WeatherPy Analysis

Conclusions:

1. On the graph Latitude vs Max Temperature, some cities have almost the same Latitude, but the variation in temperature between them can achieve 50º F. Most probably, that contradiction is justified by the difference of Longitude between them;

2. Considering the seasons of the year (summer, fall, winter, and spring) and the Earth's axis that is about 23.5º, we could say that as far from latitude 0º we are, as colder the temperature it will be;

3. As a whole, the highest wind speeds take place far from Latitude 0º;

4. The variation of cloudiness percentage around the world is higher than the variation of humidity.

In [1]:
```
# Dependencies
import matplotlib.pyplot as plt
import pandas as pd
import requests as req
import os, json, csv, time, random, datetime
from config import api_key
from citipy import citipy
```

In [2]:
```
# Assign the Cities' file to a variable
cities_file = os.path.join(".", "Resources", "cities.csv")
```

Create a list of cities utilizing citipy library

In [3]:
```
# Create lists with the complete latitudes and longitudes to better analysis accuracy.
lat = [y for y in range (-88, 93, 4)]
lng = [x for x in range (-178, 188, 10)]

# Store the cities in a collection/set. This way we be sure we won't get any duplication.
collection = set()
# Line terminator to append to each city
lineterminator = '\r\n'
# Looping combining Latitudes and Longitudes to get cities
for y in lat:
    for x in lng:
        # Get coordinates randomicaly from a small range.
        rand_y = random.uniform( (y-2), (y+2) )
        rand_x = random.uniform( (x-2), (x+2) )
        # Get the nearest city of current coordinates
        city = citipy.nearest_city(rand_y,rand_x)
        collection.add(f"{city.city_name},{city.country_code}{lineterminator}")

# Preview total of cities
print(f"Total of distinct cities: {len(collection)}")
```

```
Total of distinct cities: 672
```

In [4]:
```
# Save the selected cities in a csv file.
with open(cities_file, 'w') as writeFile:
    # Write the header
    writeFile.write(f"City,Country{lineterminator}")
    # Write the cities
    writeFile.writelines(collection)
```

In [5]:
```
# Read the cities file
cities = pd.read_csv(cities_file, sep=',')
# Convert the selected cities to a DataFrame
df_cities = pd.DataFrame(cities)
# Preview the DataFrame
df_cities.head()
```

Out[5]:

	City	Country
0	parintins	br
1	san quintin	mx
2	araguaina	br
3	miandrivazo	mg
4	sanjwal	pk

In [6]:
```
# Create new fields for city.
df_cities["Cloudiness"] = None
df_cities["Date"] = None
df_cities["Humidity"] = 0
df_cities["Lat"] = 0.0
df_cities["Lng"] = 0.0
```

```
df_cities["Max Temp"] = 0.0
df_cities["Wind Speed"] = 0.0

# Set units to get the temperature in fahrenheit
units = "imperial"

# Set the default URL.
url = f"http://api.openweathermap.org/data/2.5/weather?APPID={api_key}&units={units}"
```

In [7]:
```
# Utilize Open Weather API to fill new fields.
print("-----------------------------")
print("Beginning Data Retrieval")
print("-----------------------------")

# Loop to execute requests for each city.
count = 0
for index, row in df_cities.iterrows():
    # Uncomment the two lines below to process just 20 cities. It will take more than 10 minutes to process all cities.
#     if count == 20:
#         break
    count += 1

    # Add one second interval between requests to be in compliance with  Open Weather
    # API guideline ("Free users can make 60 requests per minute").
    time.sleep(1)

    # Build query URL for current city and print log.
    # Regarding we have cities with same name in different countries, we are appending
    # country code to request the right city.
    city_country = f"{row['City']},{row['Country']}"
    query_url = f"{url}&q={city_country}"
    print(f"Processing Record {count} - ({city_country.replace(',','/')})")
    print(query_url)

    try:
        # Run the request
        result = req.get(query_url).json()
        # Fill fields
        df_cities.loc[index, 'Cloudiness'] = result['clouds']['all']
        df_cities.loc[index, 'Date'] = datetime.datetime.fromtimestamp( int(result['dt']) ).strftime('%Y-%m-%d %H:%M:%S')
        df_cities.loc[index, 'Humidity'] = result['main']['humidity']
        df_cities.loc[index, 'Lat'] = result['coord']["lat"]
        df_cities.loc[index, 'Lng'] = result['coord']["lon"]
        df_cities.loc[index, 'Max Temp'] = result['main']['temp_max']
        df_cities.loc[index, 'Wind Speed'] = result['wind']['speed']
    except:
        print(f"We've got an error when processing city={city_country} - {result}.")
        # Remove the city with error from DF.
        df_cities.drop([index],inplace=True)

print("-----------------------------")
print("Data Retrieval Complete")
print("-----------------------------")

# Remove any City missing data
df_cities.dropna(how="any", inplace=True)
# Reindex DF
df_cities.reset_index(drop=True, inplace=True)
```

```
-----------------------------
Beginning Data Retrieval
-----------------------------
Processing Record 1 - (parintins/br)
http://api.openweathermap.org/data/2.5/weather?APPID=f5072ad53e338012bcc90c7b09683864&units=imperial&q=parintins,br
Processing Record 2 - (san quintin/mx)
http://api.openweathermap.org/data/2.5/weather?APPID=f5072ad53e338012bcc90c7b09683864&units=imperial&q=san quintin,mx
We've got an error when processing city=san quintin,mx - {'cod': '404', 'message': 'city not found'}.
Processing Record 3 - (araguaina/br)
http://api.openweathermap.org/data/2.5/weather?APPID=f5072ad53e338012bcc90c7b09683864&units=imperial&q=araguaina,br
Processing Record 4 - (miandrivazo/mg)
http://api.openweathermap.org/data/2.5/weather?APPID=f5072ad53e338012bcc90c7b09683864&units=imperial&q=miandrivazo,mg
Processing Record 5 - (sanjwal/pk)
http://api.openweathermap.org/data/2.5/weather?APPID=f5072ad53e338012bcc90c7b09683864&units=imperial&q=sanjwal,pk
Processing Record 6 - (chuy/uy)
http://api.openweathermap.org/data/2.5/weather?APPID=f5072ad53e338012bcc90c7b09683864&units=imperial&q=chuy,uy
Processing Record 7 - (port-cartier/ca)
http://api.openweathermap.org/data/2.5/weather?APPID=f5072ad53e338012bcc90c7b09683864&units=imperial&q=port-cartier,ca
Processing Record 8 - (gbarnga/lr)
```

In [8]:
```
# Preview total cities remaining after requests.
print(f"Total cities remaining: {len(df_cities)}")

# Preview new fields filled
df_cities.head()
```

```
Total cities remaining: 575
```

Out[8]:

	City	Country	Cloudiness	Date	Humidity	Lat	Lng	Max Temp	Wind Speed
0	parintins	br	100	2019-07-07 19:03:19	89	-2.63	-56.73	75.74	0.47
1	araguaina	br	62	2019-07-07 19:03:21	75	-7.19	-48.21	76.21	4.85
2	miandrivazo	mg	0	2019-07-07 19:03:23	88	-19.53	45.46	62.47	1.32
3	sanjwal	pk	20	2019-07-07 19:03:24	66	33.76	72.43	87.01	9.17
4	chuy	uy	71	2019-07-07 19:03:25	72	-33.69	-53.46	43.28	5.37

In [9]:
```
df_cities.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 575 entries, 0 to 574
Data columns (total 9 columns):
City          575 non-null object
```

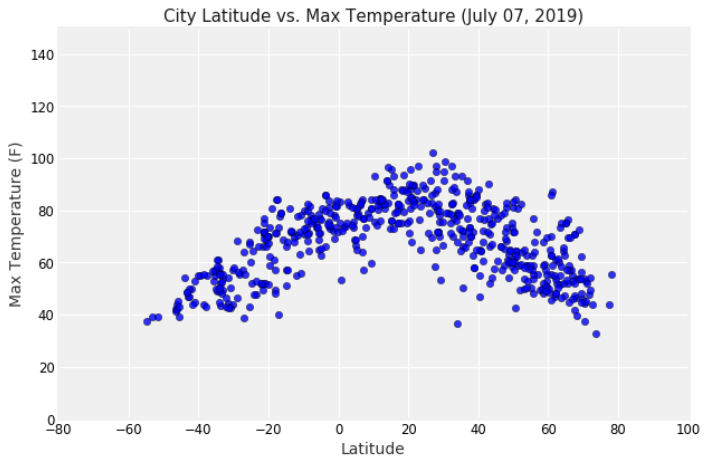
```
Country       575 non-null object
Cloudiness    575 non-null int64
Date          575 non-null object
Humidity      575 non-null int64
Lat           575 non-null float64
Lng           575 non-null float64
Max Temp      575 non-null float64
Wind Speed    575 non-null float64
dtypes: float64(4), int64(2), object(3)
memory usage: 40.5+ KB
```

In [10]:
```
# Get the analysis date. It will be used on title graphs.
analisys_date = df_cities.loc[0:0]["Date"][0]
# Get just the date, cut hour, min, and sec out.
analisys_date = analisys_date[0:10]
# Format date and convert to String
dt = datetime.datetime.strptime(analisys_date, '%Y-%m-%d')
analisys_date = dt.strftime("%B %d, %Y")
```

In [11]:
```
# Set graphs stile
plt.style.use('fivethirtyeight')

# Create a function to set graphs
def set_graph(y_axis, y_lim, title, y_label, image_file_name):
    # Start graph
    fig, ax = plt.subplots(figsize=(9,6))
    fig.set_facecolor('w')

    # Set commom params for all graphs
    x_axis = df_cities["Lat"].tolist()
    x_lim = [-80, 100]
    x_label = "Latitude"

    # Set x and y limits
    ax.set_xlim(x_lim)
    ax.set_ylim(y_lim)

    # Set the title
    ax.set_title(f"{title} ({analisys_date})", alpha=0.9, fontsize=15)

    # Set labels
    ax.set_xlabel(x_label, alpha=0.8, fontsize=14)
    ax.set_ylabel(y_label, alpha=0.8, fontsize=14)

    # Set stick
    ax.tick_params(direction='out', length=0, width=2, grid_color='w', labelsize='small', grid_linewidth=1.2)
    ax.scatter(x_axis, y_axis, marker="o",color="blue",edgecolors='black', s=40, alpha=0.8)

    # Save the graph image
    plt.savefig(image_file_name)
```

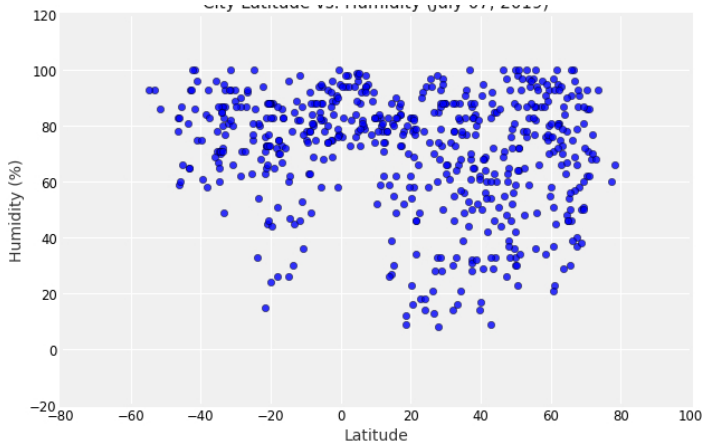
Latitude vs Max Temperature Plot

In [12]:
```
# Set the graph
set_graph(df_cities["Max Temp"].tolist(),     # y_axis
          [0, 150],                           # ylim
          "City Latitude vs. Max Temperature",# Title
          "Max Temperature (F)",              # yLabel
          "Latitude_vs_MaxTemperature.png")   # image_file_name

# Show the Figure
plt.show()
```



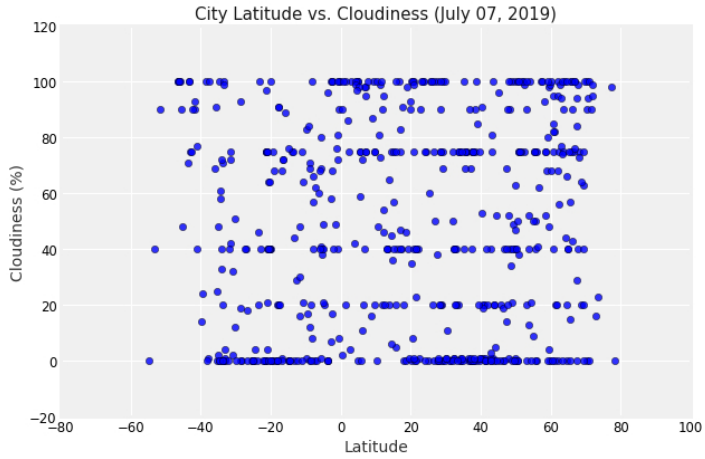
Latitude vs. Humidity Plot

In [13]:
```
# Set graph
set_graph(df_cities["Humidity"].tolist(), # y_axis
          [-20, 120],                     # ylim
          "City Latitude vs. Humidity",   # Title
          "Humidity (%)",                 # yLabel
          "Latitude_vs_Humidity.png")     # image_file_name

# Show the Figure
plt.show()
```



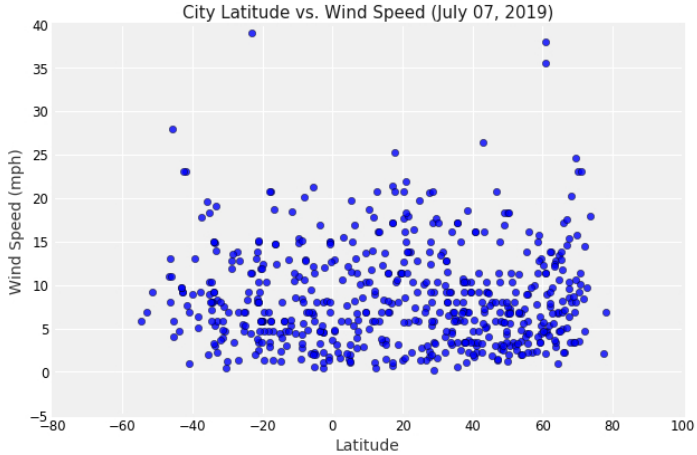
Latitude vs. Cloudiness Plot

In [14]:
```
# Set graph
set_graph(df_cities["Cloudiness"].tolist(),# y_axis
          [-20, 120],                      # ylim
          "City Latitude vs. Cloudiness",  # Title
          "Cloudiness (%)",                # yLabel
          "CityLatitude_vs_Cloudiness.png")# image_file_name

# Show the Figure
plt.show()
```



Latitude vs. Wind Speed Plot

In [15]:
```
# Set graph
set_graph(df_cities["Wind Speed"].tolist(),# y_axis
          [-5, 40],                        # ylim
          "City Latitude vs. Wind Speed",  # Title
          "Wind Speed (mph)",              # yLabel
          "Latitude_vs_WindSpeed.png")     # image_file_name

# Show the Figure
plt.show()
```



In [16]:
```
# Save Cities Data.
df_cities.to_csv(cities_file, encoding="utf-8", index=False)
```