The background is a dark blue gradient with a starry or particle-like texture. On the left side, there are several overlapping circular elements. One prominent feature is a large circular scale with tick marks and numbers ranging from 140 to 260. Other circles contain curved lines and arrows, suggesting a network or a process. The overall aesthetic is technical and scientific.

ORGANIZING THE GLOBAL HISTORICAL CLIMATOLOGY NETWORK

JILL HARDY

RACE CLARK

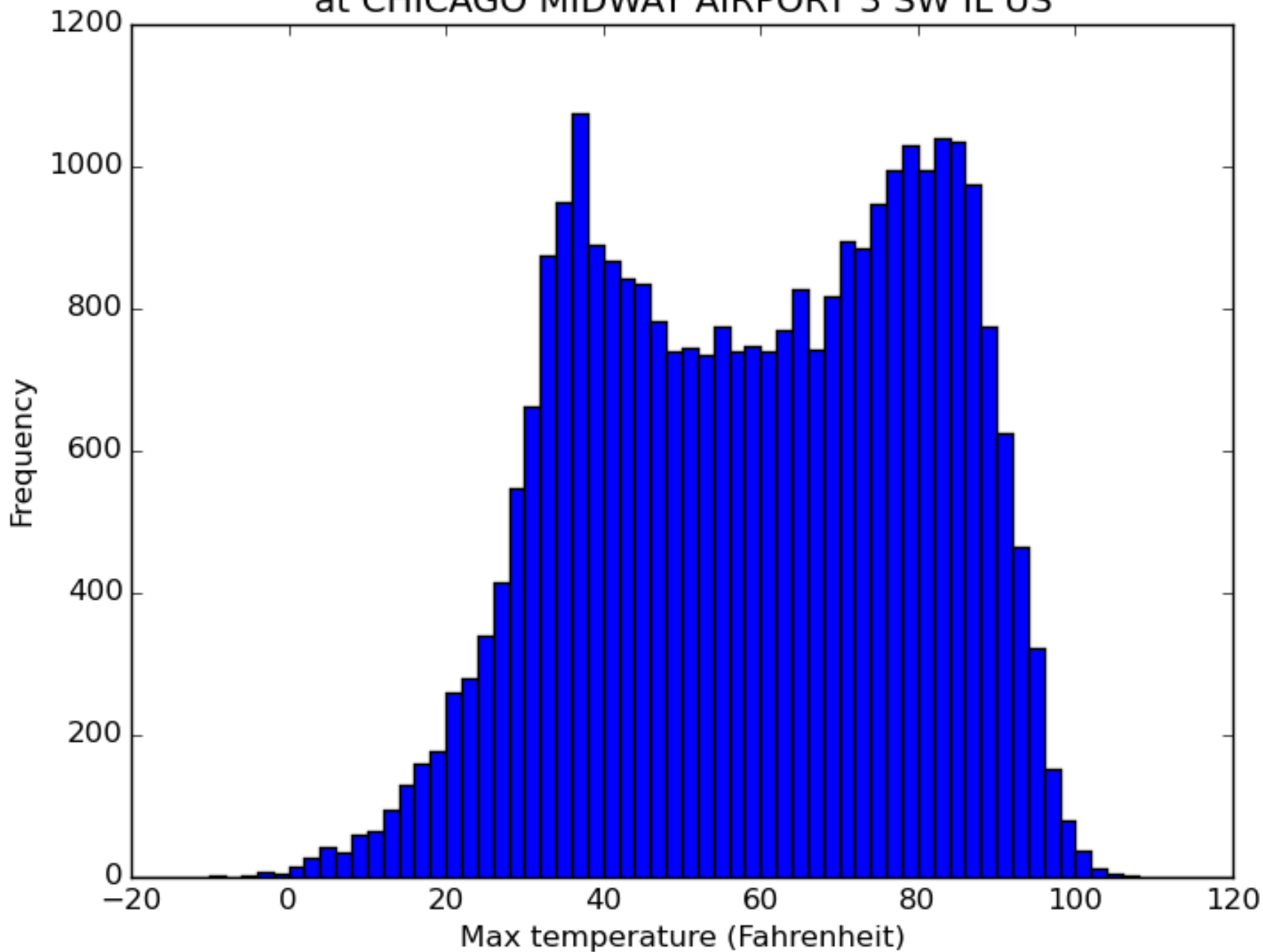
CHRIS NATOLI

WILLIAM MATTHEWS

TEMPERATURES: AVERAGES, RECORDS, AND EVERYTHING IN BETWEEN

- What is “normal”?
- What is a “record”?
- “Strong” and “weak” records
- Climate change

Max temperatures for entire year at CHICAGO MIDWAY AIRPORT 3 SW IL US



86 years of maximum
temperatures

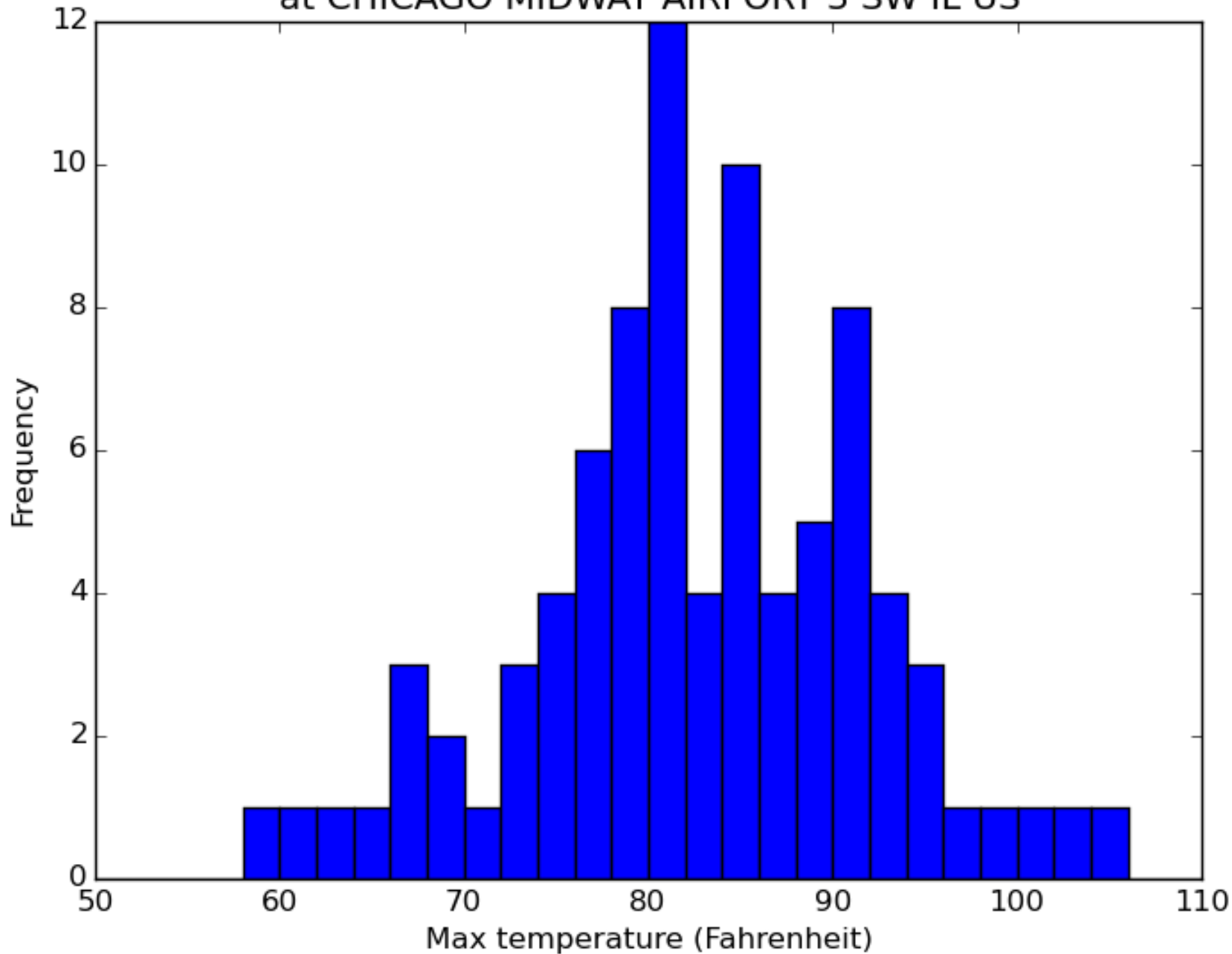
Over 31,000 total
measurements

Bimodal

Wide range –
continental climate

Can tell us rarity of all-
time highs or all-time
lows

Max temperatures for June 20
at CHICAGO MIDWAY AIRPORT 3 SW IL US



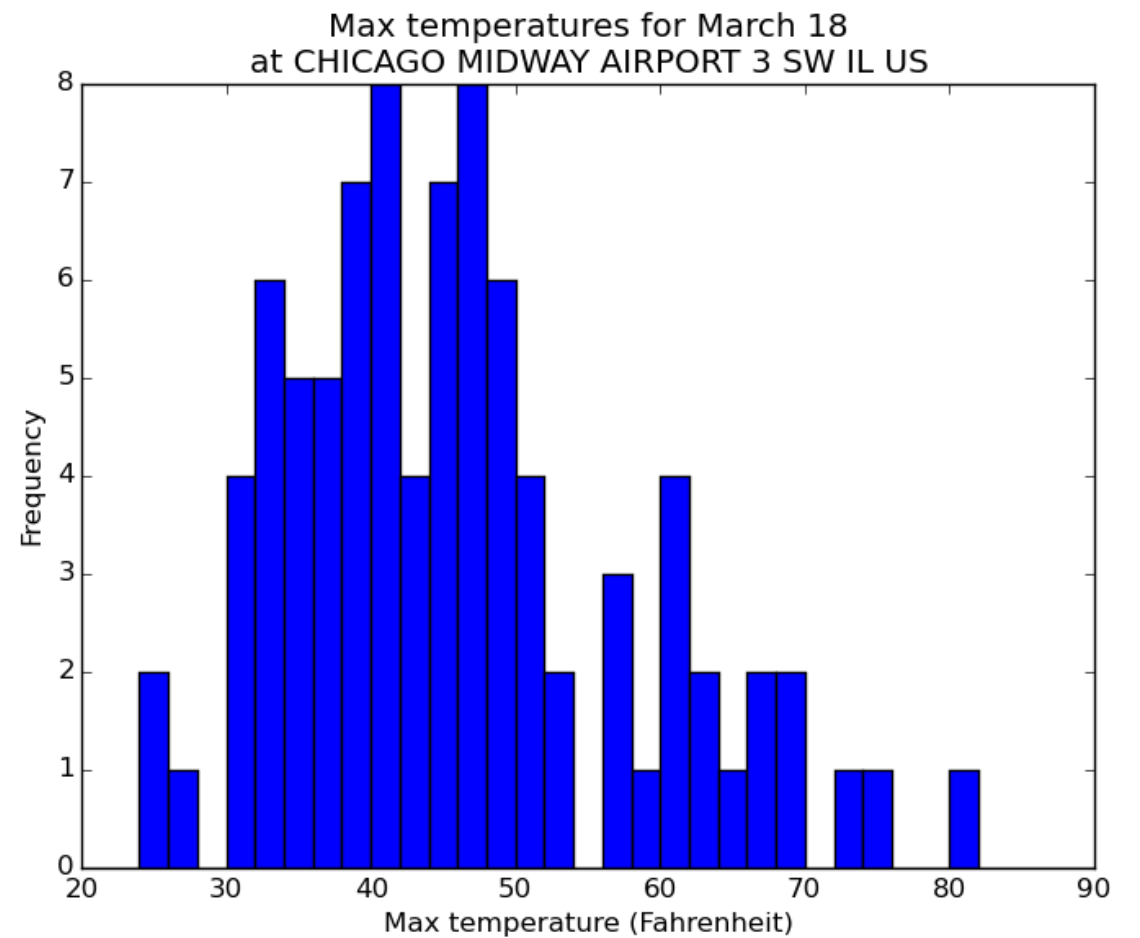
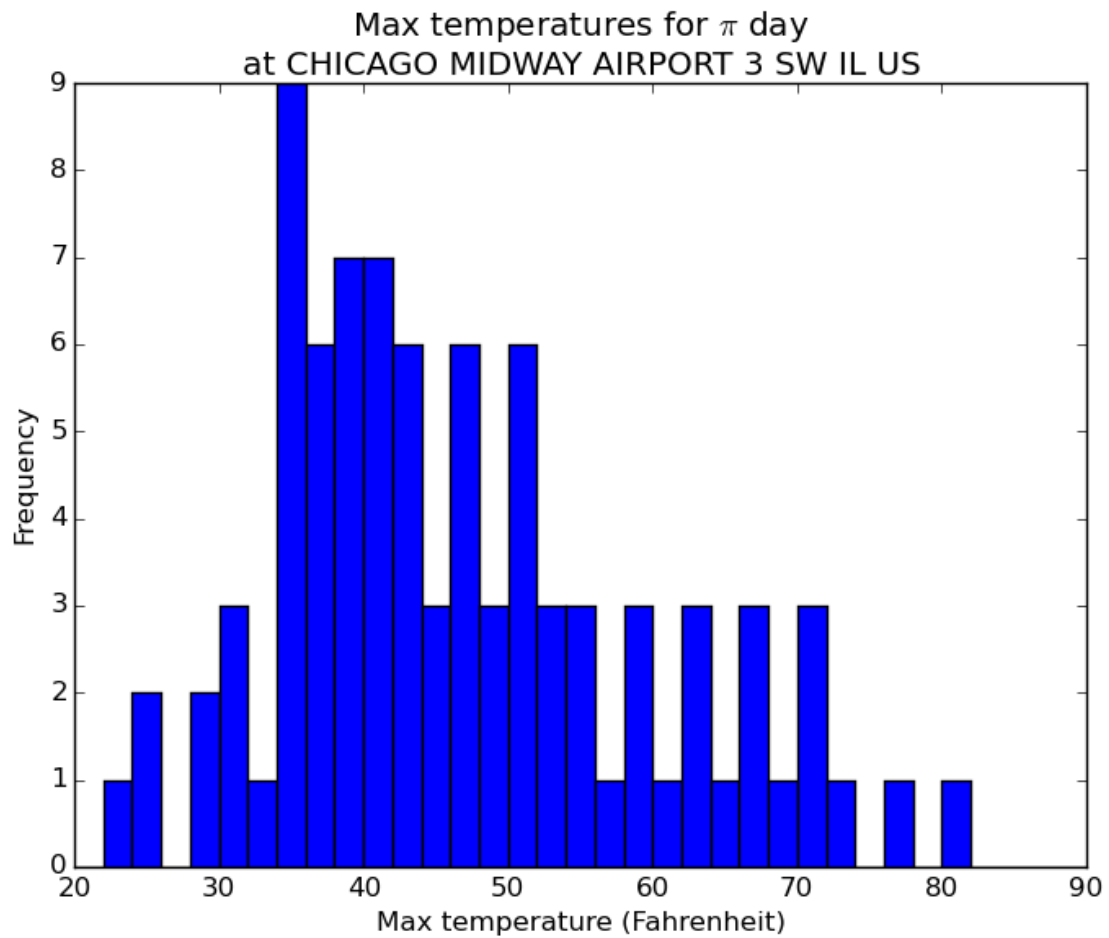
Now only 86 data points

Normal distribution

Wide variation still

No outliers

What if we could plot
the temperature ranges
as an animation through
the year?



Outliers! (20s on Pi Day and Spring Break Or 80s)

Wide variation

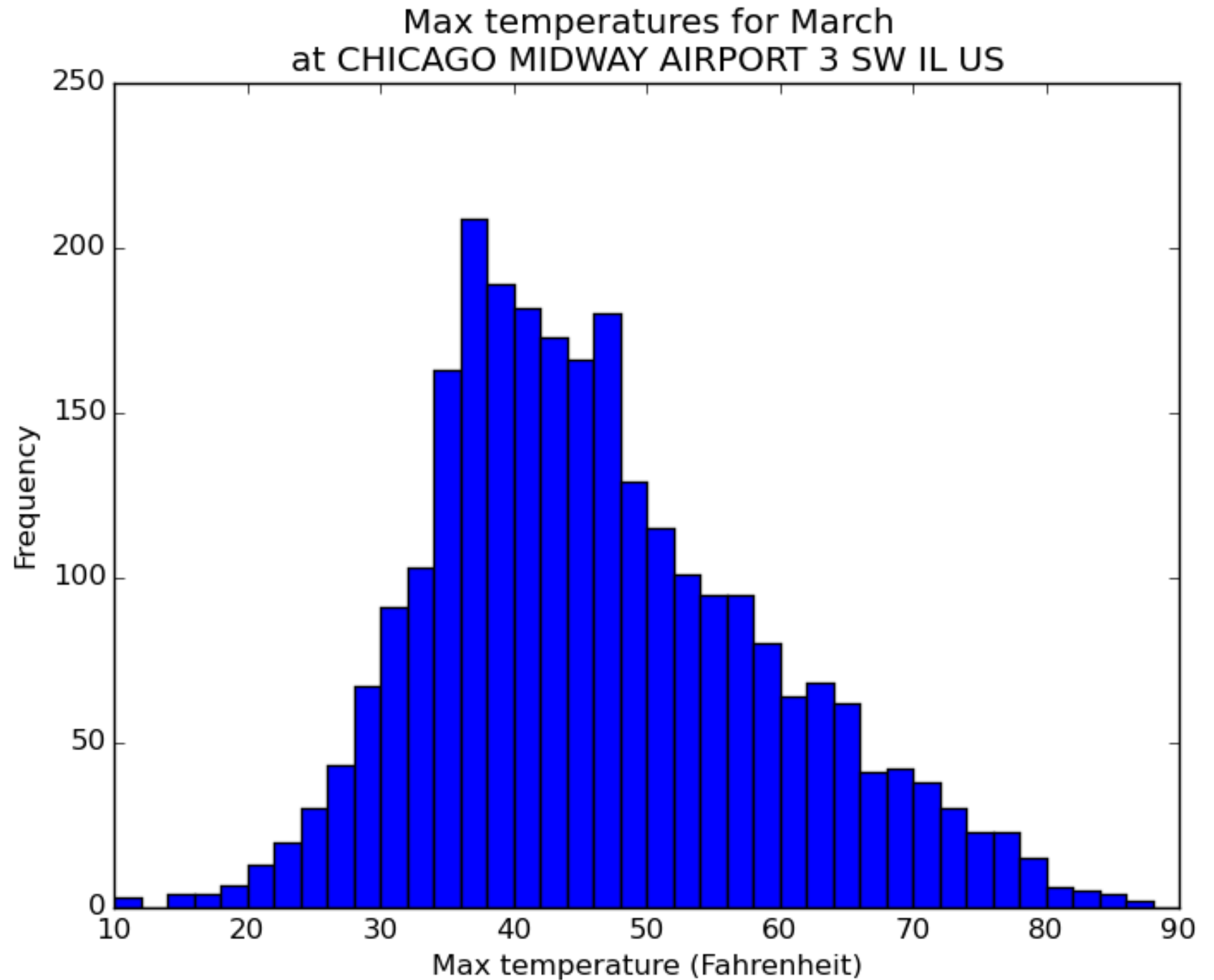
Long warm tail

Nearly 2,700 points

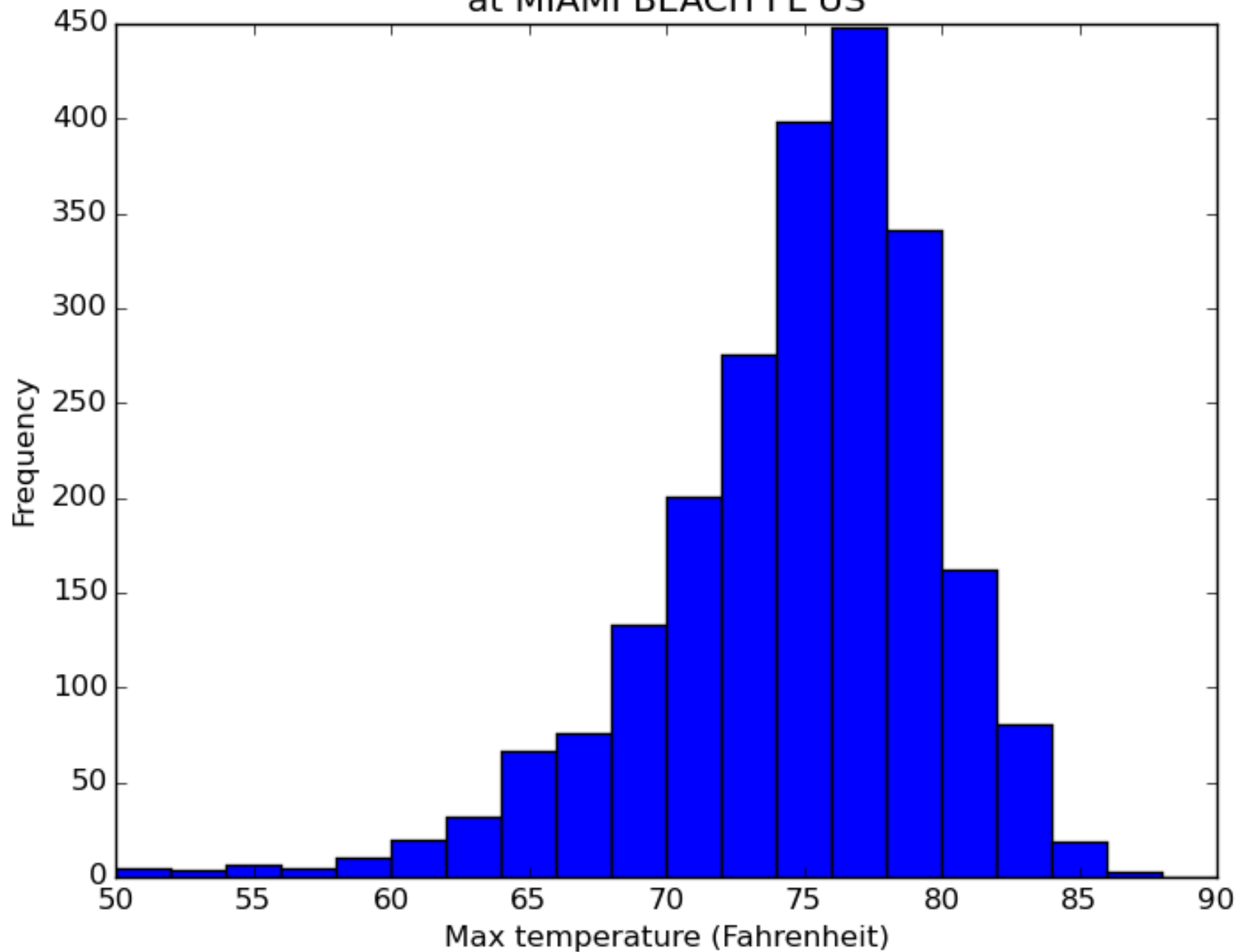
All those above 80
recorded in one week in
2012

Extremely unlikely!

Note 10 to 90F range....



Max temperatures for January at MIAMI BEACH FL US

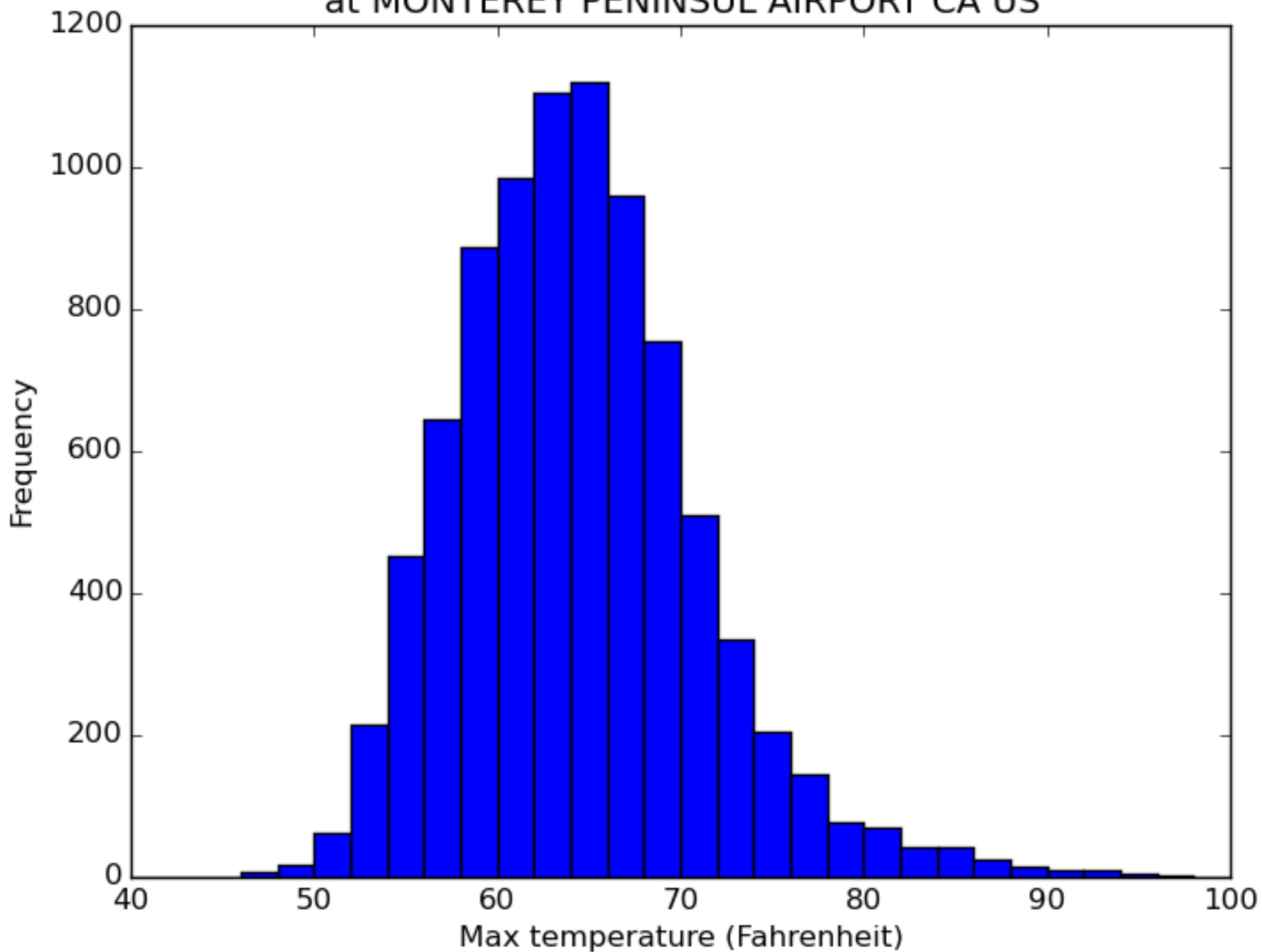


Tighter distribution

Subtropical climate

Now you see a cold tail

Max temperatures for entire year
at MONTEREY PENINSUL AIRPORT CA US



Tighter distribution

Mediterranean climate

When people in California say 80 or 90 is hot, you know they mean it....


```

import matplotlib.pyplot as plt
import csv

# Convert temperature from tenths of degree Celsius to degree Fahrenheit
# and round to nearest int.
def convert_temp(c):
    c = float(c) / 10
    f = 9 / 5 * c + 32
    return int(f + 0.5)

num_to_month = {1: 'January', 2: 'February', 3: 'March', 4: 'April',
                5: 'May', 6: 'June', 7: 'July', 8: 'August',
                9: 'September', 10: 'October', 11: 'November', 12: 'December'}

filenames = ('chicago', 'chula_vista', 'miami', 'memphis', 'monterey', 'okc',
             'vienna')

[]

# For each location, plot a histogram of the entire year of data
# and one for each month.
for filename in filenames:
    data = []
    with open(filename + '.csv') as input_file:
        reader = csv.reader(input_file)
        next(reader)
        for row in reader:
            for i in range(1,3):
                row[-i] = convert_temp(row[-i])
                data.append(row)

    # Extract all max temperatures and monthly max temperatures.
    tmaxes = [ int(row[-2]) for row in data if row[-2] != -999.9 ]
    monthly_tmaxes = [ [ row[-2] for row in data
                        if row[-2] != -999.9 and int(row[-3][4:6]) == i ]
                      for i in range(1,13) ]

    # Plot a histogram of the entire year of data. Bin width is 2 degrees.
    plt.hist(tmaxes, 100, (-50,150))
    plt.xlabel('Max temperature (Fahrenheit)')
    plt.ylabel('Frequency')
    plt.title('Max temperatures for entire year\nat {}'.format(data[0][1]))
    plt.savefig('plots/' + filename + '_all.png')

```

```

--- temperatures.py Top L20 (Python)
Wrote /home/chris/osdc/temperatures.py

```

```

plt.title('Max temperatures for entire year\nat {}'.format(data[0][1]))
plt.savefig('plots/' + filename + '_all.png')
plt.close()

# Plot a histogram for each month with bin width of 2 degrees.
for i in range(1,13):
    plt.hist(monthly_tmaxes[i-1], 100, (-50,150))
    plt.xlabel('Max temperature (Fahrenheit)')
    plt.ylabel('Frequency')
    plt.title('Max temperatures for {}\nat {}'.format(num_to_month[i],
                                                    data[0][1]))

    plt.savefig('plots/' + filename + '_' + num_to_month[i] + '.png')
    plt.close()

# Also, plot March 18 data for Chicago since it was a particularly
# extreme day in 2012.
data = []
with open('chicago.csv') as input_file:
    reader = csv.reader(input_file)
    next(reader)
    for row in reader:
        for i in range(1,3):
            try:
                row[-i] = convert_temp(row[-i])
            except:
                print(row)
            data.append(row)
day_tmaxes = [ int(row[-2]) for row in data
               if row[-2] != -999.9 and row[-3][-4:] == '0318' ]
plt.hist(day_tmaxes, 100, (-50,150))
plt.xlabel('Max temperature (Fahrenheit)')
plt.ylabel('Frequency')
plt.title('Max temperatures for March 18\nat {}'.format(data[0][1]))
plt.savefig('plots/chicago_march18.png')

```

```

--- temperatures.py 52% L77 (Python)

```