```
#Clear List, load libraries
rm(list = ls())
library(qcc)
library(forecast)
library(highcharter)
set.seed(5)
#Pull in temps data and view the head of the data
Week4 <- read.table("temps.txt", header=TRUE, stringsAsFactors = FALSE)
head(Week4)
 DAY X1996 X1997 X1998 X1999 X2000 X2001 X2002 X2003
11-Jul 98 86 91 84 89 84
                             90 73
2 2-Jul 97 90 88 82
                               81
                     91 87 90
3 3-Jul 97 93 91 87 93 87 87 87
4 4-Jul 90 91 91 88
                     95 84 89
                                86
5 5-Jul 89 84 91 90
                     96 86 93
                                80
6 6-Jul 93 84 89 91 96 87 93 84
X2004 X2005 X2006 X2007 X2008 X2009 X2010 X2011 X2012
1 82 91 93 95 85 95 87 92 105
2 81 89 93 85 87 90 84 94 93
3 86 86 93 82 91 89 83 95 99
4 88 86 91 86 90 91 85 92 98
5 90 89 90 88 88 80 88 90 100
6 90 82 81 87 82 87 89 90 98
X2013 X2014 X2015
1 82 90 85
2 85 93 87
3 76 87 79
4 77 84 85
5 83 86 84
6 83 87 84
```

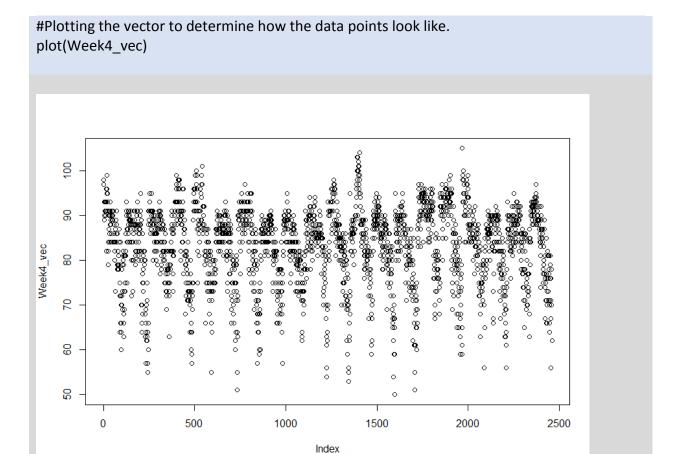
Display header of the data for me to check the first 5 days of July temperatures.

#Converting the table into a vector list.
Week4_vec <- as.vector(unlist(Week4[,2:21]))</pre>

#Display the output of the vector. Week4 vec

[1] 98 97 97 90 89 93 93 91 93 93 90 91 93 93 82 91 96 95 [19] 96 99

Checking the head of the new vector I created.



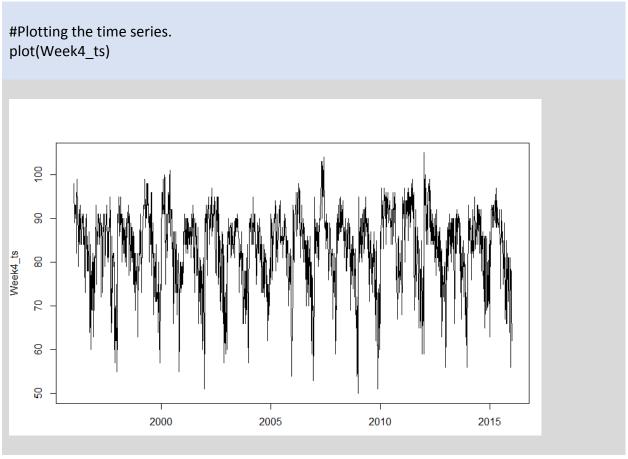
Plotted the vector to confirm that the data looks correctly and it does. It looks cyclical because the summer heats then cools.

```
#Converting the vector to a time series object for 123 days
Week4_ts <- ts(Week4_vec, start=1996, frequency=123)

#Display the output of the time-series.
Week4_ts

Time Series:
Start = c(1996, 1)
End = c(2015, 123)
Frequency = 123
...
...
...
[987] 86 88 90 90 89 87 88 89 90 89 91 91 84 84
[ reached getOption("max.print") -- omitted 1460 entries ]
```

Too much output to print out so output is shortened. I can use this information to check for the Time Series.



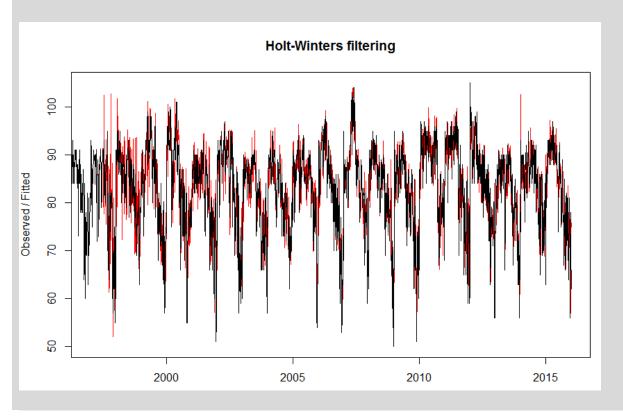
Plot looks correct. This plot is before smoothing.

```
#Computes Holt Winters filtering with a seasonal model
Week4 HW <- HoltWinters(Week4 ts, alpha=NULL, beta=NULL, gamma=NULL,
seasonal="multiplicative")
Week4 HW
Holt-Winters exponential smoothing with trend and multiplicative seasonal component.
Call:
HoltWinters(x = Week4_ts, alpha = NULL, beta = NULL, gamma = NULL, seasonal =
"multiplicative")
Smoothing parameters:
alpha: 0.615003
beta:0
gamma: 0.5495256
Coefficients:
      [,1]
a 73.679517064
b -0.004362918
s1 1.239022317
s2 1.234344062
s120 0.851036184
s121 0.820416491
s122 0.851581233
s123 0.874038407
```

Shortened list. Converted Time Series to a HoltsWinter filter.

#Outputting a snippet of the data tail(Week4_HW) summary(Week4_HW) plot(Week4_HW)

Length Class Mode fitted 9348 mts numeric 2460 ts numeric Χ alpha 1 -none- numeric beta 1 -none- numeric gamma 1 -none- numeric coefficients 125 -none-numeric seasonal 1 -none- character SSE 1 -none- numeric 6 -none-call call



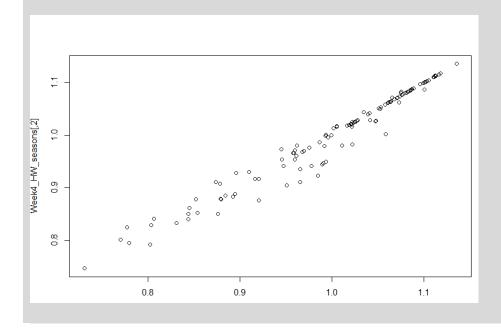
Added a smoothing model in red. The original data is in black.

#Converting the fitted data into a matrix and outputting the data Week4_HW_seasons <- matrix(Week4_HW\$fitted[,4], nrow=123) head(Week4_HW_seasons) plot(Week4_HW_seasons)

- [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12] [,13] [1,] 1.052653 1.049468 1.120607 1.103336 1.118390 1.108172 1.140906 1.140574 1.125438 1.122063 1.161415 1.198102 1.198910
- [2,] 1.100742 1.099653 1.108025 1.098323 1.110184 1.116213 1.126827 1.154074 1.142187 1.131889 1.144549 1.134661 1.153433
- [3,] 1.135413 1.135420 1.139096 1.142831 1.143201 1.138495 1.129678 1.156092 1.165657 1.147982 1.149459 1.135756 1.153310
- [4,] 1.110338 1.110492 1.117079 1.125774 1.134539 1.126117 1.130758 1.137722 1.150639 1.146992 1.142497 1.150162 1.151169
- [5,] 1.025231 1.025233 1.044684 1.067291 1.084725 1.097239 1.115055 1.103877 1.120818 1.133733 1.132167 1.142714 1.139244
- [6,] 1.025838 1.025722 1.028169 1.042340 1.053954 1.067494 1.080203 1.094312 1.102680 1.092178 1.075766 1.088547 1.082185

[,14] [,15] [,16] [,17] [,18] [,19]

- [1,] 1.243012 1.243781 1.238435 1.300204 1.290647 1.254521
- [2,] 1.165431 1.172935 1.190735 1.191956 1.219190 1.228826
- [3,] 1.155197 1.157286 1.169773 1.189915 1.172309 1.169045
- [4,] 1.157751 1.163844 1.159343 1.166605 1.167993 1.158956
- [5,] 1.112909 1.132435 1.132045 1.145230 1.168161 1.170449
- [6,] 1.103092 1.115071 1.118575 1.121598 1.134962 1.145475

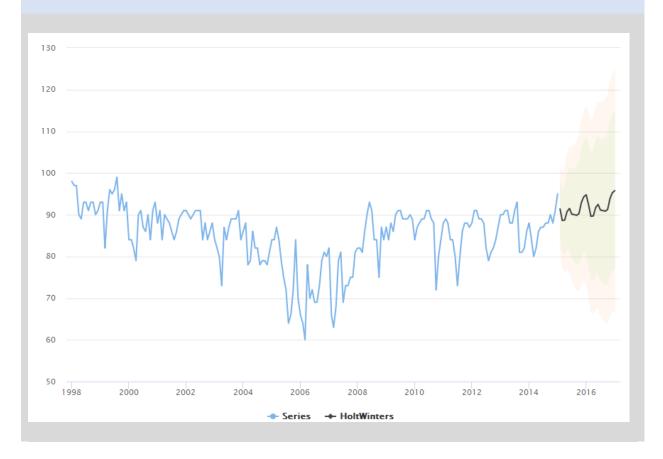


Checking if the seasonal data is relatively linear, and it does look linear. This makes sense because the longer time passes, the higher away the standard deviation is from the average value.

```
#Adding a smoothing function and performing a cusum
Week4 HW smooth <- matrix(Week4 HW$fitted[,1], nrow=123)
Week4 HW smooth
#Outputing the cusum of the smooth data
cusum(Week4 HW smooth)
List of 14
$ call
           : language cusum(data = Week4 HW smooth)
          : chr "cusum"
$ type
$ data.name
                : chr "Week4 HW smooth"
$ data
             : num [1:123, 1:19] 87.2 90.4 93 90.9 84 ...
..- attr(*, "dimnames")=List of 2
$ statistics : Named num [1:123] 84.7 85.4 87.4 87 85.2 ...
..- attr(*, "names")= chr [1:123] "1" "2" "3" "4" ...
$ sizes
            : int [1:123] 19 19 19 19 19 19 19 19 19 19 ...
$ center
            : num 83.4
$ std.dev
            : num 5.3
$ pos
          : num [1:123] 0.6 1.8 4.61 7.12 8.17 ...
         : num [1:123] 0 0 0 0 0 ...
$ neg
$ head.start
               : num 0
$ decision.interval: num 5
$ se.shift
             : num 1
$ violations :List of 2
- attr(*, "class")= chr "cusum.qcc"
                                       cusum Chart
                                   for Week4_HW_smooth
  Above target
100 2
Cumulative Sum
  Below target
00 -100
         1 5 9 14 20 26 32 38 44 50 56 62 68 74 80 86 92 98 105 113 121
                                         Group
            Number of groups = 123
                                              Decision interval (std. err.) = 5
```

The cusum looks right as it reaches a height around September and cools off.





I wanted to predict the temperature for the future two years (2016 – 2017) from 2015. As expected, there is an upwards trend which can be seen as a pattern on an analysis I performed on Excel and PowerBI. The increase in temperature is slight.

```
#Saving the fitted matrix onto an excel file for futher analysis wholefile <- data.frame(Week4_HW_seasons) write.csv(wholefile, file="Week4_HW.csv")
```

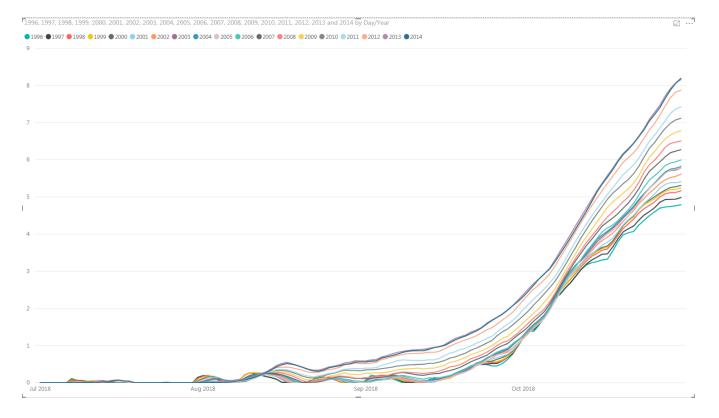
Writing the seasons data onto a csv file. I will show some output of the excel file.

| с г | 0.05 | | | | | | | | | | | | | | | | | | |
|------------------|----------------------|----------------------|----------------------|----------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---------------------|
| 5_t values | 1.071666 | | | 1.075091 | | | | | | | | 1.082471 | | | 1.089119 | | | | |
| d Day/Year | 1996 | 1997 | 1998 | | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 0.048384 2010 | 2011 | 2012 | 2013 | 2014 |
| 1-Jul 2-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3-Jul 4-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | (|
| 5-Jul 6-Jul | 0 | 0 | | 0 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | (|
| 8-Jul | 0.063247 | 0.063248 | 0.053628 | 0.077517 0.066424 | 0.066599 | 0.041362 | 0.035371 | 0 | | 0 | | 0 | | 0 | 0 | | 0 | 0 | |
| | | | | 0.060779 0.041927 | | | | 0.00456 | | 0.020947 | | 0.006686 | | 0 | 0.006422 | 0 | 0 | 0 | |
| 11-Jul 12-Jul | 0.008854 | 0.008779 | | 0.04833 0.043212 | | | | | | | 0 | 0.002052 | 0 | 0 | 0 | | | 0.017431 0.016462 | |
| 13-Jul 14-Jul | 0 | 0 | | 0.035506 | 0.045262 | | | 0.049762 | | 0.036524 | | | | | 0.020707 | | | 0.041621 | |
| 15-Jul 16-Jul | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0.000206 | | | | | 0.016872 | | | | |
| 17-Jul 18-Jul | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | | 0 | | | 0 | | | 0.044636 | |
| 19-Jul 20-Jul | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | | 0 | |
| 21-Jul 22-Jul | 0.001268 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | | 0 | 0 | |
| 23-Jul 24-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 25-Jul 26-Jul | 0 | 0 | 0 | 0 | 0 | | 0.007576 | | 0.009477 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 27-Jul 28-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 29-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | (|
| | | | | 0.073711 | | | 0.007161 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (|
| 2-Aug | 0.186749 | 0.185349 | 0.195256 | 0.134149 0.174373 | 0.158553 | 0.135897 | 0.093875 | 0.081818 | 0.058279 | 0.026594 | 0.014954 | | 0 | 0.003106 | 0.026156 | | 0 | 0 | (|
| 4-Aug | 0.071056 | 0.069333 | 0.103339 | 0.172913 0.131299 | 0.124203 | 0.120936 | 0.102122 | 0.114197 | 0.095916 | 0.045339 | 0.029867 | 0.011705 | 0.006131 | 0 | | 0.014891 | | 0.021558 | 0.005258 |
| 6-Aug | 0.02208 | 0.019122 | 0.034462 | 0.073954 0.050851 | 0.032063 | 0.036741 | 0.013482 | 0.04418 | 0.059437 | 0.024473 | 0.038402 | 0.017209 | 0.005813 | 0.009042 | 0.008926 | 0.008627 | 0.041376 | | 0.01487 |
| 8-Aug | 0.076907 | 0.072632 | 0.083368 | 0.044087 0.081269 | 0.045214 | 0.027545 | 0.025588 | 0.043107 | 0.067983 | 0.045199 | 0.045961 | 0.02308 | 0.036423 | 0.032791 | 0.037477 | 0.036092 | 0.065606 | 0.088739 | 0.057009 |
| 9-Aug 10-Aug | | | | 0.195364 0.265712 | | | | | | | | | | | 0.051638 0.084832 | | | 0.102886 0.126879 | |
| | | | | 0.268937 0.252825 | | | | | | | | | | | 0.124487 | | | | 0.156305 |
| 13-Aug | 0.170163 | 0.163351 | 0.218067 | 0.22503 0.209643 | 0.215815 | 0.222595 | 0.215395 | 0.23553 | 0.275696 | 0.219775 | 0.273177 | 0.251925 | 0.285291 | 0.281815 | 0.272905 0.319603 | 0.260066 | 0.291158 | | |
| 15-Aug | 0.098247 | 0.091675 | 0.169921 | 0.18916 0.125708 | 0.17089 | 0.178042 | 0.192579 | 0.209897 | 0.24596 | 0.182559 | 0.244164 | 0.235665 | 0.275579 | 0.295268 | 0.330095 | 0.35097 | 0.407776 | 0.462615 | 0.426433 |
| 17-Aug 18-Aug | | 0.010300 | 0.014976 | 0.049235 | 0.026752 | 0.027116 | 0.055637 | 0.099962 | 0.137411 | 0.089842 | 0.164834 | 0.170713 | 0.22557 | 0.266719 | 0.31516 0.277583 | 0.347929 | 0.421529 | 0.547532 | 0.516029 |
| 19-Aug | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.025539 | 0.063269 | 0.116362 | 0.165073 | 0.226416 | 0.261402 | 0.368124 | 0.459731 | 0.460607 |
| | 0.025563 | 0.025567 | 0.009099 | 0.00289 | 0.022578 | 0.007928 | 0 | 0 | 0 | | 0 | 0 | 0.023824 | 0.076284 | 0.172088 0.137164 | 0.179479 | 0.287746 | 0.369629 | 0.358665 |
| 23-Aug | 0.121064 | 0.121481 | 0.086506 | 0.036383 0.072667 | 0.092458 | 0.065361 | 0.04578 | 0.033804 | 0.024256 | 0.025596 | 0.027573 | 0.026235 | | 0.10777 | 0.154296 | | 0.284273 | | 0.30702 |
| 25-Aug | 0.140943 | 0.141471 | 0.111309 | 0.125425 0.137809 | 0.147553 | 0.115052 | 0.105892 | 0.097599 | 0.085066 | 0.092218 | 0.102589 | 0.112814 | 0.131168 | 0.17174 | | 0.252677 | 0.35705 | 0.424223 | 0.40111 |
| 26-Aug 27-Aug | | | | 0.100607 0.048318 | 0.086017 | 0.069662 | 0.103358 | 0.104945 | 0.088164 | 0.100476 | 0.114827 | 0.158184 | 0.181043 | 0.234398 | 0.299944 | 0.319759 | 0.414084 | 0.481334 | 0.455076 |
| 28-Aug 29-Aug | 0 | 0 | 0 | | 0.017353 0 | | | | | | | | | | 0.338625 0.331491 | | | | |
| 30-Aug 31-Aug | 0 | 0 | 0 | | 0 | 0 | 0 | 0.003108 | | | | | | | 0.328287 0.320363 | | | | |
| | | | | 0.016205 0.095634 | | | | 0.042212 | | | | | | | 0.345513 0.346802 | | | | |
| 3-Sep 4-Sep | | | | 0.156771 0.166993 | | | | | | | | | | | | | | | |
| 5-Sep 6-Sep | | 0.186414 | | 0.15719 0.134237 | | | | | | | | | | | 0.396772 0.417564 | | | | |
| | | | | 0.102927 0.058399 | | | | | | | | | | | | | | | 0.77011 |
| 9-Sep 10-Sep | 0 | 0 | 0.033951 | 0.063704 0.050673 | 0.111244 | 0.091687 | 0.0654 | 0.116122 | 0.134822 | 0.124589 | 0.172607 | 0.256608 | 0.28331 | 0.373468 | 0.477572 | 0.607403 | 0.780276 | 0.867212 | 0.846644 |
| 11-Sep 12-Sep | 0 | | 0.019179 | 0.028605 | | 0.032046 | 0 | 0.056125 | 0.068674 | 0.063846 | 0.11538 | 0.207739 | 0.261652 | 0.392909 | 0.492318 0.494916 | 0.60024 | 0.790119 | 0.891238 | 0.860546 |
| 13-Sep | 0.076474 | 0.048542 | 0.019054 | 0.010196 0.048631 | 0.004238 | 0 | | 0.046534 | 0.065651 | 0.035851 | 0.128584 | 0.22552 | 0.267171 | 0.386548 | 0.521421 | 0.615768 | 0.818786 | 0.927349 | 0.895652 |
| | 0.120692 | 0.097364 | 0.074727 | 0.054977 | 0.060018 | 0.061625 | 0.063124 | 0.083293 | 0.119488 | 0.06757 | 0.131948 | 0.250456 | 0.313273 | 0.430669 | 0.554814 | 0.652067 | 0.841586 | 0.971747 | 0.96897 |
| 17-Sep | 0.177184 | 0.141728 | 0.120618 | 0.125127 0.188958 | 0.157912 | 0.153197 | 0.154734 | 0.173957 | 0.190511 | 0.143497 | 0.191742 | 0.325566 | 0.42564 | 0.552634 | 0.661507 | 0.7916 | 0.982354 | 1.11193 | 1.074198 |
| 19-Sep | 0.316051 | 0.265477 | 0.261127 | 0.261922 | 0.263294 | 0.250916 | 0.275717 | 0.287528 | 0.300895 | 0.236434 | 0.297181 | 0.415926 | 0.487251 | 0.62536 | 0.748551 | 0.889879 | 1.103 | 1.238173 | 1.206638 |
| 21-Sep | 0.452399 | 0.396709 | 0.390795 | 0.40907 | 0.413944 | 0.37976 | 0.390184 | 0.402384 | 0.427474 | 0.352397 | 0.437788 | 0.562862 | 0.644331 | 0.760229 | 0.872767 | 0.985766 | 1.198572 | 1.365008 | 1.324535 |
| 23-Sep | 0.488808 | 0.500699 | 0.503236 | 0.501414 0.539455 0.555028 | 0.552779 | 0.516077 | 0.543488 | 0.572933 | 0.570762 | 0.503424 | 0.559137 | 0.676196 | 0.745221 | 0.856249 | 0.991392 | 1.115649 | 1.334573 | 1.483709 | 1.470236 |
| 25-Sep | 0.451334 | 0.516257 | 0.543042 | 0.555028 0.567876 0.569204 | 0.581081 | 0.640455 | 0.713173 | 0.736559 | 0.734026 | 0.662295 | 0.738991 | 0.834565 | 0.902374 | 0.997084 | 1.133266 | 1.245864 | 1.478522 | 1.685453 | 1.670178 |
| 27-Sep | 0.513511 | 0.585932 | 0.595762 | 0.619522 | 0.677316 | 0.712672 | 0.782122 | 0.820182 | 0.857586 | 0.7965 | 0.881863 | 0.996477 | 1.082649 | 1.193716 | 1.367367 | 1.476182 | 1.682022 | 1.852849 | 1.84073 |
| 29-Sep | 0.772988 | 0.78913 | 0.818073 | 0.7039 0.825014 | 0.856143 | 0.878072 | 0.933363 | 1.014331 | 1.023957 | 0.94739 | 1.051348 | 1.17116 | 1.228701 | 1.368677 | 1.558443 | 1.67956 | 1.900005 | 2.076482 | 2.075063 |
| 1-Oct | 1.237036 | 1.216189 | 1.203095 | 1.012368 1.20477 | 1.202048 | 1.197937 | 1.215723 | 1.277883 | 1.266433 | 1.184055 | 1.258457 | 1.390104 | 1.475676 | 1.609073 | 1.800374 | 1.972846 | 2.222438 | 2.375719 | 2.321013 |
| 2-Oct 3-Oct | 1.382871 1.382131 | 1.388105 1.427695 | 1.394723 1.478272 | 1.391211 1.474725 | 1.380502 1.476542 | 1.359157 1.463924 | 1.36824 1.482792 | 1.438344 1.571523 | 1.418669 1.559419 | 1.323622 1.465383 | 1.392281 1.530488 | 1.514958 1.662052 | 1.609832 1.742634 | 1.743998 1.875947 | 1.935668 2.096731 | 2.113956 2.255106 | 2.377934 2.521661 | 2.52895 2.675905 | 2.468534 2.63081 |
| 5-Oct | 1.770632 | 1.764762 | 1.78698 | 1.626963 1.800505 | 1.786484 | 1.765838 | 1.773107 | 1.824526 | 1.816911 | 1.726386 | 1.784135 | 1.913628 | 1.985545 | 2.165389 | 2.39615 | 2.525942 | 2.773023 | 2.929352 | 2.931797 |
| 6-Oct 7-Oct | 2.013092 2.303964 | 1.991126 2.266466 | 2.022888 2.275574 | 2.027956 2.270063 | 2.019611 2.277915 | 2.004166 2.263907 | 1.994508 2.256309 | 2.035231 2.290676 | 2.024034 2.26931 | 1.940226 2.179069 | 2.003383 2.249483 | 2.114074 2.347248 | 2.174317 2.397844 | 2.332598 2.524831 | 2.553927 2.721221 | 2.683901 2.855023 | 2.925637 3.131443 | 3.080306 3.298832 | 3.061199 |
| 8-Oct | 2.374944 | 2.383644 | 2.455423 | 2.462195 2.647765 | 2.521388 | 2.486656 | 2.509621 | 2.544689 | 2.524427 | 2.426408 | 2.499188 | 2.592668 | 2.660154 | 2.76752 | 2.944914 | 3.071992 | 3.367764 | 3.539911 | 3.46753 |
| 10-Oct | 2.685382 | 2.697199 | 2.784029 | 2.80861 2.967093 | 2.878166 | 2.882366 | 2.945404 | 3.001234 | 3.001097 | 2.89831 | 2.960445 | 3.068651 | 3.138623 | 3.257206 | 3.417429 | 3.567735 | 3.838024 | 3.994482 | 3.91243 |
| 12-Oct | 3.041577 | 3.050389 | 3.118965 | 3.147992 3.321215 | 3.177322 | 3.169671 | 3.206514 | 3.286974 | 3.305728 | 3.220844 | 3.325317 | 3.487576 | 3.567308 | 3.72532 | 3.902685 | 4.053149 | 4.311821 | 4.467352 | 4.38380 |
| 14-Oct | 3.227178 | 3.300403 | 3.396676 | 3.435768 | 3.464719 | 3.466624 | 3.542807 | 3.608173 | 3.662275 | 3.563155 | 3.699567 | 3.854795 | 3.941536 | 4.123195 | 4.341417 | 4.485487 | 4.760437 | 4.930498 | 4.86888 |
| 16-Oct | 3.303253 | 3.457721 | 3.566075 | 3.528786 | 3.637354 | 3.699299 | 3.826053 | 3.928775 | 3.973677 | 3.885222 | 4.058584 | 4.21706 | 4.296161 | 4.51259 | 4.738248 | 4.870391 | 5.166655 | 5.370012 | 5.34379 |
| 18-Oct | 3.538263 | 3.647397 | 3.752852 | 3.64139 | 3.813073 | 3.892261 | 4.02055 | 4.149678 | 4.186379 | 4.098542 | 4.244702 | 4.429404 | 4.591841 | 4.861502 | 5.096817 | 5.243662 | 5.553418 | 5.768311 | 5.72728 |
| 20-Oct | 3.980588 | 4.056747 | 4.153873 | 3.996424 4.217784 | 4.230647 | 4.24729 | 4.337472 | 4.429357 | 4.467261 | 4.354847 | 4.508405 | 4.696408 | 4.872741 | 5.101084 | 5.355878 | 5.599954 | 5.928724 | 6.168634 | 6.13922 |
| 21-Oct 22-Oct | 4.036619 4.067422 | 4.143033 4.217782 | 4.277252 4.401573 | 4.354768 4.45991 | 4.379836 4.486889 | 4.391414 4.503146 | 4.491255 4.635367 | 4.56817 4.72386 | 4.600799 4.751232 | 4.493438 4.674767 | 4.653295 4.827014 | 4.835698 5.017202 | 4.998223 5.177628 | 5.213756 5.371561 | 5.470399 5.626067 | 5.725718 5.864181 | 6.059399 6.19196 | 6.305915 6.450493 | 6.27940 6.44162 |
| 23-Oct | 4.244015 | 4.378179 | 4.5646 | 4.654112 4.788606 | 4.673303 | 4.673175 | 4.821359 | 4.906886 | 4.934375 | 4.854097 | 5.056353 | 5.220009 | 5.392753 | 5.577479 | 5.827701 | 6.04656 | 6.367817 | 6.640301 | 6.623277 |
| 25-Oct | 4.496653 | 4.605714 | 4.771558 | 4.875301 4.952065 | 4.911705 | 4.948938 | 5.107661 | 5.224568 | 5.23728 | 5.229742 | 5.452402 | 5.689889 | 5.861434 | 6.06633 | 6.308983 | 6.495183 | 6.8019 | 7.091255 | 7.043536 |
| 27-Oct | 4.699317 | 4.856784 | 4.999325 | 5.058158 5.148924 | 5.099128 | 5.236349 | 5.368702 | 5.527705 | 5.527076 | 5.493972 | 5.696074 | 5.94295 | 6.15387 | 6.404706 | | 6.85456 | 7.200517 | 7.469825 | 7.405463 |
| 29-Oct | 4.743947 | 4.933459 | 5.114357 | 5.196269 5.20615 | 5.253769 | 5.385013 | 5.518425 | 5.705603 | 5.747617 | 5.719456 | 5.914258 | 6.190264 | 6.440398 | 6.663026 | 6.981596 | 7.245576 | 7.66795 | 7.916068 | 7.872953 |
| | 4.760628 | | | | | | | | | | | 6.230578 | | | | | | | |

The data spans from July to October where the red marks the end of summer. As we can see, the end of summer has been end earlier or that temperatures have been rising over the years which has caused the standard deviation to rise as the years pass.

| 18-5ep 0.375801 0.2059601 0.2059601 0.2059601 0.205970 0.205920 0.2059602 0.205960 0.205970 0.20590 | 18-Sep | 0.25301 | 0.209644 | U 103803 | ∩ 188958 | 0 220251 | 0.20888 | 0 222432 | n 238525 | ∩ 2/8318 | n 191986 | 0.236577 | 0.36638 | 0.444045 | 0 570157 | 0 692233 | 0.83352 | 1.044767 | 1 187664 | 1 1/1891/ |
|--|--------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| 22-Sep 0.4378/3 0.3183/4 0.3180/9 0.352111 0.3238/4 0.30942 0.3278/8 0.3278/8 0.3278/8 0.3278/9 0.4678/8 0.56893 0.4678/9 0.4678/8 0.56893 0.4678/9 0.4778/8 0.56893 0.4678/9 0.4778/8 0.4788/9 | | | | | | | | | | | | | | | | | | | | |
| 22-Sep 0.495299 0.395700 0.395705 0.09070 0.39796 0.390190 0.47266 0.390190 0.47266 0.25220 0.52200 0.40280 0.39570 0.51260 0.51255 0.51141 0.519100 0.47266 0.52220 0.52200 0.52220 0.52200 0.52220 0.52200 0.52220 0.52200 0.52220 0.52200 0.52220 0.52200 0.52220 0.52200 0.52220 0.52200 0.52220 0.52200 0.52220 0.52200 0.52220 0.52200 0.52220 0 | | | | | | | | | | | | | | | | | | | | |
| 22-Sep 0.489M6 0.45957 0.47255 0.59144 0.51913 0.47365 0.47365 0.47363 0.57227 0.51547 0.51547 0.54248 0.57237 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.55274 0.51547 0.52274 0.54547 0.75274 | | | | | | | | | | | | | | | | | | | | |
| 22-Sep 0.488808 0.060999 0.51230 0.552376 0.583455 0.552779 0.5146977 0.543488 0.572933 0.570750 0.53347 0.583479 0.815888 0.190898 1.0641079 1.190710 7.190721 2.25569 0.451334 0.150577 0.453474 0.55070 0.533474 0.583479 0.151800 0.151800 0.151800 0.151800 0.064055 0.711807 0.716590 0.73400 0.064055 0.711807 0.716590 0.73400 0.064055 0.711807 0.716590 0.73400 0.064055 0.711807 0.716590 0.714070 0.064055 0.711807 0.716590 0.714070 0.064055 0.711807 0.716590 0.714070 0.064055 0.711807 0.064055 0.711807 0.064050 0.711807 0.716590 0.714070 0.064050 0.071807 0.064079 0.7130 0.064055 0.711807 0.071807 0.0 | 22-Sep | 0.489046 | 0.495547 | 0.472555 | | | | | | | | | | | | | | | | |
| 25-5ep 0.451324 0.516277 0.540042 0.562706 0.581081 0.662405 0.716270 0.75260 0.716206 0.776270 0.726210 0.776200 0.7762 | | | | | | | | | | | | | | | | | | | | |
| 26-5ep 0.51591 0.58691 0.58691 0.58691 0.586924 0.67368 0.71672 0.782122 0.82018 0.85893 0.57567 0.51510 0.58693 0.57572 0.67316 0.71672 0.782122 0.82018 0.85893 0.57567 0.67595 0.674279 0.77398 0.78238 0.67575 0.694279 0.77399 0.743708 0.762818 0.819639 0.885141 0.911431 0.848523 0.93414 1.653277 1.126446 1.245979 1.446045 1.576701 1.78846 1.691191 1.95123 0.5959 0.77288 0.78288 0.825914 0.856143 0.878072 0.93338 0.104131 1.024527 0.985191 1.00418 1.012368 0.878072 0.93338 0.104131 1.024527 0.985191 1.00418 0.10236 0.05614 0.10418 1.01236 0.05614 0.10418 0.05614 0.10418 0.05614 0.05 | 24-Sep | 0.488068 | 0.496715 | 0.52102 | 0.555028 | 0.563937 | 0.589337 | 0.636522 | 0.661698 | 0.655174 | 0.579507 | 0.633874 | 0.735578 | 0.815868 | 0.919986 | 1.064719 | 1.189393 | 1.421417 | 1.597107 | 1.576821 |
| 28-5ep 0.5590 0.57950 0.599520 0.679520 0.679520 0.679520 0.679520 0.679520 0.47930 0.73980 7.679520 0.89530 0.88541 0.91140 0.848521 0.93140 0.93140 0.848521 0.93140 0.9 | 25-Sep | 0.451334 | 0.516257 | 0.543042 | 0.567876 | 0.581081 | 0.640455 | 0.713173 | 0.736559 | 0.734026 | 0.662295 | 0.738991 | 0.834565 | 0.902374 | 0.997084 | 1.133266 | 1.245864 | 1.478522 | 1.685453 | 1.670178 |
| 28-5ep 0.77298 0.7891 0.80873 0.82091 0.83614 0.856143 0.876072 0.93353 0.885141 0.91413 0.848523 0.93414 1.052377 1.126446 1.287971 1.156677 1.55847 | 26-Sep | 0.451599 | 0.51801 | 0.546011 | 0.569204 | 0.628246 | 0.676538 | 0.746187 | 0.779634 | 0.791073 | 0.745272 | 0.824202 | 0.929977 | 0.999941 | 1.094497 | 1.265614 | 1.366599 | 1.57973 | 1.761142 | 1.75847 |
| 29-96 0.77988 0.78913 0.818073 0.825014 0.8586143 0.878072 0.933365 1.012368 1. | 27-Sep | 0.513511 | 0.585932 | 0.595762 | 0.619522 | 0.677316 | 0.712672 | 0.782122 | 0.820182 | 0.857586 | 0.7965 | 0.881863 | 0.996477 | 1.082649 | 1.193716 | 1.367367 | 1.476182 | 1.682022 | 1.852849 | 1.840731 |
| 30-96 1.017742 0.986191 1.00418 1.012368 1.020774 1.027048 1.197937 1.217573 1 | 28-Sep | 0.62509 | 0.677955 | 0.694279 | 0.7039 | 0.743708 | 0.762818 | 0.819639 | 0.885141 | 0.911413 | 0.848523 | 0.93241 | 1.053277 | 1.126446 | 1.245979 | 1.446045 | 1.576701 | 1.78846 | 1.961119 | 1.952123 |
| 1-Oct 1,287036 1,261699 1,202005 1,20477 1,202048 1,97937 1,215723 1,277828 1,266433 1,184055 1,258457 1,200104 1,47556 1,609032 1,030374 1,972846 2,22248 2,377934 2,52805 2,468534 3,Oct 1,382131 1,427955 1,476272 1,474725 1,476524 1,463924 1,483844 1,418667 1,358214 1,53948 1,65052 1,74638 1,185947 2,096731 2,255106 2,521661 2,675905 2,663811 4,00000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,0000000 1,0000000 1,0000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,000000 1,00000000 | 29-Sep | 0.772988 | 0.78913 | 0.818073 | 0.825014 | 0.856143 | 0.878072 | 0.933363 | 1.014331 | 1.023957 | 0.94739 | 1.051348 | 1.17116 | 1.228701 | 1.368677 | 1.558443 | 1.67956 | 1.900005 | 2.076482 | 2.075063 |
| 2-Oct 1.382871 1.388105 1.39472 1.91721 1.380502 1.39171 1.39171 1.3 | 30-Sep | 1.017742 | 0.986191 | 1.00418 | 1.012368 | 1.022734 | 1.034662 | 1.067738 | 1.137949 | 1.137869 | 1.06174 | 1.15827 | 1.286424 | 1.339875 | 1.481641 | 1.67882 | 1.810252 | 2.060462 | 2.227569 | 2.190248 |
| 3-Oct 1.382131 1.427695 1.478272 1.474725 1.47472725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.47472725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.47472725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.47472725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.474725 1.47472 | 1-Oct | 1.237036 | 1.216189 | 1.203095 | 1.20477 | 1.202048 | 1.197937 | 1.215723 | 1.277883 | 1.266433 | 1.184055 | 1.258457 | 1.390104 | 1.475676 | 1.609073 | 1.800374 | 1.972846 | 2.222438 | 2.375719 | 2.321013 |
| | 2-Oct | 1.382871 | 1.388105 | 1.394723 | 1.391211 | 1.380502 | 1.359157 | 1.36824 | 1.438344 | 1.418669 | 1.323622 | 1.392281 | 1.514958 | 1.609832 | 1.743998 | 1.935668 | 2.113956 | 2.377934 | 2.52895 | 2.468534 |
| 5-Oct 1,77662 1,776632 1,764762 1,76868 1,800505 1,786484 1,765838 1,773107 1,824525 1,816911 1,726386 1,784135 1,913628 1,985545 2,165389 2,39615 2,525942 2,773023 2,929352 2,311379 6-Oct 2,303944 2,266466 2,275574 2,270063 2,277915 2,633907 2,525639 2,056676 2,26931 2,179069 2,249483 2,34748 2,339484 2,524831 2,721221 2,855023 3,131443 3,298832 2,500508 8,000 2,245438 2,34748 2,339484 2,524831 2,721221 2,855023 3,131443 3,298832 2,500508 9-Oct 2,349434 2,348344 2,3 | 3-Oct | 1.382131 | 1.427695 | 1.478272 | 1.474725 | 1.476542 | | | | | | | | | 1.875947 | 2.096731 | 2.255106 | 2.521661 | 2.675905 | 2.630811 |
| 6-Oct 2.013092 1.991126 2.022888 2.027956 2.019611 2.004166 1.994508 2.035231 2.024034 1.940226 2.03383 2.114074 2.174317 2.332598 2.553927 2.683901 2.925637 3.080306 3.061195 7.000 7.00 | 4-Oct | 1.552127 | 1.571506 | 1.607248 | 1.626963 | 1.621868 | 1.60466 | 1.625234 | 1.688265 | 1.680504 | 1.585479 | 1.650557 | 1.783423 | 1.85814 | 2.00111 | 2.2396 | 2.38329 | 2.636179 | 2.792489 | 2.796883 |
| 8-Ord 2.303964 2.266466 2.275574 2.270063 2.277915 2.263907 2.263907 2.263908 2.290676 2.26931 2.179069 2.249483 2.347248 2.397844 2.333644 2.33544 2. | 5-Oct | 1.770632 | 1.764762 | 1.78698 | 1.800505 | 1.786484 | 1.765838 | 1.773107 | 1.824526 | 1.816911 | 1.726386 | 1.784135 | 1.913628 | 1.985545 | 2.165389 | 2.39615 | 2.525942 | 2.773023 | 2.929352 | 2.931797 |
| 8-Oct 2.374944 2.383644 2.455423 2.462195 2.521388 2.486656 2.509621 2.544689 2.524427 2.426408 2.499188 2.592668 2.660154 2.76752 2.944914 3.071992 3.367764 3.539911 3.467535 9-0ct 2.543093 2.553404 2.623644 2.647765 2.730005 2.776312 2.77106 2.806016 2.789397 2.692121 2.788644 2.845872 2.912793 3.001616 3.17293 3.311493 3.594503 3.762844 3.684989 11-0ct 2.683582 2.689799 2.784021 2.78166 2.823666 2.945404 3.001234 3.001234 3.001234 3.001079 2.8831 2.960044 3.068561 3.138623 2.527206 3.174724 3.557735 3.838204 3.99482 3.912746 11-0ct 2.683582 3.286873 2.942349 2.967093 3.013911 3.018795 3.074034 3.169585 3.169734 3.169585 3.169734 3.169585 3.169734 3.169585 3.169734 3.305783 3.220844 3.325317 3.487576 3.567308 3.72532 3.902685 4.053149 4.311821 4.467322 4.838301 13-0ct 3.227178 3.300403 3.396675 3.345768 3.464719 3.466524 3.482807 3.608217 3.662275 3.563155 3.699567 3.854795 3.941536 4.123195 4.341417 4.485487 4.760437 4.930498 4.668885 15-0ct 3.259154 3.377199 3.466482 3.597584 3.6193 3.679502 3.776228 3.917799 4.044326 4.077749 4.01926 4.162999 4.326687 4.458648 4.717634 4.95958 5.063968 5.367041 5.5754 5.530073 18-0ct 3.338263 3.667474 4.153873 4.17754 4.230647 4.230647 4.42598 4.163193 4.96586 4.63193 3.679502 3.77628 3.917799 4.044326 4.077749 4.01926 4.162999 4.326688 4.72664 4.94940 4.95141 4.95487 4.70487 4.70487 4.70497 4.94940 4.949404 4.95141 4.95487 4.70487 4.70487 4.70487 4.90497 4.15387 4.153 | | | | | | | | | | | | | | | | | | | | |
| 9-Ord 2.543093 2.553404 2.632614 2.647765 2.730005 2.726312 2.771026 2.806016 2.789397 2.692121 2.748644 2.845872 2.912793 3.006016 3.172933 3.311493 3.594503 3.762814 3.684889 1.00012 2.885382 2.697199 2.784029 2.80861 2.878166 2.882366 2.984504 3.001997 2.88831 2.960445 3.068651 3.138623 3.257206 3.417429 3.567735 3.838024 3.994482 3.912436 11-0ct 3.041577 3.050389 3.118965 3.147992 3.177322 3.169671 3.068751 3.206514 3.286974 3.050728 3.220844 3.325317 3.487576 3.567308 3.75252 3.902685 4.035149 4.311821 4.457392 4.32811 4.00012 4.20009 4.20 | | | | | | | | | | | | | | | | | | | | |
| 10-Ord 2.685382 2.697199 2.784029 2.80861 2.878166 2.882366 2.945404 3.001234 3.0012 | | | | | | | | | | | | | | | | | | | | |
| 11-Ort 2.863563 2.868431 2.942349 2.967093 3.013911 3.018795 3.074034 3.169585 3.167346 3.05972 3.135263 3.292646 3.362584 3.485878 3.650017 3.81645 4.081246 4.237041 4.150799 1.20011 3.0011 | | | | | | | | | | | | | | | | | | | | |
| 12-Oct 13-04157 | | | | | | | | | | | | | | | | | | | | |
| 13-Oct 13-Oct 13-0ct 13 | | | | | | | | | | | | | | | | | | | | |
| 14-Oct 3.227178 3.30403 3.36676 3.435768 3.464719 3.466624 3.542807 3.608173 3.662275 3.563155 3.699567 3.854795 3.854795 3.84137 4.485487 4.760437 4.930498 4.868885 1.5004 3.259115 3.375159 3.475698 3.528786 3.563106 5.517791 3.70827 3.70827 3.85832 3.45711 4.031592 4.116342 4.322932 4.540365 4.681049 4.963605 5.167094 5.12736 1.6004 3.323011 3.466484 3.597554 3.63139 3.679502 3.776428 3.917799 4.044325 4.077749 4.001926 4.162999 4.326687 4.85864 4.717634 4.95399 6.03688 5.364451 5.57547 5.530073 1.8-0ct 3.538263 3.647397 3.752852 3.949855 3.996424 4.013513 4.05866 4.163112 4.273722 4.321645 4.218258 4.38046 4.54798 4.78142 4.91844 4.91854 4.91844 4.91854 4.401595 4.58144 4.401595 4.58144 4.601592 4.462494 4.541494 4.9184 4.91 | | | | | | | | | | | | | | | | | | | | |
| 15-Oct 3.259154 3.377159 3.479698 3.528786 3.561066 3.574721 3.7087 3.797825 3.854336 3.79682 3.796823 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.469632 3.479613 3.49682 3.479613 3.49682 3.479613 3.49682 3.49862 | | | | | | | | | | | | | | | | | | | | |
| 16-Oct 3.303253 3.457721 3.566075 3.608281 3.637354 3.69929 3.826053 3.928775 3.973677 3.885222 4.058584 4.21706 4.59261 4.51259 4.738248 4.870391 5.166655 5.370012 5.343794 1.70012 3.23031 3.466484 3.597554 5.36451 3.637354 3.69929 3.826053 3.998475 4.001926 4.16299 4.2462904 4.591841 4.861502 5.09617 5.243662 5.5530073 1.80012 5.343794 1.90012 3.79018 3.867892 3.999855 3.996424 4.013513 4.05586 4.163121 4.273722 4.21645 4.218258 4.358046 4.57984 4.726164 4.91513 4.05586 4.163121 4.273722 4.231645 4.218258 4.358046 4.59848 4.726162 4.981259 5.220531 5.41974 5.738583 5.996449 5.991216 2.00012 4.036619 4.143033 4.277252 4.354768 4.379836 4.391414 4.919255 4.56817 4.600799 4.493438 4.653205 4.898404 4.918255 4.56817 4.600799 4.493438 4.653205 4.898404 5.914126 4.21788 4.218258 4.388046 4.59848 4.878124 5.218258 4.388046 4.59848 4.878124 5.218258 4.388046 4.59848 4.878124 5.218258 4.388046 4.59848 4.878124 5.218258 4.388046 4.59848 4.878124 5.218258 4.388048 4.218258 4.388048 4.878124 5.218258 4.388048 4.878124 5.218258 4.388048 4.878124 5.218258 4.388048 4.878124 5.218258 4.388048 4.218258 4.388048 4.878124 5.218258 4.388048 4.878124 5.218258 4.388048 4.878124 5.218258 4.388048 4.878124 5.218258 4.388048 4.878124 5.218258 4.388048 4.878124 5.218258 4.388048 4.878124 5.218 | | | | | | | | | | | | | | | | | | | | |
| 17-Oct 18-Oct 18 | | | | | | | | | | | | | | | | | | | | |
| 18-Oct 3.538263 3.647397 3.752852 3.795243 3.813073 3.892261 4.02055 4.149678 4.186379 4.098542 4.244702 4.429404 4.591841 4.661502 5.096817 5.243662 5.553418 5.762813 5.727289 19-Oct 3.795018 3.867892 3.949855 3.996424 4.013513 4.05586 4.163121 4.273722 4.321645 4.218258 4.358046 4.547898 4.726162 4.981259 5.220531 5.419742 5.738583 5.984649 5.47126 2.00-Oct 4.036619 4.143033 4.277252 4.354768 4.379836 4.39141 4.491255 4.56817 4.00799 4.493438 4.653295 4.835698 4.998223 5.213756 5.470399 5.75718 6.059399 6.059015 6.279406 2.00-Oct 4.066408 4.87127 4.240415 4.401573 4.401573 4.82139 4.663205 4.82139 4.663205 4.82139 4.663205 5.27006 4.2404015 4.378179 4.5646 4.65112 4.673303 4.673175 4.82139 4.906886 4.994375 4.854095 5.056135 5.270406 4.98129 5.552708 4.007402 4.00749 4. | | | | | | | | | | | | | | | | | | | | |
| 19-Oct 3,79018 3,867892 3,949855 3,996424 4,013513 4,05586 4,163121 4,273722 4,321645 4,218258 4,358046 4,54798 4,726162 4,981259 5,220531 5,419742 5,738583 5,984649 5,947126 2,0001 3,980588 4,0656747 4,153873 4,217784 4,23967 4,24729 4,337472 4,429357 4,467261 4,354847 4,508405 4,696408 4,872741 5,101084 5,355878 5,599954 5,287379 6,168636 6,139228 2,2001 4,0667422 4,217782 4,401573 4,45991 4,486889 4,093146 4,691536 4,781346 4,691540 4,241788 4,241785 4,68112 4,673303 4,673175 4,821145 4,918255 4,988425 4,988 | | | | | | | | | | | | | | | | | | | | |
| 20-Oct 3,980588 4.056747 4.153873 4.217784 4.230647 4.24729 4.337472 4.429357 4.467261 4.354847 4.508405 4.696408 4.872741 5.101084 5.355878 5.59954 5.928724 6.168634 6.139228 2.20054 4.0366619 4.143033 4.277252 4.354768 4.379836 4.391414 4.491255 4.56817 4.600799 4.493438 4.653295 4.835698 4.998223 5.213756 5.470399 5.725718 6.059399 6.305915 6.279406 2.20055 4.244015 4.378179 4.5646 4.6591412 4.67303 4.673175 4.821359 4.968889 4.993437 5.858097 5.056353 5.20009 5.392753 5.577479 5.827701 6.04656 6.367817 6.460301 6.623277 2.20055 4.24055 4.835698 4.96838 4.968181 4.911705 6.24058 6.34058 6 | | | | | | | | | | | | | | | | | | | | |
| 21-Oct 4.036619 4.143033 4.277252 4.354768 4.379836 4.391414 4.491255 4.56817 4.690799 4.493438 4.653295 4.835698 4.998223 5.213756 5.470399 5.725718 6.059399 6.305915 6.279406 22-Oct 4.067422 4.217782 4.401573 4.485991 4.485898 4.503146 4.635367 4.72386 4.73386 4.75123 4.673707 4.827014 5.017200 5.177628 5.371561 5.626067 5.864181 6.19196 6.450493 6.441621 22-Oct 4.244015 4.378179 4.5646 4.657303 4.51225 4.825102 4.958432 5.067472 5.092307 5.057171 5.265965 5.481302 5.670552 5.847339 6.075557 6.27225 6.58248 6.845703 6.841232 22-Oct 4.496653 4.605714 4.771558 4.875301 4.911705 4.948938 5.107661 5.224568 5.23728 5.23728 5.23728 5.825742 5.452402 5.698898 5.861344 6.06333 6.308983 6.495183 6.80179 4.952065 5.001535 5.078421 5.223308 5.36592 5.375147 5.356212 5.73077 5.814706 5.99274 6.422608 6.46534 6.66514 6.85456 7.20517 7.469825 7.0453536 22-Oct 4.782566 4.999325 5.084899 5.148929 5.14892 5.185125 5.33493 5.459813 5.662507 5.747619 5.94256 6.93048 6.40308 6.69126 6.98259 7.277046 7.218536 22-Oct 4.782565 4.928962 5.49399 5.14892 5.185125 5.33493 5.459813 5.662507 5.747619 5.914258 6.190266 6.440398 6.663026 6.98159 6.245576 7.45667 7.746507 7.716608 7.872518 6.20048 7.072508 7.94508 7. | | | | | | | | | | | | | | | | | | | | |
| 22-Oct 4.067422 4.217782 4.401573 4.45991 4.486889 4.503146 4.635367 4.72136 4.751232 4.674767 4.827014 5.017202 5.177628 5.371561 5.626067 5.864181 6.1919 6.450493 6.441621 (24-24015 4.378179 4.5664 6.564112 4.673303 4.571274 4.821389 4.906886 4.934375 4.854087 5.056333 5.220009 5.392753 5.577479 5.827701 6.0456 6.367817 6.640301 6.623277 5.24001 4.70508 4.605114 4.771558 4.875301 4.911705 4.948938 5.107661 5.224568 6.23728 5.23728 5.23728 5.23728 5.25742 5.452402 5.689889 5.861434 6.06633 6.308983 6.495183 6.8019 7.091255 7.043536 5.26001 4.958031 4.958035 5.08421 5.224368 5.368703 5.36802 5.375470 5.525706 5.493972 5.695074 5.94893 5.405704 6.40508 6.405704 6.40580 6.40580 6.405704 6.40580 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.40580 6.405704 6.405704 6.40580 6.405704 | | | | | | | | | | | | | | | | | | | | |
| 23-Oct 4.244015 4.378179 4.5646 4.654112 4.673303 4.673175 4.821359 4.906886 4.934375 5.056135 5.056135 5.056135 5.05009 5.392753 5.577479 5.827701 6.04656 6.367817 6.640301 6.623277 (24-Oct 4.370733 4.512226 4.682157 4.788606 4.817982 4.825102 4.958432 5.067427 5.092307 5.057171 5.265965 5.481302 5.670552 5.847339 6.075057 6.27225 6.58248 6.845703 6.81723 (24-Oct 4.998031 4.710508 4.864179 4.952065 5.001353 5.078421 5.22308 5.078421 5.22308 5.36592 5.375147 5.365212 5.73077 5.814706 5.990274 6.222082 6.465674 6.663034 6.98259 7.277046 7.2185356 (24-Oct 4.699317 4.856784 4.999325 5.058188 5.099128 5.26349 5.368702 5.567705 5.52705 5.52706 5.493912 5.636303 5.841996 6.99257 6.404706 6.66514 6.85456 7.200517 7.469825 7.405463 (24-Oct 4.727565 4.928962 5.084899 5.184894 5.184594 5.498312 5.34934 5.459831 5.65207 5.74167 5.719456 5.914258 6.192456 6.404038 6.663026 6.98159 7.245576 7.24576 7.245576 7.245576 7.245576 7.245576 7.245576 7.245576 7.24576 7.24576 7.245576 7.245576 7.245576 7.245576 7.245576 7.245576 7.2457 | | | | | | | | | | | | | | | | | | | | |
| 24-Oct 4.370733 4.512226 4.682157 4.788606 4.817982 4.825102 4.958432 5.067427 5.092307 5.057171 5.265965 5.481302 5.670552 5.847339 6.075057 6.27225 6.58248 6.845703 6.81723 25-Oct 4.496653 4.605714 4.71558 4.875301 4.911705 4.948938 5.107661 5.224568 5.23728 5.229742 5.452402 5.689889 5.861434 6.06633 6.308983 6.495183 6.8019 7.091255 7.043536 27-Oct 4.598031 4.710508 4.864179 4.999325 5.058135 5.058143 5.223308 5.36592 5.375147 5.356212 5.573077 5.814706 5.990274 6.22208 6.465674 6.663094 6.98259 7.277046 7.218536 28-Oct 4.727565 4.928962 5.084899 5.148932 5.185125 5.334934 5.458931 5.662507 5.761228 5.63303 5.841986 6.079255 6.3336 6.651521 6.841066 7.045573 7.46582 7.405463 28-Oct 4.73493479 5.114337 5.196269 5.235769 5.385013 5.518425 5.705603 5.747617 5.719456 5.914258 6.190264 6.440398 6.66302 6.98159 7.245576 7.66795 7.916068 7.872953 30-Oct 4.760628 4.938972 5.120348 5.20165 5.275055 5.381212 5.552704 5.72618 5.742614 5.944506 6.230578 6.474412 6.740168 7.07290 7.368057 7.81953 8.068878 8.058179 | | | | | | | | | | | | | | | | | | | | |
| 25-Oct 4.496653 4.605714 4.771558 4.875301 4.911705 4.948938 5.107661 5.224568 5.23728 5.229742 5.689889 5.861434 6.06633 6.308983 6.495183 6.8019 7.091255 7.043536 26-Oct 4.598031 4.710508 4.864179 4.952065 5.001353 5.078421 5.223308 5.36592 5.375147 5.356212 5.73077 5.814706 5.990274 6.222082 6.465674 6.663094 6.98259 7.277046 7.218536 28-Oct 4.727565 4.92892 5.084899 5.148924 5.185125 5.33493 5.459831 5.662507 5.671228 5.63033 5.841986 6.079255 6.39128 6.404708 6.65152 6.841066 7.045573 7.46567 7.716617 7.651933 29-Oct 4.73947 4.933459 5.114337 5.196269 5.235769 5.385013 5.518425 5.705603 5.747617 5.719456 5.914278 6.202086 6.404308 6.63026 6.981599 7.245576 7.46567 7.71667 7.716508 7.871608 7.716918 7.091259 7.09 | | | | | | | | | | | | | | | | | | | | |
| 26-Oct 4.598031 4.710508 4.864179 4.952065 5.001535 5.078421 5.22308 5.36592 5.375147 5.356212 5.573077 5.814706 5.990274 6.222082 6.465674 6.663094 6.98259 7.277046 7.218536 28-Oct 4.727565 4.92982 5.084899 5.148924 5.26349 5.368702 5.257705 5.527076 5.493972 5.696074 5.94259 6.45387 6.404706 6.66514 6.85456 7.200517 7.469825 7.405463 28-Oct 4.743947 4.933459 5.141357 5.196269 5.283769 5.385013 5.518425 5.70560 5.747617 5.719456 5.914258 6.190264 6.40398 6.663026 6.981596 7.245576 7.46567 7.716068 7.872583 30-Oct 4.769628 4.938972 5.120348 5.20615 5.275055 5.381212 5.552704 5.724688 5.77466 5.742619 5.944506 6.230578 6.404706 6.240389 6.663026 6.981596 7.245576 7.46567 7.916068 7.872593 30-Oct 4.769628 4.938972 5.120348 5.20615 5.275055 5.381212 5.552704 5.724678 5.724618 5.944506 6.230578 6.474412 6.740168 7.072906 7.368057 7.81953 8.068878 8.058179 | | | | | | | | | | | | | | | | | | | | |
| 28-Oct 4.727565 4.928962 5.084899 5.148924 5.185125 5.334934 5.459831 5.662507 5.671228 5.636303 5.841986 6.079255 6.336 6.561521 6.841066 7.045573 7.44566 7.714617 7.651933 29-Oct 4.743947 4.933459 5.114357 5.196269 5.253769 5.253769 5.253769 5.518425 5.705603 5.747617 5.719456 5.914258 6.190264 6.440398 6.663026 6.981596 7.245576 7.66795 7.916068 7.872953 30-Oct 4.760628 4.938972 5.120348 5.20615 5.275055 5.381212 5.552704 5.724658 5.77416 5.742614 5.944506 6.230578 6.474412 6.740168 7.072906 7.368057 7.81953 8.068878 8.058179 | | | | | | | | | | | | | | | | | | | | |
| 29-Oct 4.743947 4.933459 5.114357 5.196269 5.253769 5.385013 5.518425 5.705603 5.747617 5.719456 5.914258 6.190264 6.440398 6.663026 6.981596 7.245576 7.66795 7.916068 7.872953 30-Oct 4.760628 4.938972 5.120348 5.20615 5.275055 5.381212 5.552704 5.724658 5.77416 5.724614 5.944506 6.230578 6.474412 6.740168 7.072906 7.368057 7.81953 8.068878 8.058179 | 27-Oct | 4.699317 | 4.856784 | 4.999325 | 5.058158 | 5.099128 | 5.236349 | 5.368702 | 5.527705 | 5.527076 | 5.493972 | 5.696074 | 5.94295 | 6.15387 | 6.404706 | 6.66514 | 6.85456 | 7.200517 | 7.469825 | 7.405463 |
| 30-Oct 4,760628 4,938972 5,120348 5,20615 5,275055 5,381212 5,552704 5,720658 5,77416 5,742614 5,944506 6,230578 6,474412 6,740168 7,072906 7,368057 7,81953 8,068878 8,058179 | 28-Oct | 4.727565 | 4.928962 | 5.084899 | 5.148924 | 5.185125 | 5.334934 | 5.459831 | 5.662507 | 5.671228 | 5.636303 | 5.841986 | 6.079255 | 6.336 | 6.561521 | 6.841066 | 7.045573 | 7.44566 | 7.714617 | 7.651933 |
| | 29-Oct | 4.743947 | 4.933459 | 5.114357 | 5.196269 | 5.253769 | 5.385013 | 5.518425 | 5.705603 | 5.747617 | 5.719456 | 5.914258 | 6.190264 | 6.440398 | 6.663026 | 6.981596 | 7.245576 | 7.66795 | 7.916068 | 7.872953 |
| 31-Oct 4.790253 4.981663 5.16492 5.244707 5.30951 5.406574 5.614754 5.776651 5.816023 5.77595 5.994828 6.2699 6.506468 6.781593 7.117876 7.423782 7.873235 8.151758 8.191157 | 30-Oct | 4.760628 | 4.938972 | 5.120348 | 5.20615 | 5.275055 | 5.381212 | 5.552704 | 5.720658 | 5.77416 | 5.742614 | 5.944506 | 6.230578 | 6.474412 | 6.740168 | 7.072906 | 7.368057 | 7.81953 | 8.068878 | 8.058179 |
| | 31-Oct | 4.790253 | 4.981663 | 5.16492 | 5.244707 | 5.30951 | 5.406574 | 5.614754 | 5.776651 | 5.816023 | 5.77595 | 5.994828 | 6.2699 | 6.506468 | 6.781593 | 7.117876 | 7.423782 | 7.873235 | 8.157958 | 8.191157 |

Here is a larger view of the data which has already been smoothed.



This is the standard deviation graph of the temperatures over the years plotted on PowerBI. As we can see the standard deviation, which is compared to its own year average, has been steadily increasing. This fact, coupled with the fact that temperatures are trending up, is that summer are getting hotter and the end of October may also be getting cooler. Since it is not getting cooler in October, this means that summer is ending later because summer temperature is rising.