Canadian Agronomist

DIGGING INTO RESEARCH

Warming trends at the Breton Plots in Alberta

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Significant increases in annual, growing season, and seasonal minimum air temperatures occurred between 1901 and 2020. There was also significant increases in growing degree days, frost free days, total annual precipitation, growing season precipitation, and off-season precipitation.

This study examined climate trends at the Breton Plots, located at Breton, Alberta 100 km southwest of Edmonton for the time period of 1901 to 2020. Specifically, it looked at changes in long-term seasonal, and annual minimum and maximum air temperatures, and precipitation.

Historical climate data were compiled by the Alberta Climate Information Service from up to 8 weather stations located 5.7 and 197.6 km from Breton Plots. Growing season (May 1 – September 3) and off-season (October 1 to April 30) were compared.

Climate data calculated included monthly air temperature mean, monthly maximum air temperature mean, monthly minimum air temperature mean, total monthly precipitation, and total season precipitation. Growing degree days (GDD) and frost-free days (FFD) were also calculated. Seasonal climate trends for spring, summer, fall, and winter were also analyzed.

Warming trend but large fluctuations

Over the past 120 years, the annual average air temperature significantly increased at a rate of 0.2C every 10 years. During the same time period, the annual minimum air temperature average increased significantly at a rate of 0.3C every 10 years. However, the annual maximum air temperature average did not increase significantly.

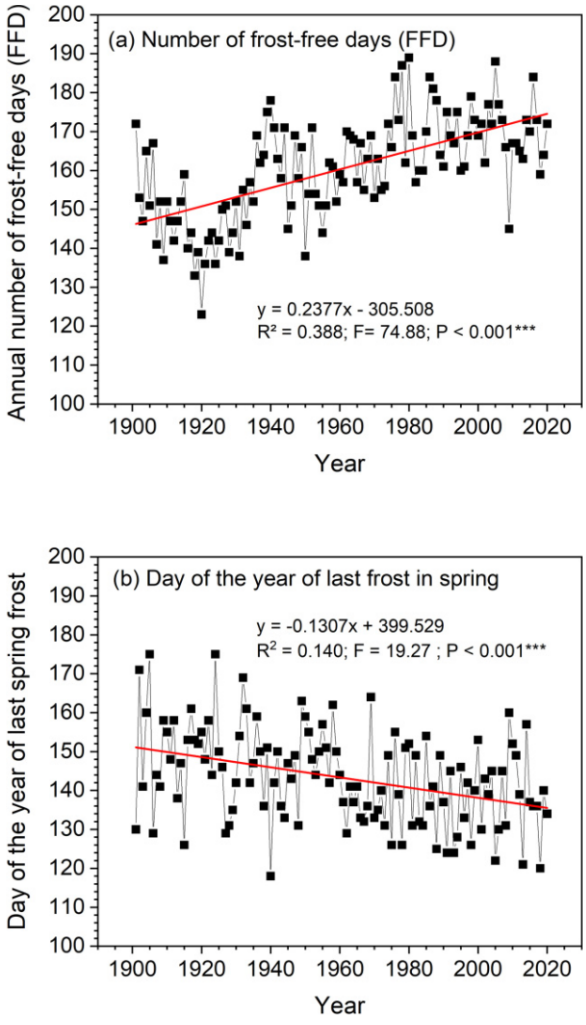
For the growing season period, the minimum air temperature increased 0.2C every 10 years by about 2.4C over the 120 years, but the average maximum growing season air temperature did not change. The off-season average minimum and maximum temperatures did not change over the 120 years.

Analysis of seasonal trends found that the average air temperature for the winter season increased 4.8C in the past 120 years. The average spring and summer air temperature increased 0.1C for every 10 years, but no changes were found for fall temperatures.

Overall, there was a significant linear increase in growing degree days at a rate of 13.8 GDD every 10 years for a total increase of 166 GDD. The number of frost free days also increased at a rate of approximately 3 days for every 13 years, for an increase in the number of FFD of 28 days. The number of FFD has grown from 146 to about 174 FFD. However, there have been large fluctuations in the number of FFD especially in the years prior to 1970.

The occurrence of the last spring frost was earlier by 1 day for every 8 years, or 15 days earlier over the last 120 years, moving the last spring frost from approximately the first of June to the middle of May.

Total number of frost-free days (i.e., minimum temperature greater than 0 ◦C) (*a*) and the day of the year of last spring frost (*b*).



Source: Mapfumo et al. 2022

Annual precipitation increased linearly at a rate of approximately 8 mm for every 10 years, or 96 mm over the 120 years. Growing season precipitation increased linearly by 6 mm for every 10 years, or a total of 72 mm. Off-season precipitation increased slightly at a rate of 2.5 mm per 10 years.

Overall, the study found increasing trends in temperature, precipitation, GDD and FFD. These changes could have positive or negative impacts on crop production. It may allow adaptation of warm season crops like corn and soybean, but may also bring periods of heat stress, and new pest and disease concerns.

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Emmanuel Mapfumo, David S. Chanasyk, and Dick Puurveen. 2023. Long-term annual climate trends around the Breton Plots area, Alberta: is there any evidence of local climate change?. *Canadian Journal of Plant Science*. **103**(3): 285-299. https://doi.org/10.1139/cjps-2022-0211