

## Mapping changes of 43 climate indices at high spatial resolution for Alberta, Canada, for the period 1950 to 2010

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Hydroclimatic extremes can only be analyzed when data are available at a daily time scale or less. It is a computational challenge to organize and transform the vast amount of climatic data into relevant information for climate change impact studies and mapping the spatial distribution of changing weather extremes. With the recent advent of a Canada-wide climate time series, spanning the period 1950-2010 at a spatial resolution of 10km by 10km, a complete, long-term, and spatially consistent climate dataset became available (Tmin, Tmax, P), which served as a keystone in the calculation of a wide range of climate indices. To cover the entire Province of Alberta, 6833 time series were analysed to detect trends for 43 climate indices using the non-parametric Mann-Kendall and Sen Slope tests. Many climate indices exhibit trends with confidence levels exceeding 95%. Results provide a compelling picture of overall warming and changes of weather extremes. Generally, and with few exceptions, the number of very cold days, when the minimum temperature falls below -20°C, has about halved across Alberta since the 1950s, and the number of heatwaves has roughly doubled. With the exception of regions with high elevations, snowfall is being replaced by rainfall. The growing season has lengthened by between two and five weeks per year. Energy requirements for heating have decreased by about 10%, but the energy requirements for cooling are increasing in the extreme south-east of the Province. Historical temperature averages are no longer a true indicator for the future, and society must adapt to the new conditions. All indices are available for visualization and download at [albertaclimaterecords.com](http://albertaclimaterecords.com).