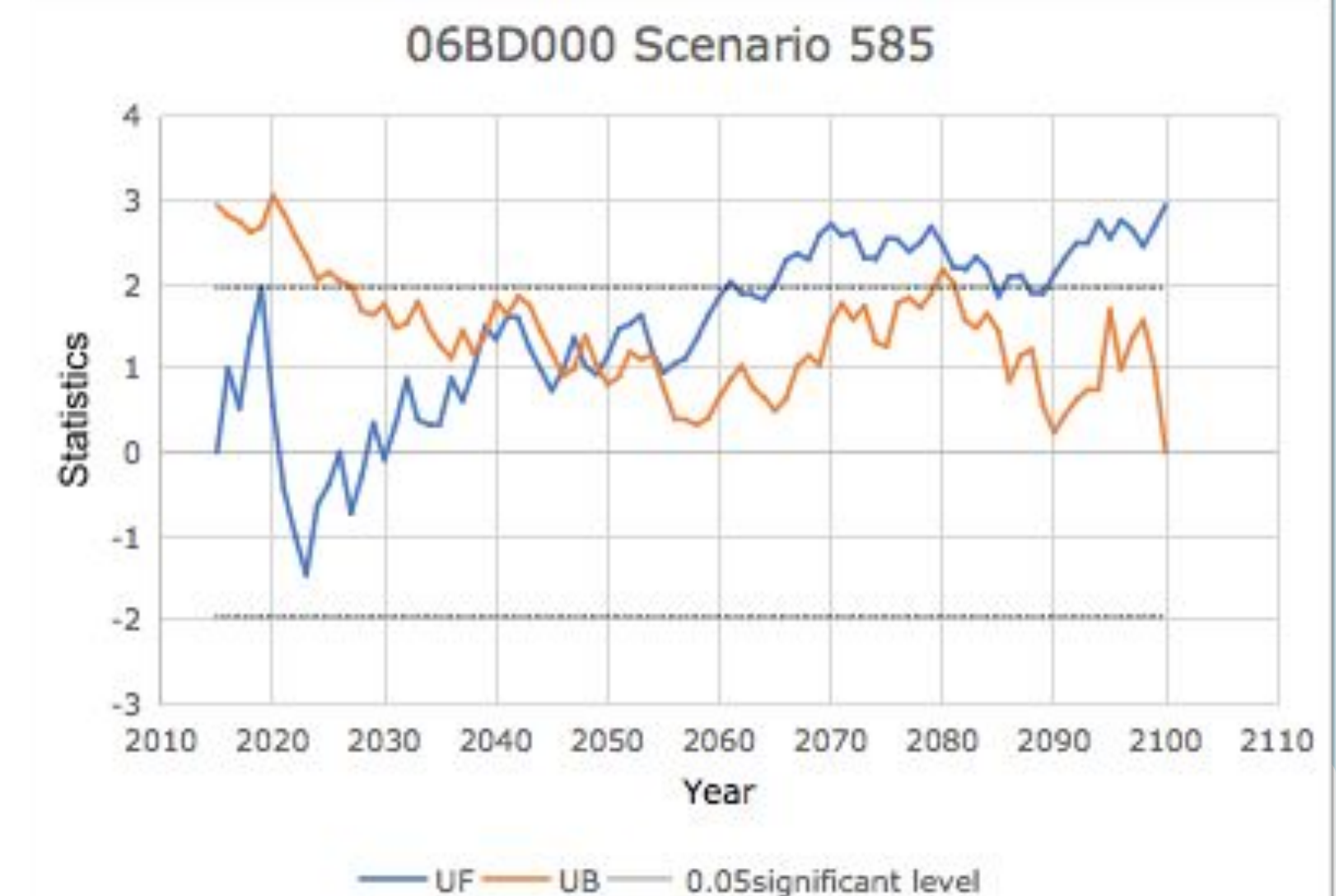
## Conclusion

- The Mann-Kendall results of 7 stations show that the $Z$ values of 5 stations are positive.
- The future streamflow of 2 / 3 stations is on the rising trend.
- There will be more water available in the future.

## Acknowledgements

- Thank Prof. Gordon. Huang for helping of the project design.
- Thank Chen Lu and Tangnyu Song for helping of the methodology developing.
- Thank the Government of Canada for the data supporting.

## Results
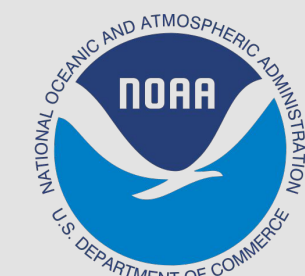## 1. Stepwise regression models

| Station ID | Model |
|---|---|
| 05EF000 | $Y = -596.6804 + 876.3273X_2 + 289.2008X_5 + 25.6336X_{13} - 15.5814X_{15} + 2.7058X_{17}$ |
| 05GG000 | $Y = -1584.69 + 1905.56X_2 + 305.735X_5 - 182.12X_6 + 2.6038X_{10} + 32.0258X_{13} + 5.65224X_{17}$ |
| 05KD000 | $Y = -52.504 + 2018.45X_2 + 952.5382X_5 + 3.2511X_{10} + 44.2309X_{21} + 49.9432X_{22}$ |
| 06BA001 | $Y = -2.219 + 86.1757X_3 + 37.1167X_4 + 4.5441X_{28}$ |
| 06BD000 | $Y = -60.9729 + 20.4442X_2 + 19.5144X_3 - 57.9649X_6 - 0.2919X_9 + 0.3347X_{17} - 1.7974X_{23} + 3.5099X_{28} + 2.0558X_{30}$ |
| 06DA000 | $Y = -112.0342 - 4.9035X_1 - 15.7051X_7 + 0.20716X_{10} + 0.2105X_{11} + 0.13307X_{18} + 1.1407X_{30}$ |
| 06DC000 | $Y = -475.2377 + 133.6698X_2 - 95.0991X_7 + 1.2532X_{12} + 4.2505X_{16} + 1.4382X_{19} + 11.3423X_{29}$ |

Note: X-Climatic variables, Y-Streamflow value

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