

Rising Temperature and Precipitation Trends on Mount Mansfield Summit

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Abstract:

A simple Mann-Kendall trend test was applied to the Mount Mansfield Summit weather data. The data set includes the daily maximum and minimum temperatures, precipitation, new snow fall, and total snow depth. The mean annual maximum and minimum temperature, precipitation, and snow depth measurements were calculated for each year, and the results were analyzed by a simple Mann-Kendall trend test. Results suggest that over a 50+ year period the minimum daily temperature, precipitation, and snow depth have risen, while the maximum daily temperature has remained steady.

Materials and Methods:

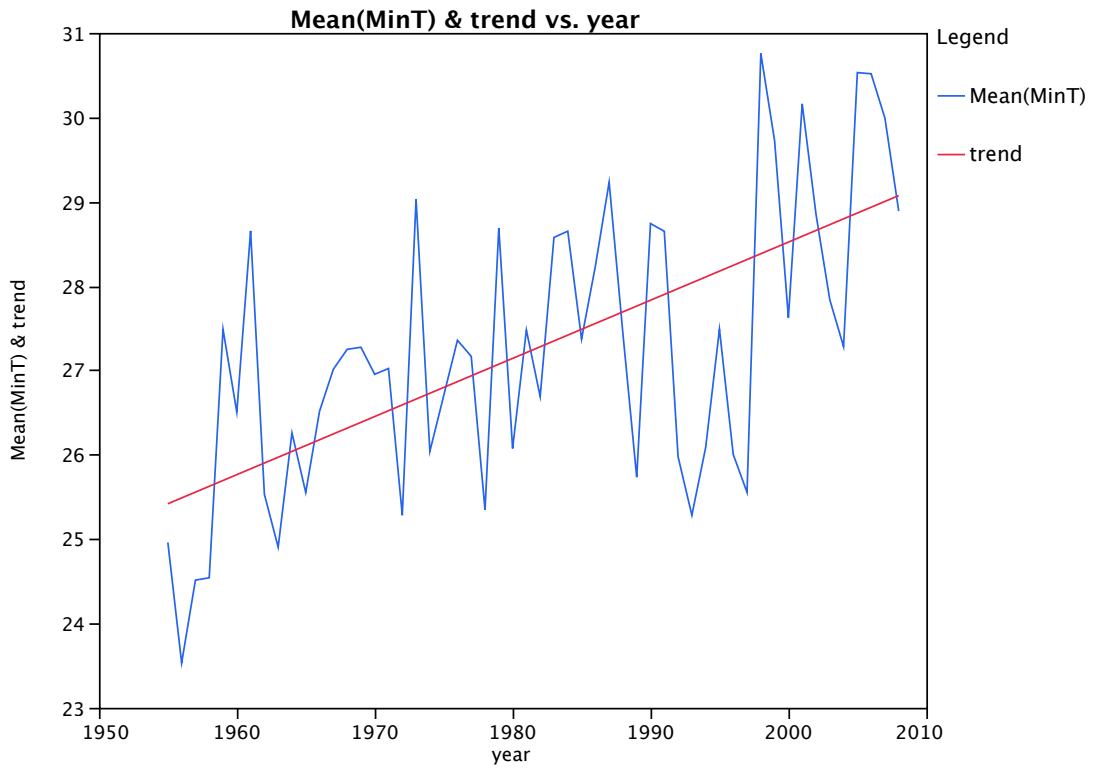
Each day around 5 PM during shift change, WCAX engineers record data at the Summit Snow Stake and related weather instruments at the summit of Mount Mansfield and radio it to the NWS in Burlington, who then release it in their "DAILY HYDROMETEOROLOGICAL DATA" report at <http://www.srh.noaa.gov/data/BTV/HYDBTV> . Once each day a script is launched on a UVM server which looks for the report, parses the data, and inserts it into a mySQL database housed on an university server. The database was pre-populated with historic data obtained from the NOAA National Data Center. The result is data set spanning over 50 years of measurements.

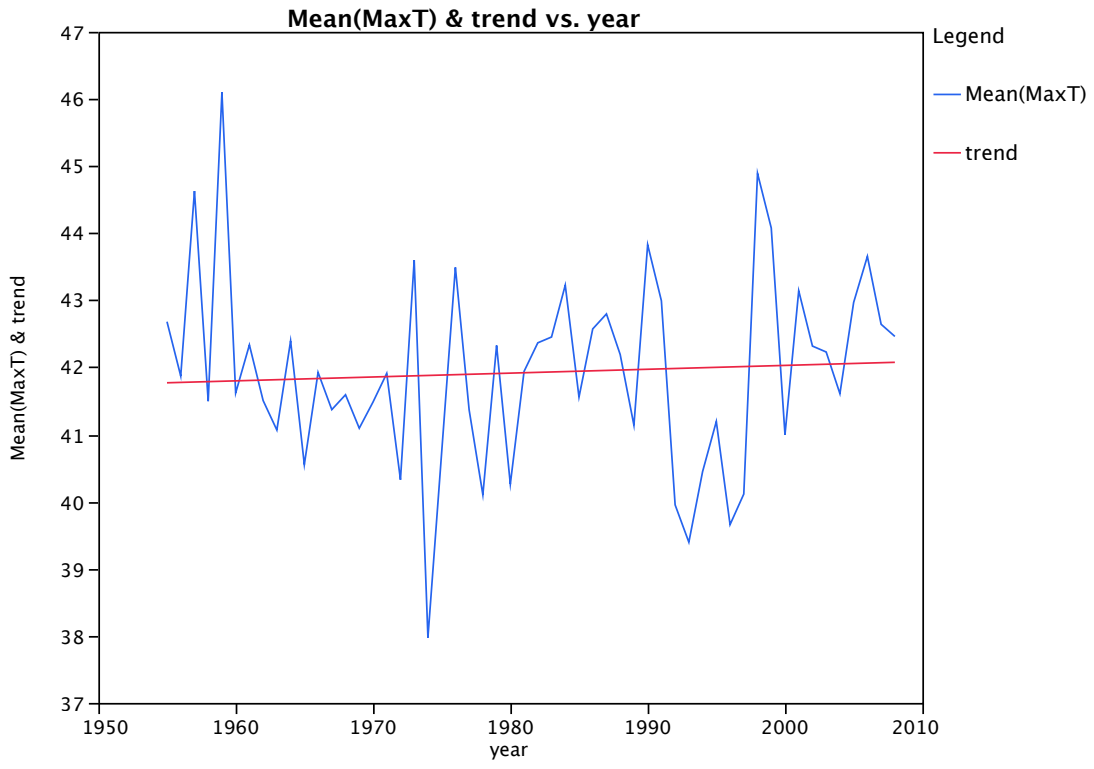
Four annual summary statistics were chosen for analysis: mean daily minimum temperature; mean daily maximum temperature, mean daily precipitation, and mean snow depth. Trend significance was determined using the non-parametric Mann-Kendall test (Helsel et al, 2005 "Computer Program for the Kendall Family of Trend Tests", USGS Scientific Investigations Report 2005-5275 <http://pubs.usgs.gov/sir/2005/5275/pdf/sir2005-5275.pdf>).

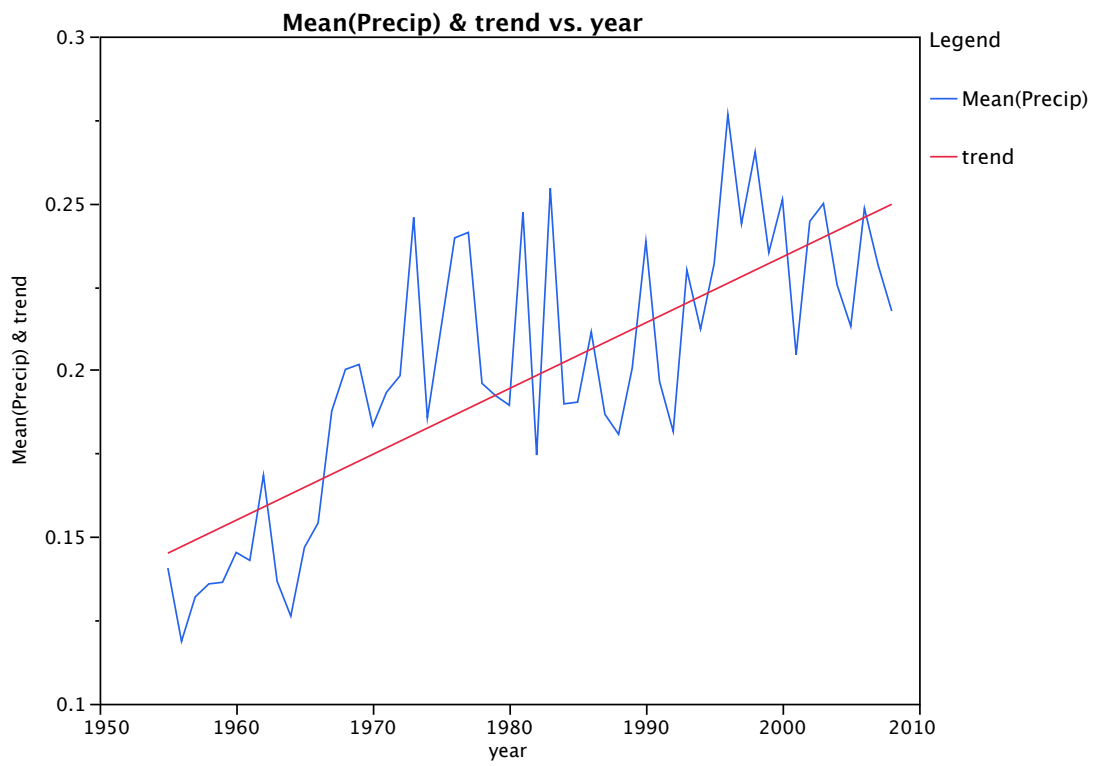
Results:

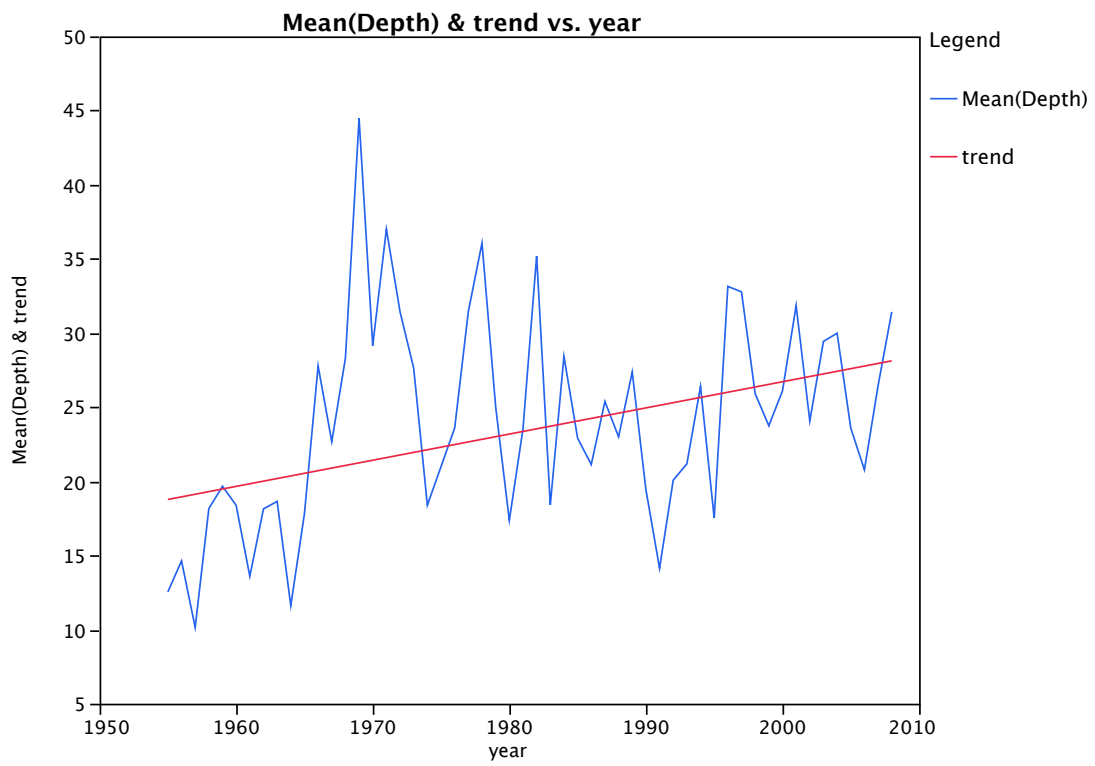
<p>Data set: Mean(MinT)</p> <p>The tau correlation coefficient is 0.433 S = 597. z = 4.572 Increasing Trend p < 0.0001 Significantly different from 0</p> <p>The relation may be described by the equation:</p> <p>MinT = -109.32 + 0.6892E-01 * Year</p>	<p>Data set: Mean(MaxT)</p> <p>The tau correlation coefficient is 0.051 S = 70. z = 0.529 No Trend p = 0.5966 Not significantly different from 0</p> <p>The relation may be described by the equation:</p> <p>MaxT = 30.517 + 0.5756E-02 * Year</p>
<p>Data set: Mean(Precip)</p> <p>The tau correlation coefficient is 0.553 S = 762. z = 5.837 Increasing Trend p < 0.0001 Significantly different from 0</p> <p>The relation may be described by the equation:</p> <p>Precip = -3.7121 + 0.1973E-02 * Year</p>	<p>Data set: Mean(SnowDepth)</p> <p>The tau correlation coefficient is 0.266 S = 366. z = 2.800 Increasing Trend p = 0.0051 Significantly different from 0</p> <p>The relation may be described by the equation:</p> <p>Depth = -326.09 + 0.1764 * Year</p>

For all measures, except MaxT, a significant increasing trend is detected.









Conclusions:

The results present strong evidence that while daytime temperatures on Mount Mansfield have remained consistent over the last half century, night time temperatures, precipitation, and summit snow depth are all on the rise. However, snow depth is not increasing as quickly as precipitation. This may suggest that the rising temperatures will spell more rain rather than snow events in coming years.