Changes in extreme temperature and precipitation events in the Arctic

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Motivation

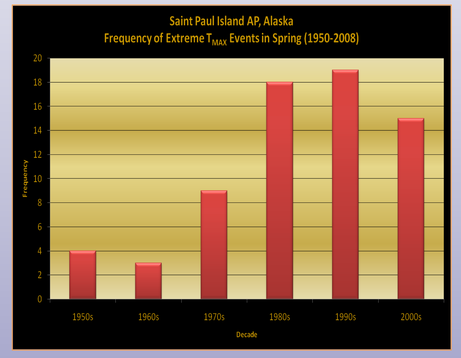
- Changes in climatic means have been larger in the Arctic than elsewhere over the past 50-60 years.
- Changes in extremes have greater impacts than changes in the means.
- Trends in extreme events have not been examined comprehensively in the Arctic.

Data Sources

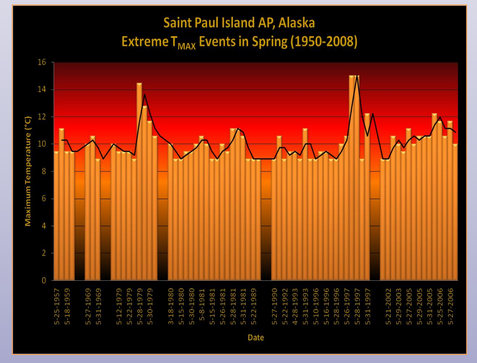
- Daily data were obtained from the MRCC for 27 surface observing stations for 1950 to 2008
- Results shown here are based on analysis of 8 preliminary stations
- Extreme events are defined as the highest (or lowest) 1% of temperature/precipitation

Station Location

Extreme Maximum Temperature Events

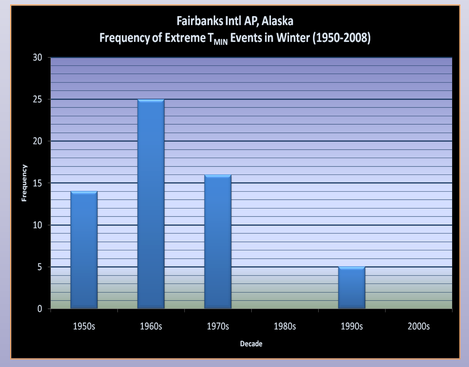


Most stations show upward trends in frequency of extreme T_{max} events

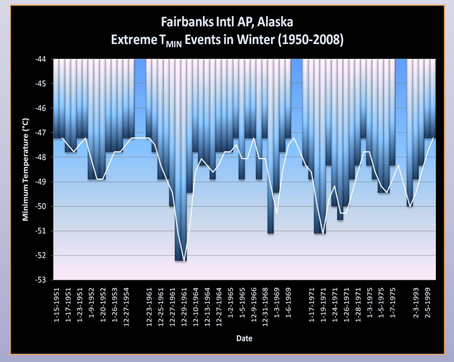


Extreme T_{max} events show increases in intensity as well as frequency

Extreme Minimum Temperature Events

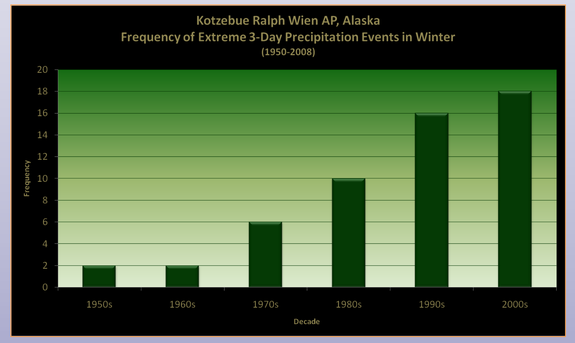


Most stations show strong decreases in frequency of extreme T_{min} events

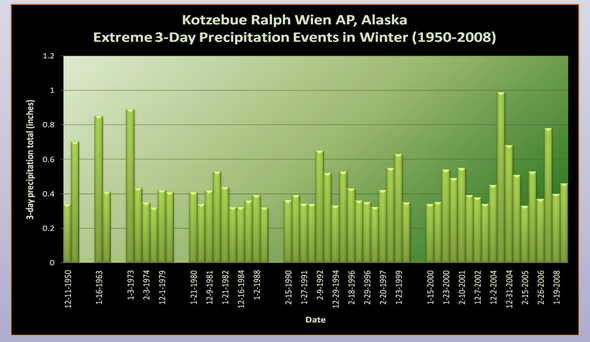


Extreme T_{min} events show decreasing trends in intensity, especially in the latter half of the POR

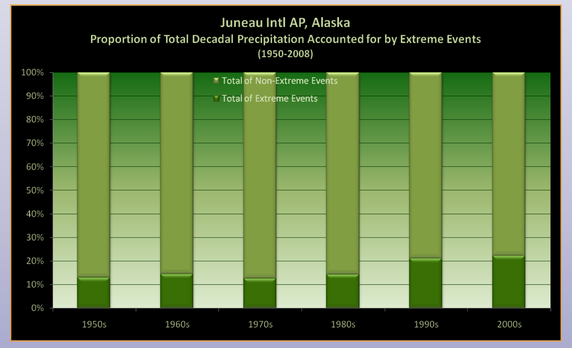
Extreme 3-Day Precipitation Events



Many stations show seasonal increases in frequency of extreme 3-day precipitation events, especially in the last half of the POR



Along with increases in frequency, some stations display upward trends in intensity of 3-day precipitation totals



Some stations show increases in the proportion of total decadal rainfall accounted for by extreme 3-day events, while others show little or no trend

Percent of stations showing greater extremes relative to preceding decade

	50s - 60s	60s - 70s	70s - 80s	80s - 90s	90s - 00s
T_{max}	50%	87.5%	37.5%	87.5%	62.5%
T_{min}	62.5%	50%	12.5%	50%	0%
Precip	37.5%	12.5%	87.5%	75%	37.5%

Conclusions

- Frequency and intensity of extreme *Tmax* events are *increasing* at many stations
- Frequency and intensity of extreme *Tmin* events are *decreasing* at many stations seasonally
- Extreme 3-day precipitation events are increasingly frequent at some stations, but trends vary seasonally
- Extreme 3-day precipitation events are accounting for an increasing proportion of the total annual rainfall, indicating that increases in extreme precipitation events are separated by increasingly long dry periods

Abstract

- Decadal mean temperatures show a warming over the past 60 years at individual stations in Alaska and the frequency of extremes (defined as the upper and lower percentiles) show corresponding decadal variations for some, but not all stations. The ratio of highest-percentile to lowest-percentile temperature occurrences has increased in the past decade, especially in the colder half of the year. Occurrences of precipitation extremes show more varied trends over the past 60 years, although there are indications that heavy precipitation events track the decadal mean precipitation amounts. We will present the spatial and seasonal distributions of the variations of extremes of temperature and precipitation in the context of changing climatic means in Alaska.