

ATMOS Research & Consulting

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Alberta's Climate Future

Alberta's climate is changing. Since 1950, winter temperatures have increased by +0.5 to +1°C per decade across the province, and the frequency of cold days, heating degree-days, and the proportion of winter precipitation falling as snow rather than rain have all decreased. Across much of the province, summer temperatures have increased by +0.1 to +0.3°C per decade, and some regions have also seen significant increases in the frequency of warm days over 25 and 30°C.

Even greater changes are projected to occur over the rest of this century. Many climate indicators for Alberta are projected to increase as global average temperature increases, though at a greater rate of change. **Per degree of global mean temperature increase**, projected changes for Alberta include:

- A 2°C increase in average winter and 1.5°C increase in average summer temperature.
- An increase of about 3°C in the temperature of the coldest day of the year and an increase of about 2°C in the temperature of the warmest day of the year.
- A two-week lengthening of the frost-free season, and between a two to four-week lengthening of the growing season, with greater changes for more southern locations.
- A 5-10% increase in Sept-Apr precipitation, with between 5-10% more falling as rain compared to snow.
- A 50% increase in the number of currently rare very wet days (more than 25mm in 24 hours) and a 20% increase the amount of precipitation on the wettest day of the year.
- Proportional decreases in heating degree-days and increases in growing degree-days and other cumulative heating indices.

Changes in the number of days per year experiencing extreme high and low temperatures are projected to increase exponentially, rather than linearly, as global mean temperature increases. For many locations, the number of days per year above 30°C, for example, could double per degree of global warming.

Little change is expected in average precipitation and in the number of dry days during the growing season (May-Aug). However, temperature during the growing season is projected to increase and soil moisture is projected to decrease, increasing the risk of dry conditions as global temperature increases.

Projected changes will profoundly impact Alberta's natural environment, and have the potential to affect the province's agriculture, infrastructure, and natural resources, as well as the health and welfare of its inhabitants. For both temperature and precipitation, the changes reported here are consistent with those projected to occur throughout north-central North America in response to human-induced climate change. They are appropriate for use in scientific analyses to quantify the impacts of a warming planet on both human and natural systems, and to inform long-term planning, education, and outreach.