**A Tabulated Ratio of Record Highs to Record Lows:**
A Useful Marker for On-going Climate warming in the United States

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**Introduction**

During the late 1990’s those of us looking at temperature trends at The Weather Channel noticed that more often than not more record highs were occurring than record lows. We began keeping track of the record highs vs. record low statistics in a tabulated file starting 1/1/2000. Starting in November 2006 NCDC began an automated site, which keeps track of all record temperature and precipitation events for all 50 states. After we combined our records with the NCDC records a pattern of a ratio of two to one of record highs to record lows emerged for this decade. Ties of record highs and record lows were incorporated into the raw counts. All ASOS and COOP stations are included in the counts in figure 1.

**Figure 1:**

<table>
<thead>
<tr>
<th>Year</th>
<th>Highs</th>
<th>Lows</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>40055</td>
<td>18871</td>
</tr>
<tr>
<td>2001</td>
<td>28852</td>
<td>14234</td>
</tr>
<tr>
<td>2002</td>
<td>33693</td>
<td>22500</td>
</tr>
<tr>
<td>2003</td>
<td>35704</td>
<td>11985</td>
</tr>
<tr>
<td>2004</td>
<td>20698</td>
<td>17080</td>
</tr>
<tr>
<td>2005</td>
<td>34049</td>
<td>12708</td>
</tr>
<tr>
<td>2006</td>
<td>37465</td>
<td>14762</td>
</tr>
<tr>
<td>2007</td>
<td>36376</td>
<td>13656</td>
</tr>
<tr>
<td>2008</td>
<td>12858</td>
<td>9175</td>
</tr>
</tbody>
</table>

The record statistics are emerging as a bridge between long term climatology statistics and short term average temperature statistics. As of this report, statistics have been compiled by NCDC well back into the 1950’s. Figure 2 shows the ratio of highs to lows from January 1960 through December 2009 by decade.

**Figure 2:**

**Methodology and Discussion of Results**

One can compare the ratio of records to NCDC averages as shown in figures 3 and 4.

**Figure 3:**

**August 2004 Statewide Ranks**
National Climatic Data Center-NCDC/NOAA

**Example of how a Cold Month map (August 200)**

1. Cold
2. Normal
3. Warm
4. Hot
5. Extreme

724 Record Highs 918 Record Lows (including Ties)
It can also be shown that there is a relationship between the record data that was affected by the eruption of Mt. Pinatubo during the early and mid 1990’s shown in figure 5.

There is a good correlation between the record data and NASA GISS data for the United States (figure 6).

The medium range statistics cancel out the noise of week to week variability by showing trends lasting over several years. This data set can prove to be a good statistical link between long term climate averages and short term, monthly temperature averages. As discussed in Meehl et al 2009, the trends in surface record data fit well with those of long term climate projections.

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References
NOAA Records Site: http://www.ncdc.noaa.gov/extremes/records.php

NASA U.S. Averages Trend Chart: http://data.giss.nasa.gov/gistemp/graphs/ Fig.D.lrg.gif