

Project 2 (FINAL) : Big Data Analysis Project - Weather

This project performs Data Analysis and processing using Apache Spark. Project will use the weather dataset from the below URL.

URL: https://www1.ncdc.noaa.gov/pub/data/ghcn/daily/by_year/

This project uses 18 years of data (2000 - 2018) for all the stations starting with US and elements TMAX, TMIN.

Dataset obtained by using shell script

```
for i in `seq 2000 2018`  
do  
wget https://www1.ncdc.noaa.gov/pub/data/ghcn/daily/by_year/${i}.csv.gz  
gzip -cd ${i}.csv.gz | grep -e TMIN -e TMAX | grep ^US > ${i}.csv  
done
```

The following information serves as a definition of each field in one line of data covering one station-day. Each field described below is separated by a comma (,) and follows the order presented in this document.

ID = 11 character station identification code
YEAR/MONTH/DAY = 8 character date in YYYYMMDD format (e.g. 19860529 = May 29, 1986) ELEMENT = 4 character indicator of element type
DATA VALUE = 5 character data value for ELEMENT
M-FLAG = 1 character Measurement Flag
Q-FLAG = 1 character Quality Flag
S-FLAG = 1 character Source Flag
OBS-TIME = 4-character time of observation in hour-minute format (i.e. 0700 =7:00 am)

See section III of the GHCN-Daily <ftp://ftp.ncdc.noaa.gov/pub/data/ghcn/daily/readme.txt> file for an explanation of ELEMENT codes and their units as well as the M-FLAG, Q-FLAGS and S-FLAGS.

The OBS-TIME field is populated with the observation times contained in NOAA/NCDC's Multinetwork Metadata System (MMS).

What are we supposed to find using these datasets:

- Average TMIN, TMAX for each year excluding abnormalities or missing data
- Maximum TMAX, Minimum TMIN for each year excluding abnormalities or missing data
- 5 hottest , 5 coldest weather stations for each year excluding abnormalities or missing data
- Hottest and coldest day and corresponding weather stations in the entire dataset

Code Snippets: File: sparksql.py

```
from __future__ import print_function
from pyspark import SparkContext
from pyspark.sql import SQLContext, Row
import pyspark.sql.functions as func
from datetime import datetime as date

if __name__ == "__main__":
    sc = SparkContext(appName="SparkDatasetAnalysis")
    sqlContext = SQLContext(sc)
    years = list(range(2000, 2019))

    #Yearly Analysis
    for year in years:
        lines = sc.textFile("dataset/%s.csv" % year)
        parts = lines.map(lambda l: l.split(","))
        obs = parts.map(lambda p: Row(station=p[0], date=p[1], measurement=p[2], value=float(p[3]) * 0.1, m=p[4], q=p[5], s=p[6], time=p[7]))

        df = sqlContext.createDataFrame(obs)
        df = df.filter(df.q == '')

        print("\n")
        print("Stats for year %s" % year)
        print("#####")

        #Average Min Temperature
        print("#####Average Min Temperature#####")
        tmin = df.filter(df.measurement=="TMIN").groupBy().avg("value").first()

        print("Average TMIN = %0.2f C" % (tmin["avg(value)"]))
        #Average Max Temperature
        print("#####Average Max Temperature#####")
        tmax = df.filter(df.measurement=="TMAX").groupBy().avg("value").first()

        print("Average TMAX = %0.2f C" % (tmax["avg(value)"]))

        #Min Temperature
        print("#####Minimum Temperature#####")
        min_tmax = df.filter(df.measurement=="TMIN").sort(func.asc("value")).first()

        print("Minimum TMIN = %0.2f C" % (min_tmax.value))

        #Maximum Temperature
        print("#####Maximum Temperature#####")
        max_tmax = df.filter(df.measurement=="TMAX").sort(func.desc("value")).first()

        print("Maximum TMAX = %0.2f C" % (max_tmax.value))

    #Maximum Temperature
    print("#####Maximum Temperature#####")
    max_tmax = df.filter(df.measurement=="TMAX").sort(func.desc("value")).first()

    print("Maximum TMAX = %0.2f C" % (max_tmax.value))

    # Average Hottest Stations
    print("#####Hottest Stations Based on Average#####")
    hotStations = df.filter(df.measurement == "TMAX").groupBy(df.station).agg(func.avg("value")).sort(func.desc("avg(value)")).limit(5).collect()

    sta = 1
    for stations in hotStations:
        print("Hottest Station %s: %s - Average Max Temperature = %0.2f C" % (sta, stations.station, float(stations["avg(value)"])))
        sta = sta + 1

    # Average Coldest Stations
    print("#####Coldest Stations Based on Average#####")
    coldStations = df.filter(df.measurement == "TMIN").groupBy(df.station).agg(func.avg("value")).sort(func.asc("avg(value)")).limit(5).collect()

    sta = 1
    for stations in coldStations:
        print("Coldest Station %s: %s - Average Min Temperature = %0.2f C" % (sta, stations.station, float(stations["avg(value)"])))
        sta = sta + 1

    # Maximum Hottest Stations
    print("#####Hottest Stations Based on Temperature#####")
    hotStations = df.filter(df.measurement == "TMAX").groupBy(df.station).agg(func.max("value")).sort(func.desc("max(value)")).limit(5).collect()

    sta = 1
    for stations in hotStations:
        print("Hottest Station %s: %s - Highest Max Temperature = %0.2f C" % (sta, stations.station, float(stations["max(value)"])))
        sta = sta + 1

    #Coldest Stations
    print("#####Coldest Stations Based on Temperature#####")
    coldStations = df.filter(df.measurement == "TMIN").groupBy(df.station).agg(func.min("value")).sort(func.asc("min(value)")).limit(5).collect()

    sta = 1
    for stations in coldStations:
        print("Coldest Station %s: %s - Lowest Min Temperature = %0.2f C" % (sta, stations.station, float(stations["min(value)"])))
        sta = sta + 1
```

```

#Entire Dataset Analysis
print("\n")
print("#####Entire Dataset Analysis#####")
print("#####Entire Dataset Analysis#####")
lines = sc.textFile("dataset/20k.csv")
parts = lines.map(lambda l: l.split(","))
obs = parts.map(lambda p: Row(station=p[0], date=p[1], measurement=float(p[3]) * 0.1, m=p[4], q=p[5], s=p[6], time=p[7]))

df = sqlContext.createDataFrame(obs)
df = df.filter(df.q == '')
print("\n")
print("-----")
print("Coldest Day and Corresponding Weather Station")
print("-----")

coldStation = df.filter(df.measurement == "TMIN").groupBy(df.station, df.date).min("value").sort(func.asc("min(value))).first()

print("Coldest Temperature has been observed on %s in City %s with a temperature of %0.2f C\n" % (coldStation.date, coldStation.station, float(coldStation["min(value)"])))

print("\n")
print("-----")
print("Hottest Day and Corresponding Weather Station")
print("-----")

hotStation = df.filter(df.measurement == "TMAX").groupBy(df.station, df.date).max("value").sort(func.desc("max(value))).first()

print("Hottest Temperature has been observed on %s in City %s with a temperature of %0.2f C\n" % (hotStation.date, hotStation.station, float(hotStation["max(value)"])))

```

By using the above code run in a system spark and python are installed by entering the command:

When running on Hadoop Cluster:

spark-submit --master yarn-client sparksq.py > local_output.log

When running on your own system:

spark-submit sparksq.py > local_output.log

The output of the above file is stored as local_output.log in which the below screenshots have been pasted.

Github:

https://github.uc.edu/gondinm/Cloud_Computing/tree/master/Project-2

Why I chose to work on Apache SparkSQL:

I chose Apache SparkSQL to get the analysis done. I am comfortable with SQL, so since the data looks like tabular data, I thought of using SQL like programming to get the task done.

Year 2000:

```
Stats for year 2000
#####
#####Average Min Temperature#####
Average TMIN = 4.43 C
#####
#####Average Max Temperature#####
Average TMAX = 17.56 C
#####
#####Minimum Temperature#####
Minimum TMIN = -57.80 C
#####
#####Maximum Temperature#####
Maximum TMAX = 52.20 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00416892 - Average Max Temperature = 37.36 C
Hottest Station 2: USC00411013 - Average Max Temperature = 36.86 C
Hottest Station 3: USC00045502 - Average Max Temperature = 36.76 C
Hottest Station 4: USC00024761 - Average Max Temperature = 34.96 C
Hottest Station 5: USC00021026 - Average Max Temperature = 34.01 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USC00508140 - Average Min Temperature = -20.78 C
Coldest Station 2: USC00505873 - Average Min Temperature = -18.74 C
Coldest Station 3: USR0000WBAR - Average Min Temperature = -18.10 C
Coldest Station 4: USC00247248 - Average Min Temperature = -16.00 C
Coldest Station 5: USW00026508 - Average Min Temperature = -15.69 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00042319 - Highest Max Temperature = 52.20 C
Hottest Station 2: USR0000AHAV - Highest Max Temperature = 49.40 C
Hottest Station 3: USC00024761 - Highest Max Temperature = 49.40 C
Hottest Station 4: USC00021050 - Highest Max Temperature = 49.40 C
Hottest Station 5: USC00029376 - Highest Max Temperature = 48.90 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USC00501684 - Lowest Min Temperature = -57.80 C
Coldest Station 2: USC00505644 - Lowest Min Temperature = -57.80 C
Coldest Station 3: USC00508140 - Lowest Min Temperature = -53.90 C
Coldest Station 4: USW00026440 - Lowest Min Temperature = -51.70 C
Coldest Station 5: USC00509313 - Lowest Min Temperature = -51.10 C
```

Year 2001:

```
Stats for year 2001
#####
#####Average Min Temperature#####
Average TMIN = 4.79 C
#####
#####Average Max Temperature#####
Average TMAX = 17.88 C
#####
#####Minimum Temperature#####
Minimum TMIN = -52.80 C
#####
#####Maximum Temperature#####
Maximum TMAX = 52.80 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00045502 - Average Max Temperature = 35.65 C
Hottest Station 2: USC00022434 - Average Max Temperature = 35.09 C
Hottest Station 3: USC00026250 - Average Max Temperature = 33.96 C
Hottest Station 4: USC00024761 - Average Max Temperature = 33.90 C
Hottest Station 5: USC00042319 - Average Max Temperature = 33.80 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USR0000AHAY - Average Min Temperature = -31.70 C
Coldest Station 2: USW00026508 - Average Min Temperature = -29.86 C
Coldest Station 3: USC00508409 - Average Min Temperature = -18.67 C
Coldest Station 4: USW00026440 - Average Min Temperature = -18.54 C
Coldest Station 5: USC00509315 - Average Min Temperature = -18.43 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00042319 - Highest Max Temperature = 52.80 C
Hottest Station 2: USR0000CMOJ - Highest Max Temperature = 50.60 C
Hottest Station 3: USC00265085 - Highest Max Temperature = 50.00 C
Hottest Station 4: USC00024829 - Highest Max Temperature = 50.00 C
Hottest Station 5: USR0000AHAV - Highest Max Temperature = 50.00 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USW00026508 - Lowest Min Temperature = -52.80 C
Coldest Station 2: USR0000ABCA - Lowest Min Temperature = -51.10 C
Coldest Station 3: USS0051R01S - Lowest Min Temperature = -48.00 C
Coldest Station 4: USC00504567 - Lowest Min Temperature = -46.10 C
Coldest Station 5: USC00508470 - Lowest Min Temperature = -46.10 C
```

Year 2002:

```
Stats for year 2002
#####
#####Average Min Temperature#####
Average TMIN = 4.66 C
#####
#####Average Max Temperature#####
Average TMAX = 17.72 C
#####
#####Minimum Temperature#####
Minimum TMIN = -47.20 C
#####
#####Maximum Temperature#####
Maximum TMAX = 53.30 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00022807 - Average Max Temperature = 34.62 C
Hottest Station 2: USC00347254 - Average Max Temperature = 34.40 C
Hottest Station 3: USC00042319 - Average Max Temperature = 33.92 C
Hottest Station 4: USC00044259 - Average Max Temperature = 33.44 C
Hottest Station 5: USR0000CBUU - Average Max Temperature = 32.79 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USR0000NHAM - Average Min Temperature = -19.20 C
Coldest Station 2: USS0051R01S - Average Min Temperature = -18.97 C
Coldest Station 3: USC00502873 - Average Min Temperature = -17.28 C
Coldest Station 4: USC00501987 - Average Min Temperature = -15.05 C
Coldest Station 5: USC00263101 - Average Min Temperature = -14.81 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00042319 - Highest Max Temperature = 53.30 C
Hottest Station 2: USR0000CMOJ - Highest Max Temperature = 50.00 C
Hottest Station 3: USC00265846 - Highest Max Temperature = 50.00 C
Hottest Station 4: USC00265085 - Highest Max Temperature = 48.90 C
Hottest Station 5: USR0000AHAV - Highest Max Temperature = 48.90 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USR0000AKAI - Lowest Min Temperature = -47.20 C
Coldest Station 2: USS0050S01S - Lowest Min Temperature = -47.00 C
Coldest Station 3: USS0051R01S - Lowest Min Temperature = -47.00 C
Coldest Station 4: USR0000ABEV - Lowest Min Temperature = -46.70 C
Coldest Station 5: USC00503212 - Lowest Min Temperature = -46.10 C
```

Year 2003:

Stats for year 2003

#####Average Min Temperature#####
Average TMIN = 4.86 C
#####Average Max Temperature#####
Average TMAX = 17.71 C
#####Minimum Temperature#####
Minimum TMIN = -50.00 C
#####Maximum Temperature#####
Maximum TMAX = 53.30 C
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00344766 – Average Max Temperature = 36.20 C
Hottest Station 2: USC00026194 – Average Max Temperature = 35.07 C
Hottest Station 3: USC00045502 – Average Max Temperature = 34.70 C
Hottest Station 4: USR0000CWIL – Average Max Temperature = 34.56 C
Hottest Station 5: USC00412906 – Average Max Temperature = 34.31 C
#####Coldest Stations Based on Average#####
Coldest Station 1: USS0045M07S – Average Min Temperature = -20.06 C
Coldest Station 2: USS0048V01S – Average Min Temperature = -17.77 C
Coldest Station 3: USC00433581 – Average Min Temperature = -16.60 C
Coldest Station 4: USC00067373 – Average Min Temperature = -16.30 C
Coldest Station 5: USC00503181 – Average Min Temperature = -15.68 C
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00042319 – Highest Max Temperature = 53.30 C
Hottest Station 2: USR0000CMEA – Highest Max Temperature = 52.80 C
Hottest Station 3: USR0000AHAV – Highest Max Temperature = 52.20 C
Hottest Station 4: USC00021050 – Highest Max Temperature = 51.10 C
Hottest Station 5: USC00029376 – Highest Max Temperature = 50.60 C
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USC00501492 – Lowest Min Temperature = -50.00 C
Coldest Station 2: USS0051R01S – Lowest Min Temperature = -49.00 C
Coldest Station 3: USW00026533 – Lowest Min Temperature = -48.30 C
Coldest Station 4: USS0050S01S – Lowest Min Temperature = -48.00 C
Coldest Station 5: USC00509869 – Lowest Min Temperature = -46.70 C

Year 2004:

```
Stats for year 2004
#####
#####Average Min Temperature#####
Average TMIN = 4.95 C
#####
#####Average Max Temperature#####
Average TMAX = 17.49 C
#####
#####Minimum Temperature#####
Minimum TMIN = -53.30 C
#####
#####Maximum Temperature#####
Maximum TMAX = 51.70 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00042346 - Average Max Temperature = 37.07 C
Hottest Station 2: USW00053139 - Average Max Temperature = 34.80 C
Hottest Station 3: USR0000CMIO - Average Max Temperature = 34.34 C
Hottest Station 4: USW00023195 - Average Max Temperature = 33.65 C
Hottest Station 5: USC00044259 - Average Max Temperature = 33.41 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USR0000ACOA - Average Min Temperature = -25.44 C
Coldest Station 2: USR0000AOKL - Average Min Temperature = -21.70 C
Coldest Station 3: USR0000ASTU - Average Min Temperature = -21.70 C
Coldest Station 4: USR0000NLIM - Average Min Temperature = -21.00 C
Coldest Station 5: USC00306957 - Average Min Temperature = -19.66 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00042319 - Highest Max Temperature = 51.70 C
Hottest Station 2: USC00024761 - Highest Max Temperature = 51.10 C
Hottest Station 3: USW00053139 - Highest Max Temperature = 49.50 C
Hottest Station 4: USC00261371 - Highest Max Temperature = 48.90 C
Hottest Station 5: USC00021050 - Highest Max Temperature = 48.90 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USC00501684 - Lowest Min Temperature = -53.30 C
Coldest Station 2: USC00502568 - Lowest Min Temperature = -50.60 C
Coldest Station 3: USW00026412 - Lowest Min Temperature = -50.00 C
Coldest Station 4: USS0045010S - Lowest Min Temperature = -50.00 C
Coldest Station 5: USC00502350 - Lowest Min Temperature = -50.00 C
```

Year 2005:

```
Stats for year 2005
#####
#####Average Min Temperature#####
Average TMIN = 4.98 C
#####
#####Average Max Temperature#####
Average TMAX = 17.77 C
#####
#####Minimum Temperature#####
Minimum TMIN = -55.00 C
#####
#####Maximum Temperature#####
Maximum TMAX = 53.90 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USR0000MKIL - Average Max Temperature = 34.00 C
Hottest Station 2: USC00290525 - Average Max Temperature = 33.98 C
Hottest Station 3: USC00427606 - Average Max Temperature = 33.51 C
Hottest Station 4: USC00383906 - Average Max Temperature = 32.92 C
Hottest Station 5: USC00311515 - Average Max Temperature = 32.65 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USR0000AFYK - Average Min Temperature = -41.10 C
Coldest Station 2: USR0000AUMI - Average Min Temperature = -38.30 C
Coldest Station 3: USR0000ADEV - Average Min Temperature = -28.90 C
Coldest Station 4: USC00305925 - Average Min Temperature = -27.80 C
Coldest Station 5: USR0000AWLL - Average Min Temperature = -23.90 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00042319 - Highest Max Temperature = 53.90 C
Hottest Station 2: USW00053139 - Highest Max Temperature = 51.90 C
Hottest Station 3: USR0000CMOJ - Highest Max Temperature = 51.70 C
Hottest Station 4: USW00023179 - Highest Max Temperature = 51.70 C
Hottest Station 5: USC00029376 - Highest Max Temperature = 51.10 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USC00501684 - Lowest Min Temperature = -55.00 C
Coldest Station 2: USC00509313 - Lowest Min Temperature = -52.80 C
Coldest Station 3: USC00509869 - Lowest Min Temperature = -51.70 C
Coldest Station 4: USW00026412 - Lowest Min Temperature = -51.10 C
Coldest Station 5: USC00502568 - Lowest Min Temperature = -51.10 C
```

Year 2006:

Stats for year 2006

#####Average Min Temperature#####
Average TMIN = 5.09 C
#####Average Max Temperature#####
Average TMAX = 18.07 C
#####Minimum Temperature#####
Minimum TMIN = -52.80 C
#####Maximum Temperature#####
Maximum TMAX = 52.80 C
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00021514 – Average Max Temperature = 40.80 C
Hottest Station 2: USC00419122 – Average Max Temperature = 36.24 C
Hottest Station 3: USC00080611 – Average Max Temperature = 35.00 C
Hottest Station 4: USR0000HMOL – Average Max Temperature = 34.02 C
Hottest Station 5: USC00042319 – Average Max Temperature = 33.45 C
#####Coldest Stations Based on Average#####
Coldest Station 1: USC00505534 – Average Min Temperature = -24.16 C
Coldest Station 2: USC00508130 – Average Min Temperature = -17.84 C
Coldest Station 3: USC00210059 – Average Min Temperature = -17.19 C
Coldest Station 4: USS0049T03S – Average Min Temperature = -17.15 C
Coldest Station 5: USS0045Q05S – Average Min Temperature = -16.40 C
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00042319 – Highest Max Temperature = 52.80 C
Hottest Station 2: USW00053139 – Highest Max Temperature = 51.10 C
Hottest Station 3: USC00044259 – Highest Max Temperature = 50.00 C
Hottest Station 4: USC00045502 – Highest Max Temperature = 50.00 C
Hottest Station 5: USR0000CMOJ – Highest Max Temperature = 50.00 C
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USR0000ASEL – Lowest Min Temperature = -52.80 C
Coldest Station 2: USC00501492 – Lowest Min Temperature = -52.20 C
Coldest Station 3: USR0000ABEV – Lowest Min Temperature = -51.10 C
Coldest Station 4: USR0000ACHL – Lowest Min Temperature = -50.60 C
Coldest Station 5: USC00501684 – Lowest Min Temperature = -50.00 C

Year 2007:

Stats for year 2007

#####Average Min Temperature#####
Average TMIN = 4.90 C
#####Average Max Temperature#####
Average TMAX = 17.81 C
#####Minimum Temperature#####
Minimum TMIN = -53.90 C
#####Maximum Temperature#####
Maximum TMAX = 55.60 C
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00314987 - Average Max Temperature = 38.30 C
Hottest Station 2: USC00029376 - Average Max Temperature = 35.48 C
Hottest Station 3: USR0000HMOL - Average Max Temperature = 34.62 C
Hottest Station 4: USC00042319 - Average Max Temperature = 33.99 C
Hottest Station 5: USC00041048 - Average Max Temperature = 33.78 C
#####Coldest Stations Based on Average#####
Coldest Station 1: USC00502707 - Average Min Temperature = -25.97 C
Coldest Station 2: USR0000AUMI - Average Min Temperature = -25.45 C
Coldest Station 3: USC00248857 - Average Min Temperature = -23.30 C
Coldest Station 4: USC00509315 - Average Min Temperature = -20.01 C
Coldest Station 5: USC00502107 - Average Min Temperature = -17.07 C
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USR0000CSAW - Highest Max Temperature = 55.60 C
Hottest Station 2: USC00042319 - Highest Max Temperature = 53.90 C
Hottest Station 3: USW00053139 - Highest Max Temperature = 52.30 C
Hottest Station 4: USR0000CMOJ - Highest Max Temperature = 51.70 C
Hottest Station 5: USR0000AHAV - Highest Max Temperature = 50.60 C
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USC00501684 - Lowest Min Temperature = -53.90 C
Coldest Station 2: USS0045R01S - Lowest Min Temperature = -50.10 C
Coldest Station 3: USW00026422 - Lowest Min Temperature = -49.30 C
Coldest Station 4: USC00502607 - Lowest Min Temperature = -48.90 C
Coldest Station 5: USR0000ACHL - Lowest Min Temperature = -48.90 C

Year 2008:

```
Stats for year 2008
#####
#####Average Min Temperature#####
Average TMIN = 4.07 C
#####
#####Average Max Temperature#####
Average TMAX = 17.00 C
#####
#####Minimum Temperature#####
Minimum TMIN = -57.80 C
#####
#####Maximum Temperature#####
Maximum TMAX = 52.80 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00411671 - Average Max Temperature = 35.08 C
Hottest Station 2: USC00254113 - Average Max Temperature = 35.01 C
Hottest Station 3: USW00003125 - Average Max Temperature = 34.88 C
Hottest Station 4: USR0000HMOL - Average Max Temperature = 34.50 C
Hottest Station 5: USC00044259 - Average Max Temperature = 34.39 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USS0051R01S - Average Min Temperature = -25.96 C
Coldest Station 2: USC00509315 - Average Min Temperature = -24.43 C
Coldest Station 3: USC00390223 - Average Min Temperature = -19.74 C
Coldest Station 4: USC00391917 - Average Min Temperature = -19.41 C
Coldest Station 5: USC00476838 - Average Min Temperature = -19.25 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00044297 - Highest Max Temperature = 52.80 C
Hottest Station 2: USC00042319 - Highest Max Temperature = 52.80 C
Hottest Station 3: USC00024761 - Highest Max Temperature = 51.10 C
Hottest Station 4: USW00053139 - Highest Max Temperature = 50.80 C
Hottest Station 5: USC00261371 - Highest Max Temperature = 50.00 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USC00501684 - Lowest Min Temperature = -57.80 C
Coldest Station 2: USR0000ACHL - Lowest Min Temperature = -52.20 C
Coldest Station 3: USC00501492 - Lowest Min Temperature = -52.20 C
Coldest Station 4: USS0045R01S - Lowest Min Temperature = -52.00 C
Coldest Station 5: USW00026412 - Lowest Min Temperature = -51.10 C
```

Year 2009:

```
Stats for year 2009
#####
#####Average Min Temperature#####
Average TMIN = 4.34 C
#####
#####Average Max Temperature#####
Average TMAX = 16.88 C
#####
#####Minimum Temperature#####
Minimum TMIN = -55.60 C
#####
#####Maximum Temperature#####
Maximum TMAX = 53.30 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00141408 - Average Max Temperature = 37.80 C
Hottest Station 2: USR0000HMOL - Average Max Temperature = 36.21 C
Hottest Station 3: USC00144530 - Average Max Temperature = 36.10 C
Hottest Station 4: USC00027370 - Average Max Temperature = 34.46 C
Hottest Station 5: USC00046198 - Average Max Temperature = 34.25 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USC00501492 - Average Min Temperature = -33.43 C
Coldest Station 2: USC00471618 - Average Min Temperature = -30.54 C
Coldest Station 3: USC00509315 - Average Min Temperature = -27.51 C
Coldest Station 4: USC00502015 - Average Min Temperature = -24.43 C
Coldest Station 5: USC00212916 - Average Min Temperature = -23.43 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00042319 - Highest Max Temperature = 53.30 C
Hottest Station 2: USW00053139 - Highest Max Temperature = 50.90 C
Hottest Station 3: USR0000AHAV - Highest Max Temperature = 49.40 C
Hottest Station 4: USR0000CSQU - Highest Max Temperature = 49.40 C
Hottest Station 5: USR0000CBUU - Highest Max Temperature = 49.40 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USC00501684 - Lowest Min Temperature = -55.60 C
Coldest Station 2: USC00502101 - Lowest Min Temperature = -55.60 C
Coldest Station 3: USC00509313 - Lowest Min Temperature = -52.80 C
Coldest Station 4: USR0000ACHL - Lowest Min Temperature = -52.20 C
Coldest Station 5: USR0000AEAG - Lowest Min Temperature = -51.70 C
```

Year 2010:

```
Stats for year 2010
#####
#####Average Min Temperature#####
Average TMIN = 4.72 C
#####
#####Average Max Temperature#####
Average TMAX = 17.14 C
#####
#####Minimum Temperature#####
Minimum TMIN = -53.30 C
#####
#####Maximum Temperature#####
Maximum TMAX = 51.70 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00141408 - Average Max Temperature = 35.00 C
Hottest Station 2: USC00417951 - Average Max Temperature = 34.93 C
Hottest Station 3: USC00027370 - Average Max Temperature = 33.36 C
Hottest Station 4: USC00028070 - Average Max Temperature = 33.32 C
Hottest Station 5: USC00341544 - Average Max Temperature = 33.11 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USC00507097 - Average Min Temperature = -24.05 C
Coldest Station 2: USR0000MKIL - Average Min Temperature = -22.85 C
Coldest Station 3: USC00505873 - Average Min Temperature = -22.80 C
Coldest Station 4: USR0000MOSC - Average Min Temperature = -22.79 C
Coldest Station 5: USR0000MBRV - Average Min Temperature = -21.85 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00042319 - Highest Max Temperature = 51.70 C
Hottest Station 2: USR0000AHAV - Highest Max Temperature = 51.10 C
Hottest Station 3: USW00053139 - Highest Max Temperature = 50.40 C
Hottest Station 4: USR0000CBUU - Highest Max Temperature = 49.40 C
Hottest Station 5: USR0000CMOJ - Highest Max Temperature = 49.40 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USC00501684 - Lowest Min Temperature = -53.30 C
Coldest Station 2: USC00502101 - Lowest Min Temperature = -53.30 C
Coldest Station 3: USS0051R01S - Lowest Min Temperature = -51.90 C
Coldest Station 4: USR0000AACL - Lowest Min Temperature = -51.70 C
Coldest Station 5: USS0045R01S - Lowest Min Temperature = -51.50 C
```

Year 2011:

```
Stats for year 2011
#####
#####Average Min Temperature#####
Average TMIN = 4.60 C
#####
#####Average Max Temperature#####
Average TMAX = 17.24 C
#####
#####Minimum Temperature#####
Minimum TMIN = -51.70 C
#####
#####Maximum Temperature#####
Maximum TMAX = 51.10 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USR0000CTAR - Average Max Temperature = 37.80 C
Hottest Station 2: USC00411416 - Average Max Temperature = 37.04 C
Hottest Station 3: USC00035514 - Average Max Temperature = 36.10 C
Hottest Station 4: USC00412350 - Average Max Temperature = 34.40 C
Hottest Station 5: USR0000HMOL - Average Max Temperature = 34.36 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USC00479012 - Average Min Temperature = -34.40 C
Coldest Station 2: USC00509314 - Average Min Temperature = -24.56 C
Coldest Station 3: USR0000MOSC - Average Min Temperature = -22.87 C
Coldest Station 4: USR0000MBRV - Average Min Temperature = -22.75 C
Coldest Station 5: USC00505136 - Average Min Temperature = -22.55 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00042319 - Highest Max Temperature = 51.10 C
Hottest Station 2: USR0000CCAA - Highest Max Temperature = 50.00 C
Hottest Station 3: USR0000CBUU - Highest Max Temperature = 49.40 C
Hottest Station 4: USC00022782 - Highest Max Temperature = 49.40 C
Hottest Station 5: USW00053139 - Highest Max Temperature = 49.00 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USC00509869 - Lowest Min Temperature = -51.70 C
Coldest Station 2: USS0045R01S - Lowest Min Temperature = -50.70 C
Coldest Station 3: USS0051R01S - Lowest Min Temperature = -50.20 C
Coldest Station 4: USC00501684 - Lowest Min Temperature = -50.00 C
Coldest Station 5: USC00501492 - Lowest Min Temperature = -49.40 C
```

Year 2012:

```
Stats for year 2012
#####
#####Average Min Temperature#####
Average TMIN = 5.34 C
#####
#####Average Max Temperature#####
Average TMAX = 18.38 C
#####
#####Minimum Temperature#####
Minimum TMIN = -54.40 C
#####
#####Maximum Temperature#####
Maximum TMAX = 53.70 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USW00012946 - Average Max Temperature = 35.87 C
Hottest Station 2: USC00290915 - Average Max Temperature = 35.38 C
Hottest Station 3: USC00412906 - Average Max Temperature = 34.83 C
Hottest Station 4: USC00040924 - Average Max Temperature = 34.60 C
Hottest Station 5: USC00042319 - Average Max Temperature = 34.45 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USC00504210 - Average Min Temperature = -28.25 C
Coldest Station 2: USC00504971 - Average Min Temperature = -27.47 C
Coldest Station 3: USC00503368 - Average Min Temperature = -22.78 C
Coldest Station 4: USC00508156 - Average Min Temperature = -22.27 C
Coldest Station 5: USR0000MKIL - Average Min Temperature = -22.04 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USS0005N23S - Highest Max Temperature = 53.70 C
Hottest Station 2: USC00042319 - Highest Max Temperature = 53.30 C
Hottest Station 3: USW00053139 - Highest Max Temperature = 51.20 C
Hottest Station 4: USC00020672 - Highest Max Temperature = 49.40 C
Hottest Station 5: USR0000AHAV - Highest Max Temperature = 49.40 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USC00503165 - Lowest Min Temperature = -54.40 C
Coldest Station 2: USC00503212 - Lowest Min Temperature = -53.90 C
Coldest Station 3: USS0051R01S - Lowest Min Temperature = -53.60 C
Coldest Station 4: USR0000AFYK - Lowest Min Temperature = -53.30 C
Coldest Station 5: USC00504210 - Lowest Min Temperature = -53.30 C
```

Year 2013:

```
Stats for year 2013
#####
#####Average Min Temperature#####
Average TMIN = 4.31 C
#####
#####Average Max Temperature#####
Average TMAX = 16.73 C
#####
#####Minimum Temperature#####
Minimum TMIN = -52.80 C
#####
#####Maximum Temperature#####
Maximum TMAX = 53.90 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00260125 - Average Max Temperature = 36.91 C
Hottest Station 2: USC00042319 - Average Max Temperature = 33.70 C
Hottest Station 3: USC00042410 - Average Max Temperature = 33.62 C
Hottest Station 4: USC00025270 - Average Max Temperature = 33.33 C
Hottest Station 5: USC00021050 - Average Max Temperature = 32.98 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USR0000ASLC - Average Min Temperature = -35.73 C
Coldest Station 2: USC00201940 - Average Min Temperature = -24.40 C
Coldest Station 3: USR0000MBRV - Average Min Temperature = -21.63 C
Coldest Station 4: USR0000ABUU - Average Min Temperature = -20.31 C
Coldest Station 5: USC00503212 - Average Min Temperature = -20.29 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00042319 - Highest Max Temperature = 53.90 C
Hottest Station 2: USW00004134 - Highest Max Temperature = 53.30 C
Hottest Station 3: USC00044297 - Highest Max Temperature = 52.80 C
Hottest Station 4: USW00053139 - Highest Max Temperature = 52.00 C
Hottest Station 5: USC00045502 - Highest Max Temperature = 50.60 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USC00502339 - Lowest Min Temperature = -52.80 C
Coldest Station 2: USC00501684 - Lowest Min Temperature = -52.20 C
Coldest Station 3: USS0051R01S - Lowest Min Temperature = -50.50 C
Coldest Station 4: USS0045R01S - Lowest Min Temperature = -50.20 C
Coldest Station 5: USR0000ABCK - Lowest Min Temperature = -50.00 C
```

Year 2014:

Stats for year 2014

#####Average Min Temperature#####
Average TMIN = 4.38 C
#####Average Max Temperature#####
Average TMAX = 16.84 C
#####Minimum Temperature#####
Minimum TMIN = -50.00 C
#####Maximum Temperature#####
Maximum TMAX = 52.20 C
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00413618 - Average Max Temperature = 36.17 C
Hottest Station 2: USC00042319 - Average Max Temperature = 34.70 C
Hottest Station 3: USC00040924 - Average Max Temperature = 34.06 C
Hottest Station 4: USW00003145 - Average Max Temperature = 33.77 C
Hottest Station 5: USC00029656 - Average Max Temperature = 33.58 C
#####Coldest Stations Based on Average#####
Coldest Station 1: USC00238456 - Average Min Temperature = -25.53 C
Coldest Station 2: USC00210746 - Average Min Temperature = -24.94 C
Coldest Station 3: USC00210050 - Average Min Temperature = -24.26 C
Coldest Station 4: USC00320450 - Average Min Temperature = -23.89 C
Coldest Station 5: USC00208680 - Average Min Temperature = -23.30 C
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00042319 - Highest Max Temperature = 52.20 C
Hottest Station 2: USW00053139 - Highest Max Temperature = 51.10 C
Hottest Station 3: USC00028396 - Highest Max Temperature = 49.40 C
Hottest Station 4: USR0000CBUU - Highest Max Temperature = 48.90 C
Hottest Station 5: USC00020672 - Highest Max Temperature = 48.90 C
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USC00501684 - Lowest Min Temperature = -50.00 C
Coldest Station 2: USS0045R01S - Lowest Min Temperature = -47.90 C
Coldest Station 3: USR0000ABCK - Lowest Min Temperature = -47.20 C
Coldest Station 4: USR0000AFYK - Lowest Min Temperature = -47.20 C
Coldest Station 5: USR0000ACOA - Lowest Min Temperature = -46.70 C

Year 2015:

```
Stats for year 2015
#####
#####Average Min Temperature#####
Average TMIN = 5.34 C
#####
#####Average Max Temperature#####
Average TMAX = 17.71 C
#####
#####Minimum Temperature#####
Minimum TMIN = -52.80 C
#####
#####Maximum Temperature#####
Maximum TMAX = 55.60 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00092593 - Average Max Temperature = 34.65 C
Hottest Station 2: USC00403379 - Average Max Temperature = 34.63 C
Hottest Station 3: USC00414278 - Average Max Temperature = 34.57 C
Hottest Station 4: USC00040924 - Average Max Temperature = 34.40 C
Hottest Station 5: USC00042319 - Average Max Temperature = 34.05 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USC00158551 - Average Min Temperature = -32.20 C
Coldest Station 2: USC00210050 - Average Min Temperature = -31.95 C
Coldest Station 3: USC00242347 - Average Min Temperature = -24.18 C
Coldest Station 4: USC00508130 - Average Min Temperature = -21.84 C
Coldest Station 5: USC00503212 - Average Min Temperature = -20.01 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USR0000HKAU - Highest Max Temperature = 55.60 C
Hottest Station 2: USC00042319 - Highest Max Temperature = 51.70 C
Hottest Station 3: USW00053139 - Highest Max Temperature = 49.90 C
Hottest Station 4: USR0000CBUU - Highest Max Temperature = 48.90 C
Hottest Station 5: USC00045502 - Highest Max Temperature = 48.30 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USC00502339 - Lowest Min Temperature = -52.80 C
Coldest Station 2: USC00501684 - Lowest Min Temperature = -50.60 C
Coldest Station 3: USS0041P07S - Lowest Min Temperature = -49.10 C
Coldest Station 4: USC00509314 - Lowest Min Temperature = -48.90 C
Coldest Station 5: USW00026533 - Lowest Min Temperature = -48.80 C
```

Year 2016:

```
Stats for year 2016
#####
#####Average Min Temperature#####
Average TMIN = 5.50 C
#####
#####Average Max Temperature#####
Average TMAX = 17.90 C
#####
#####Minimum Temperature#####
Minimum TMIN = -46.90 C
#####
#####Maximum Temperature#####
Maximum TMAX = 53.90 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00412906 - Average Max Temperature = 40.48 C
Hottest Station 2: USC00297461 - Average Max Temperature = 36.31 C
Hottest Station 3: USC00415101 - Average Max Temperature = 35.60 C
Hottest Station 4: USC00406340 - Average Max Temperature = 34.30 C
Hottest Station 5: USC00025700 - Average Max Temperature = 34.29 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USC00200234 - Average Min Temperature = -26.65 C
Coldest Station 2: USC00507778 - Average Min Temperature = -18.53 C
Coldest Station 3: USC00210746 - Average Min Temperature = -17.11 C
Coldest Station 4: USC00273860 - Average Min Temperature = -13.98 C
Coldest Station 5: USW00027401 - Average Min Temperature = -13.77 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USR0000CBEV - Highest Max Temperature = 53.90 C
Hottest Station 2: USC00042319 - Highest Max Temperature = 52.80 C
Hottest Station 3: USC00040924 - Highest Max Temperature = 52.20 C
Hottest Station 4: USW00053139 - Highest Max Temperature = 51.70 C
Hottest Station 5: USW00023179 - Highest Max Temperature = 51.70 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USS0051R01S - Lowest Min Temperature = -46.90 C
Coldest Station 2: USR0000ACHL - Lowest Min Temperature = -46.70 C
Coldest Station 3: USC00501684 - Lowest Min Temperature = -46.70 C
Coldest Station 4: USS0045R01S - Lowest Min Temperature = -45.60 C
Coldest Station 5: USS0041P07S - Lowest Min Temperature = -44.30 C
```

Year 2017:

```
Stats for year 2017
#####
#####Average Min Temperature#####
Average TMIN = 5.27 C
#####
#####Average Max Temperature#####
Average TMAX = 17.66 C
#####
#####Minimum Temperature#####
Minimum TMIN = -52.00 C
#####
#####Maximum Temperature#####
Maximum TMAX = 52.80 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USC00044297 - Average Max Temperature = 36.62 C
Hottest Station 2: USC00022790 - Average Max Temperature = 35.99 C
Hottest Station 3: USC00042319 - Average Max Temperature = 34.15 C
Hottest Station 4: USC00029656 - Average Max Temperature = 33.87 C
Hottest Station 5: USC00020632 - Average Max Temperature = 33.60 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USC00503567 - Average Min Temperature = -22.89 C
Coldest Station 2: USC00503585 - Average Min Temperature = -21.92 C
Coldest Station 3: USC00322525 - Average Min Temperature = -17.07 C
Coldest Station 4: USC00421590 - Average Min Temperature = -15.75 C
Coldest Station 5: USC00253617 - Average Min Temperature = -15.37 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00042319 - Highest Max Temperature = 52.80 C
Hottest Station 2: USC00021050 - Highest Max Temperature = 52.20 C
Hottest Station 3: USW00053139 - Highest Max Temperature = 51.80 C
Hottest Station 4: USW00023179 - Highest Max Temperature = 51.70 C
Hottest Station 5: USR0000AHAV - Highest Max Temperature = 51.10 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USS0051R01S - Lowest Min Temperature = -52.00 C
Coldest Station 2: USR0000ASLC - Lowest Min Temperature = -50.60 C
Coldest Station 3: USW00026529 - Lowest Min Temperature = -50.60 C
Coldest Station 4: USR0000ALIV - Lowest Min Temperature = -49.40 C
Coldest Station 5: USS0045004S - Lowest Min Temperature = -49.10 C
```

Year 2018:

```
Stats for year 2018
#####
#####Average Min Temperature#####
Average TMIN = -3.42 C
#####
#####Average Max Temperature#####
Average TMAX = 8.26 C
#####
#####Minimum Temperature#####
Minimum TMIN = -52.80 C
#####
#####Maximum Temperature#####
Maximum TMAX = 41.70 C
#####
#####Hottest Stations Based on Average#####
Hottest Station 1: USW00092826 - Average Max Temperature = 28.15 C
Hottest Station 2: USC00515710 - Average Max Temperature = 28.00 C
Hottest Station 3: USC00518422 - Average Max Temperature = 27.81 C
Hottest Station 4: USW00003104 - Average Max Temperature = 27.74 C
Hottest Station 5: USW00092809 - Average Max Temperature = 27.72 C
#####
#####Coldest Stations Based on Average#####
Coldest Station 1: USC00501684 - Average Min Temperature = -26.99 C
Coldest Station 2: USC00210809 - Average Min Temperature = -26.55 C
Coldest Station 3: USR0000AUMI - Average Min Temperature = -25.80 C
Coldest Station 4: USS0051R01S - Average Min Temperature = -25.04 C
Coldest Station 5: USR0000ANOR - Average Min Temperature = -24.88 C
#####
#####Hottest Stations Based on Temperature#####
Hottest Station 1: USC00415060 - Highest Max Temperature = 41.70 C
Hottest Station 2: USW00012907 - Highest Max Temperature = 40.60 C
Hottest Station 3: USR0000TFAL - Highest Max Temperature = 40.60 C
Hottest Station 4: USC00412950 - Highest Max Temperature = 40.00 C
Hottest Station 5: USC00415861 - Highest Max Temperature = 40.00 C
#####
#####Coldest Stations Based on Temperature#####
Coldest Station 1: USC00502339 - Lowest Min Temperature = -52.80 C
Coldest Station 2: USC00501684 - Lowest Min Temperature = -47.80 C
Coldest Station 3: USR0000AKAV - Lowest Min Temperature = -47.80 C
Coldest Station 4: USR0000ANOR - Lowest Min Temperature = -47.80 C
Coldest Station 5: USW00096406 - Lowest Min Temperature = -47.50 C
```

Entire Dataset Analysis:

```
#####
#####Entire Dataset Analysis#####
#####

Coldest Day and Corresponding Weather Station
-----
Coldest Temperature has been observed on 20080207 in City USC00501684 with a temperature of -57.80 C

-----
Hottest Day and Corresponding Weather Station
-----
Hottest Temperature has been observed on 20150213 in City USR0000HKAU with a temperature of 55.60 C
```

Summary In Tabular Form:

Year wise Analysis:

Year	Average TMIN	Average TMAX	Min Temp	Max Temp
2000	4.43 C	17.56 C	-57.80 C	52.20 C
2001	4.79 C	17.88 C	-52.80 C	52.80 C
2002	4.66 C	17.72 C	-47.20 C	53.30 C
2003	4.86 C	17.71 C	-50.00 C	53.30 C
2004	4.95 C	17.49 C	-53.30 C	51.70 C
2005	4.98 C	17.77 C	-55.00 C	53.90 C
2006	5.09 C	18.07 C	-52.80 C	52.80 C
2007	4.90 C	17.81 C	-53.90 C	55.60 C
2008	4.07 C	17.00 C	-57.80 C	52.80 C
2009	4.34 C	16.88 C	-55.60 C	53.30 C
2010	4.72 C	17.14 C	-53.30 C	51.70 C
2011	4.60 C	17.24 C	-51.70 C	51.10 C
2012	5.34 C	18.38 C	-54.40 C	53.70 C
2013	4.31 C	16.73 C	-52.80 C	53.90 C
2014	4.38 C	16.84 C	-50.00 C	52.20 C
2015	5.34 C	17.71 C	-52.80 C	55.60 C
2016	5.50 C	17.90 C	-46.90 C	53.90 C
2017	5.27 C	17.66 C	-52.00 C	52.80 C
2018	-3.42 C	8.26 C	-52.80 C	41.70 C

Year	Rank	Average Model			Max-Min Model			Coldest Station	Temp
		Hottest Station	Temp	Coldest Station	Temp	Hottest Station	Temp		
2000	1	USC00416892	37.36 C	USC00508140	-20.78 C	USC00042319	52.20 C	USC00501684	-57.80 C
2000	2	USC00411013	36.86 C	USC00505873	-18.74 C	USR0000AHAV	49.40 C	USC00505644	-57.80 C
2000	3	USC00045502	36.76 C	USR0000WBAR	-18.10 C	USC00024761	49.40 C	USC00508140	-53.90 C
2000	4	USC00024761	34.96 C	USC00247248	-16.00 C	USC00021050	49.40 C	USW00026440	-51.70 C
2000	5	USC00021026	34.01 C	USW00026508	-15.69 C	USC00029376	48.90 C	USC00509313	-51.10 C
2001	1	USC00045502	35.65 C	USR0000AHAY	-31.70 C	USC00042319	52.80 C	USW00026508	-52.80 C
2001	2	USC00022434	35.09 C	USW00026508	-29.86 C	USR0000CMOJ	50.60 C	USR0000ABCA	-51.10 C
2001	3	USC00026250	33.96 C	USC00508409	-18.67 C	USC00265085	50.00 C	USS0051R01S	-48.00 C
2001	4	USC00024761	33.90 C	USW00026440	-18.54 C	USC00024829	50.00 C	USC00504567	-46.10 C
2001	5	USC00042319	33.80 C	USC00509315	-18.43 C	USR0000AHAV	50.00 C	USC00508470	-46.10 C
2002	1	USC00022807	34.62 C	USR0000NHAM	-19.20 C	USC00042319	53.30 C	USR0000AKAI	-47.20 C
2002	2	USC00347254	34.40 C	USS0051R01S	-18.97 C	USR0000CMOJ	50.00 C	USS0050S01S	-47.00 C
2002	3	USC00042319	33.92 C	USC00502873	-17.28 C	USC00265846	50.00 C	USS0051R01S	-47.00 C
2002	4	USC00044259	33.44 C	USC00501987	-15.05 C	USC00265085	48.90 C	USR0000ABEV	-46.70 C
2002	5	USR0000CBUU	32.79 C	USC00263101	-14.81 C	USR0000AHAV	48.90 C	USC00503212	-46.10 C
2003	1	USC00344766	36.20 C	USS0045M075	-20.06 C	USC00042319	53.30 C	USC00501492	-50.00 C
2003	2	USC00026194	35.07 C	USS0048V01S	-17.77 C	USR0000CMEA	52.80 C	USS0051R01S	-49.00 C
2003	3	USC00045502	34.70 C	USC00433581	-16.60 C	USR0000AHAV	52.20 C	USW00026533	-48.30 C
2003	4	USR0000CWIL	34.56 C	USC00067373	-16.30 C	USC00021050	51.10 C	USS0050S01S	-48.00 C
2003	5	USC00412906	34.31 C	USC00503181	-15.68 C	USC00029376	50.60 C	USC00509869	-46.70 C
2004	1	USC00042346	37.07 C	USR0000ACOA	-25.44 C	USC00042319	51.70 C	USC00501684	-53.30 C
2004	2	USW00053139	34.80 C	USR0000AOKL	-21.70 C	USC00024761	51.10 C	USC00502568	-50.60 C
2004	3	USR0000CMIO	34.34 C	USR0000ASTU	-21.70 C	USW00053139	49.50 C	USW00026412	-50.00 C
2004	4	USW00023195	33.65 C	USR0000NLIM	-21.00 C	USC00261371	48.90 C	USS0045O10S	-50.00 C
2004	5	USC00044259	33.41 C	USC00306957	-19.66 C	USC00021050	48.90 C	USC00502350	-50.00 C
2005	1	USR0000MKIL	34.00 C	USR0000AFYK	-41.10 C	USC00042319	53.90 C	USC00501684	-55.00 C
2005	2	USC00290525	33.98 C	USR0000AUMI	-38.30 C	USW00053139	51.90 C	USC00509313	-52.80 C
2005	3	USC00427606	33.51 C	USR0000ADEV	-28.90 C	USR0000CMOJ	51.70 C	USC00509869	-51.70 C
2005	4	USC00383906	32.92 C	USC00305925	-27.80 C	USW00023179	51.70 C	USW00026412	-51.10 C
2005	5	USC00311515	32.65 C	USR0000AWLL	-23.90 C	USC00029376	51.10 C	USC00502568	-51.10 C

2006	1	USC00021514	40.80 C	USC00505534	-24.16 C	USC00042319	52.80 C	USR0000ASEL	-52.80 C
2006	2	USC00419122	36.24 C	USC00508130	-17.84 C	USW00053139	51.10 C	USC00501492	-52.20 C
2006	3	USC00080611	35.00 C	USC00210059	-17.19 C	USC00044259	50.00 C	USR0000ABEV	-51.10 C
2006	4	USR0000HMOL	34.02 C	USS0049T03S	-17.15 C	USC00045502	50.00 C	USR0000ACHL	-50.60 C
2006	5	USC00042319	33.45 C	USS0045Q05S	-16.40 C	USR0000CMOJ	50.00 C	USC00501684	-50.00 C
2007	1	USC00314987	38.30 C	USC00502707	-25.97 C	USR0000CSAW	55.60 C	USC00501684	-53.90 C
2007	2	USC00029376	35.48 C	USR0000AUMI	-25.45 C	USC00042319	53.90 C	USS0045R01S	-50.10 C
2007	3	USR0000HMOL	34.62 C	USC00248857	-23.30 C	USW00053139	52.30 C	USW00026422	-49.30 C
2007	4	USC00042319	33.99 C	USC00509315	-20.01 C	USR0000CMOJ	51.70 C	USC00502607	-48.90 C
2007	5	USC00041048	33.78 C	USC00502107	-17.07 C	USR0000AHAV	50.60 C	USR0000ACHL	-48.90 C
2008	1	USC00411671	35.08 C	USS0051R01S	-25.96 C	USC00044297	52.80 C	USC00501684	-57.80 C
2008	2	USC00254113	35.01 C	USC00509315	-24.43 C	USC00042319	52.80 C	USR0000ACHL	-52.20 C
2008	3	USW00003125	34.88 C	USC00390223	-19.74 C	USC00024761	51.10 C	USC00501492	-52.20 C
2008	4	USR0000HMOL	34.50 C	USC00391917	-19.41 C	USW00053139	50.80 C	USS0045R01S	-52.00 C
2008	5	USC00044259	34.39 C	USC00476838	-19.25 C	USC00261371	50.00 C	USW00026412	-51.10 C
2009	1	USC00141408	37.80 C	USC00501492	-33.43 C	USC00042319	53.30 C	USC00501684	-55.60 C
2009	2	USR0000HMOL	36.21 C	USC00471618	-30.54 C	USW00053139	50.90 C	USC00502101	-55.60 C
2009	3	USC00144530	36.10 C	USC00509315	-27.51 C	USR0000AHAV	49.40 C	USC00509313	-52.80 C
2009	4	USC00027370	34.46 C	USC00502015	-24.43 C	USR0000CSQU	49.40 C	USR0000ACHL	-52.20 C
2009	5	USC00046198	34.25 C	USC00212916	-23.43 C	USR0000CBUU	49.40 C	USR0000AEAG	-51.70 C
2010	1	USC00141408	35.00 C	USC00507097	-24.05 C	USC00042319	51.70 C	USC00501684	-53.30 C
2010	2	USC00417951	34.93 C	USR0000MKIL	-22.85 C	USR0000AHAV	51.10 C	USC00502101	-53.30 C
2010	3	USC00027370	33.36 C	USC00505873	-22.80 C	USW00053139	50.40 C	USS0051R01S	-51.90 C
2010	4	USC00028070	33.32 C	USR0000MOSC	-22.79 C	USR0000CBUU	49.40 C	USR0000ACHL	-51.70 C
2010	5	USC00341544	33.11 C	USR0000MBRV	-21.85 C	USR0000CMOJ	49.40 C	USS0045R01S	-51.50 C

2011	1	USR0000CTAR	37.80 C	USC00479012	-34.40 C	USC00042319	51.10 C	USC00509869	-51.70 C
2011	2	USC00411416	37.04 C	USC00509314	-24.56 C	USR0000CCAA	50.00 C	USS0045R01S	-50.70 C
2011	3	USC00035514	36.10 C	USR0000MOSC	-22.87 C	USR0000CBUU	49.40 C	USS0051R01S	-50.20 C
2011	4	USC00412350	34.40 C	USR0000MBRV	-22.75 C	USC00022782	49.40 C	USC00501684	-50.00 C
2011	5	USR0000HMOL	34.36 C	USC0050136	-22.55 C	USW00053139	49.00 C	USC00501492	-49.40 C
2012	1	USW00012946	35.87 C	USC00504210	-28.25 C	USS0005N23S	53.70 C	USC00503165	-54.40 C
2012	2	USC00290915	35.38 C	USC00504971	-27.47 C	USC00042319	53.30 C	USC00503212	-53.90 C
2012	3	USC00412906	34.83 C	USC00503368	-22.78 C	USW00053139	51.20 C	USS0051R01S	-53.60 C
2012	4	USC00040924	34.60 C	USC00508156	-22.27 C	USC00020672	49.40 C	USR0000AFYK	-53.30 C
2012	5	USC00042319	34.45 C	USR0000MKIL	-22.04 C	USR0000AHAV	49.40 C	USC00504210	-53.30 C
2013	1	USC00260125	36.91 C	USR0000ASLC	-35.73 C	USC00042319	53.90 C	USC00502339	-52.80 C
2013	2	USC00042319	33.70 C	USC00201940	-24.40 C	USW00004134	53.30 C	USC00501684	-52.20 C
2013	3	USC00042410	33.62 C	USR0000MBRV	-21.63 C	USC00044297	52.80 C	USS0051R01S	-50.50 C
2013	4	USC00025270	33.33 C	USR0000ABUU	-20.31 C	USW00053139	52.00 C	USS0045R01S	-50.20 C
2013	5	USC00021050	32.98 C	USC00503212	-20.29 C	USC00045502	50.60 C	USR0000ABCK	-50.00 C
2014	1	USC00413618	36.17 C	USC00238456	-25.53 C	USC00042319	52.20 C	USC00501684	-50.00 C
2014	2	USC00042319	34.70 C	USC00210746	-24.94 C	USW00053139	51.10 C	USS0045R01S	-47.90 C
2014	3	USC00040924	34.06 C	USC00210050	-24.26 C	USC00028396	49.40 C	USR0000ABCK	-47.20 C
2014	4	USW00003145	33.77 C	USC00320450	-23.89 C	USR0000CBUU	48.90 C	USR0000AFYK	-47.20 C
2014	5	USC00029656	33.58 C	USC00208680	-23.30 C	USC00020672	48.90 C	USR0000ACOA	-46.70 C
2015	1	USC00092593	34.65 C	USC00158551	-32.20 C	USR0000HKAU	55.60 C	USC00502339	-52.80 C
2015	2	USC00403379	34.63 C	USC00210050	-31.95 C	USC00042319	51.70 C	USC00501684	-50.60 C
2015	3	USC00414278	34.57 C	USC00242347	-24.18 C	USW00053139	49.90 C	USS0041P07S	-49.10 C
2015	4	USC00040924	34.40 C	USC00508130	-21.84 C	USR0000CBUU	48.90 C	USC00509314	-48.90 C
2015	5	USC00042319	34.05 C	USC00503212	-20.01 C	USC00045502	48.30 C	USW00026533	-48.80 C

2016	1	USC00412906	40.48 C	USC00200234	-26.65 C	USR0000CBEV	53.90 C	USS0051R01S	-46.90 C
2016	2	USC00297461	36.31 C	USC00507778	-18.53 C	USC00042319	52.80 C	USR0000ACHL	-46.70 C
2016	3	USC00415101	35.60 C	USC00210746	-17.11 C	USC00040924	52.20 C	USC00501684	-46.70 C
2016	4	USC00406340	34.30 C	USC00273860	-13.98 C	USW00053139	51.70 C	USS0045R01S	-45.60 C
2016	5	USC00025700	34.29 C	USW00027401	-13.77 C	USW00023179	51.70 C	USS0041P07S	-44.30 C
2017	1	USC00044297	36.62 C	USC00503567	-22.89 C	USC00042319	52.80 C	USS0051R01S	-52.00 C
2017	2	USC00022790	35.99 C	USC00503585	-21.92 C	USC00021050	52.20 C	USR0000ASLC	-50.60 C
2017	3	USC00042319	34.15 C	USC00322525	-17.07 C	USW00053139	51.80 C	USW00026529	-50.60 C
2017	4	USC00029656	33.87 C	USC00421590	-15.75 C	USW00023179	51.70 C	USR0000ALIV	-49.40 C
2017	5	USC00020632	33.60 C	USC00253617	-15.37 C	USR0000AHAV	51.10 C	USS0045O04S	-49.10 C
2018	1	USW00092826	28.15 C	USC00501684	-26.99 C	USC00415060	41.70 C	USC00502339	-52.80 C
2018	2	USC00515710	28.00 C	USC00210809	-26.55 C	USW00012907	40.60 C	USC00501684	-47.80 C
2018	3	USC00518422	27.81 C	USR0000AUMI	-25.80 C	USR0000TFAL	40.60 C	USR0000AKAV	-47.80 C
2018	4	USW00003104	27.74 C	USS0051R01S	-25.04 C	USC00412950	40.00 C	USR0000ANOR	-47.80 C
2018	5	USW00092809	27.72 C	USR0000ANOR	-24.88 C	USC00415861	40.00 C	USW00096406	-47.50 C

Entire Data Analysis:

Day Type	Date	Station	Temperature
Hottest Day	20150213	USR0000HKAU	55.60 C
Coldest Day	20080207	USC00501684	-57.80 C