

WeatherPy

Data Analyst

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Analysis Report

- The correlation between latitude and max temperature is highly notorious for northern and southern hemispheres.
 - The farther the city is from the equator, the max temperature goes down linearly.
 - There is no clear correlation between cloudiness & latitude for either hemisphere
 - There is no clear correlation between humidity & latitude for either hemisphere
 - There is no clear correlation between wind speed & latitude for either hemisphere. However, wind speeds are similarly consistent when the cities are closer to the equator.
 - Temperature rises as cities get closer to the equator
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```
In [1]: # Dependencies and Setup
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
import requests
import time
from scipy.stats import linregress
from pprint import pprint
from datetime import datetime
from dateutil import tz

# Import the OpenWeatherMap API key
from api_keys import weather_api_key

# Import citipy to determine the cities based on Latitude and Longitude
from citipy import citipy
```

Generate the Cities List by Using the `citipy` Library

```
In [2]: # Empty List for holding the Latitude and Longitude combinations
lat_lngs = []

# Empty List for holding the cities names
cities = []
```

```

# Range of Latitudes and Longitudes
lat_range = (-90, 90)
lng_range = (-180, 180)

# Create a set of random Lat and Lng combinations
lats = np.random.uniform(lat_range[0], lat_range[1], size=1500)
lngs = np.random.uniform(lng_range[0], lng_range[1], size=1500)
lat_lngs = zip(lats, lngs)

# Identify nearest city for each Lat, Lng combination
for lat_lng in lat_lngs:
    city = citipy.nearest_city(lat_lng[0], lat_lng[1]).city_name

    # If the city is unique, then add it to our cities list
    if city not in cities:
        cities.append(city)

# Print the city count to confirm sufficient count
print(f"Number of cities in the list: {len(cities)}")

```

Number of cities in the list: 607

Requirement 1

- Create Plots to Showcase the Relationship Between Weather Variables and Latitude
- Use the OpenWeatherMap API to retrieve weather data from the cities list generated in the started code

```

In [3]: # Set the API base URL
url = "http://api.openweathermap.org/data/2.5/weather?appid={weather_api_key}&units=metric"

# Define an empty list to fetch the weather data for each city
city_data = []

# Print to Logger
print("Beginning Data Retrieval      ")
print("-----")

# Create counters
record_count = 1
set_count = 1

# Loop through all the cities in our list to fetch weather data
for i, city in enumerate(cities):

    # Group cities in sets of 50 for Logging purposes
    if (i % 50 == 0 and i >= 50):
        set_count += 1
        record_count = 0

    # Create endpoint URL with each city
    city_url = url + city.replace(" ", "&")

```

```

# Log the url, record, and set numbers
print("Processing Record %s of Set %s | %s" % (record_count, set_count, city))

# Add 1 to the record count
record_count += 1

# Run an API request for each of the cities
try:

    response = requests.get(city_url).json()

    # Parse the JSON and retrieve data
    city_weather = response['main']['temp']

    # Parse out latitude, longitude, max temp, humidity, cloudiness, wind speed, etc.
    city_lat = response['coord']['lat']
    city_lng = response['coord']['lon']
    city_max_temp = response['main']['temp_max']
    city_humidity = response['main']['humidity']
    city_clouds = response['clouds']['all']
    city_wind = response['wind']['speed']
    city_country = response['sys']['country']
    city_date = response['dt']

    # Convert UTC to Local TZ
    city_date = datetime.fromtimestamp(int(city_date)).strftime("%m/%d/%Y %H:%M:%S")

    # Append the City information into city_data list
    city_data.append({"City": city,
                      "Lat": city_lat,
                      "Lng": city_lng,
                      "Max Temp": city_max_temp,
                      "Humidity": city_humidity,
                      "Cloudiness": city_clouds,
                      "Wind Speed": city_wind,
                      "Country": city_country,
                      "Date": city_date})

# If an error is experienced, skip the city
except:
    print("City not found. Skipping...")
    pass

# Indicate that Data Loading is complete
print("-----")
print("Data Retrieval Complete      ")
print("-----")

```

Beginning Data Retrieval

```
Processing Record 1 of Set 1 | chokurdakh
Processing Record 2 of Set 1 | verkhoyansk
Processing Record 3 of Set 1 | albany
Processing Record 4 of Set 1 | cidreira
Processing Record 5 of Set 1 | vaini
Processing Record 6 of Set 1 | tiksi
Processing Record 7 of Set 1 | port alfred
Processing Record 8 of Set 1 | yellowknife
Processing Record 9 of Set 1 | barentsburg
City not found. Skipping...
Processing Record 10 of Set 1 | bluff
Processing Record 11 of Set 1 | east london
Processing Record 12 of Set 1 | butaritari
Processing Record 13 of Set 1 | arraial do cabo
Processing Record 14 of Set 1 | hastings
Processing Record 15 of Set 1 | busselton
Processing Record 16 of Set 1 | punta arenas
Processing Record 17 of Set 1 | vanimo
Processing Record 18 of Set 1 | namibe
Processing Record 19 of Set 1 | alice springs
Processing Record 20 of Set 1 | dolbeau
City not found. Skipping...
Processing Record 21 of Set 1 | flinders
Processing Record 22 of Set 1 | georgetown
Processing Record 23 of Set 1 | longlac
City not found. Skipping...
Processing Record 24 of Set 1 | kahului
Processing Record 25 of Set 1 | tasiilaq
Processing Record 26 of Set 1 | fairbanks
Processing Record 27 of Set 1 | husavik
Processing Record 28 of Set 1 | la paz
City not found. Skipping...
Processing Record 29 of Set 1 | cape town
Processing Record 30 of Set 1 | new norfolk
Processing Record 31 of Set 1 | attawapiskat
City not found. Skipping...
Processing Record 32 of Set 1 | muli
Processing Record 33 of Set 1 | hambantota
Processing Record 34 of Set 1 | qaanaaq
Processing Record 35 of Set 1 | griffith
Processing Record 36 of Set 1 | karauzyak
City not found. Skipping...
Processing Record 37 of Set 1 | rikitea
Processing Record 38 of Set 1 | camacha
Processing Record 39 of Set 1 | hithadhoo
Processing Record 40 of Set 1 | clyde river
Processing Record 41 of Set 1 | buon me thuot
City not found. Skipping...
Processing Record 42 of Set 1 | vila franca do campo
Processing Record 43 of Set 1 | nizwa
Processing Record 44 of Set 1 | ust-nera
Processing Record 45 of Set 1 | college
Processing Record 46 of Set 1 | dingle
Processing Record 47 of Set 1 | kushmurun
Processing Record 48 of Set 1 | dikson
Processing Record 49 of Set 1 | shache
Processing Record 50 of Set 1 | mataura
Processing Record 0 of Set 2 | alofi
```

Processing Record 1 of Set 2 | san patricio
Processing Record 2 of Set 2 | kapaa
Processing Record 3 of Set 2 | omsukchan
Processing Record 4 of Set 2 | ushuaia
Processing Record 5 of Set 2 | hermanus
Processing Record 6 of Set 2 | higuey
City not found. Skipping...
Processing Record 7 of Set 2 | luwingu
Processing Record 8 of Set 2 | louisbourg
City not found. Skipping...
Processing Record 9 of Set 2 | illoqqortoormiut
City not found. Skipping...
Processing Record 10 of Set 2 | zabaykalsk
Processing Record 11 of Set 2 | samusu
City not found. Skipping...
Processing Record 12 of Set 2 | bac can
Processing Record 13 of Set 2 | matamoros
Processing Record 14 of Set 2 | bathsheba
Processing Record 15 of Set 2 | tuktoyaktuk
Processing Record 16 of Set 2 | matara
Processing Record 17 of Set 2 | tezu
Processing Record 18 of Set 2 | dicabisagan
Processing Record 19 of Set 2 | ponta do sol
Processing Record 20 of Set 2 | barrow
Processing Record 21 of Set 2 | honiara
Processing Record 22 of Set 2 | olavarria
Processing Record 23 of Set 2 | shingu
Processing Record 24 of Set 2 | ulaangom
Processing Record 25 of Set 2 | jinzhou
Processing Record 26 of Set 2 | chosyczno
Processing Record 27 of Set 2 | asau
Processing Record 28 of Set 2 | bredasdorp
Processing Record 29 of Set 2 | goure
Processing Record 30 of Set 2 | myaundzha
Processing Record 31 of Set 2 | saldanha
Processing Record 32 of Set 2 | ayolas
Processing Record 33 of Set 2 | belushya guba
City not found. Skipping...
Processing Record 34 of Set 2 | turtkul
City not found. Skipping...
Processing Record 35 of Set 2 | nikolskoye
Processing Record 36 of Set 2 | ribeira grande
Processing Record 37 of Set 2 | vaux-sur-sure
Processing Record 38 of Set 2 | rio grande
Processing Record 39 of Set 2 | katsuura
Processing Record 40 of Set 2 | cedar city
Processing Record 41 of Set 2 | cockburn town
Processing Record 42 of Set 2 | kamenskoye
City not found. Skipping...
Processing Record 43 of Set 2 | upington
Processing Record 44 of Set 2 | amberley
Processing Record 45 of Set 2 | pushkinskiye gory
City not found. Skipping...
Processing Record 46 of Set 2 | ixtapa
Processing Record 47 of Set 2 | coahuayana
Processing Record 48 of Set 2 | hualmay
Processing Record 49 of Set 2 | codrington
Processing Record 0 of Set 3 | khatanga
Processing Record 1 of Set 3 | ranong
Processing Record 2 of Set 3 | byron bay

Processing Record 3 of Set 3 | flin flon
Processing Record 4 of Set 3 | thunder bay
City not found. Skipping...
Processing Record 5 of Set 3 | conde
Processing Record 6 of Set 3 | nikolayevka
Processing Record 7 of Set 3 | hilo
Processing Record 8 of Set 3 | bambous virieux
Processing Record 9 of Set 3 | tilichiki
Processing Record 10 of Set 3 | avarua
Processing Record 11 of Set 3 | muros
Processing Record 12 of Set 3 | taolanaro
City not found. Skipping...
Processing Record 13 of Set 3 | valparaiso
Processing Record 14 of Set 3 | lagoa
Processing Record 15 of Set 3 | springfield
Processing Record 16 of Set 3 | tura
Processing Record 17 of Set 3 | veere
Processing Record 18 of Set 3 | nha trang
Processing Record 19 of Set 3 | puerto ayora
Processing Record 20 of Set 3 | lucapa
Processing Record 21 of Set 3 | santa cruz del norte
Processing Record 22 of Set 3 | vaitupu
City not found. Skipping...
Processing Record 23 of Set 3 | chebenki
Processing Record 24 of Set 3 | lebu
Processing Record 25 of Set 3 | hobart
Processing Record 26 of Set 3 | dir
Processing Record 27 of Set 3 | mahebourg
Processing Record 28 of Set 3 | porto novo
Processing Record 29 of Set 3 | juba
Processing Record 30 of Set 3 | ugoofaar
Processing Record 31 of Set 3 | hamilton
Processing Record 32 of Set 3 | isangel
Processing Record 33 of Set 3 | tsihombe
City not found. Skipping...
Processing Record 34 of Set 3 | nemuro
Processing Record 35 of Set 3 | pacific grove
Processing Record 36 of Set 3 | jamestown
Processing Record 37 of Set 3 | kodiak
Processing Record 38 of Set 3 | bani walid
Processing Record 39 of Set 3 | thompson
Processing Record 40 of Set 3 | richards bay
Processing Record 41 of Set 3 | ahipara
Processing Record 42 of Set 3 | guiyang
Processing Record 43 of Set 3 | alyangula
Processing Record 44 of Set 3 | carnarvon
Processing Record 45 of Set 3 | port elizabeth
Processing Record 46 of Set 3 | poum
Processing Record 47 of Set 3 | neiafu
Processing Record 48 of Set 3 | chimbote
Processing Record 49 of Set 3 | kahramanmaras
Processing Record 0 of Set 4 | lata
Processing Record 1 of Set 4 | sao filipe
Processing Record 2 of Set 4 | provideniya
Processing Record 3 of Set 4 | krasnogvardeyskiy
Processing Record 4 of Set 4 | mar del plata
Processing Record 5 of Set 4 | longyearbyen
Processing Record 6 of Set 4 | burica
City not found. Skipping...
Processing Record 7 of Set 4 | lorengau

Processing Record 8 of Set 4 | salalah
Processing Record 9 of Set 4 | poso
Processing Record 10 of Set 4 | broken hill
City not found. Skipping...
Processing Record 11 of Set 4 | bethel
Processing Record 12 of Set 4 | victoria
Processing Record 13 of Set 4 | severo-kurilsk
Processing Record 14 of Set 4 | khasan
Processing Record 15 of Set 4 | melfort
Processing Record 16 of Set 4 | atbasar
Processing Record 17 of Set 4 | palmer
Processing Record 18 of Set 4 | port hedland
Processing Record 19 of Set 4 | superior
Processing Record 20 of Set 4 | puerto rondon
Processing Record 21 of Set 4 | lensk
Processing Record 22 of Set 4 | deputatskiy
Processing Record 23 of Set 4 | sioux lookout
Processing Record 24 of Set 4 | saint-augustin
Processing Record 25 of Set 4 | upata
Processing Record 26 of Set 4 | trelew
Processing Record 27 of Set 4 | torbay
Processing Record 28 of Set 4 | cururupu
Processing Record 29 of Set 4 | nouakchott
Processing Record 30 of Set 4 | portland
Processing Record 31 of Set 4 | yulara
Processing Record 32 of Set 4 | castro
Processing Record 33 of Set 4 | marystown
Processing Record 34 of Set 4 | tomatlan
Processing Record 35 of Set 4 | luba
Processing Record 36 of Set 4 | mahajanga
Processing Record 37 of Set 4 | fortuna
Processing Record 38 of Set 4 | saskylakh
Processing Record 39 of Set 4 | praya
Processing Record 40 of Set 4 | upernavik
Processing Record 41 of Set 4 | impfondo
Processing Record 42 of Set 4 | guerrero negro
Processing Record 43 of Set 4 | nova olinda do norte
Processing Record 44 of Set 4 | sakakah
Processing Record 45 of Set 4 | luena
Processing Record 46 of Set 4 | jiaohe
Processing Record 47 of Set 4 | namatanai
Processing Record 48 of Set 4 | grand river south east
Processing Record 49 of Set 4 | te anau
City not found. Skipping...
Processing Record 0 of Set 5 | sentyabrskiy
City not found. Skipping...
Processing Record 1 of Set 5 | aasiaat
Processing Record 2 of Set 5 | challapata
Processing Record 3 of Set 5 | tuatapere
Processing Record 4 of Set 5 | batsfjord
Processing Record 5 of Set 5 | monrovia
Processing Record 6 of Set 5 | saleaula
City not found. Skipping...
Processing Record 7 of Set 5 | waipawa
Processing Record 8 of Set 5 | atuona
Processing Record 9 of Set 5 | nouadhibou
Processing Record 10 of Set 5 | charcas
Processing Record 11 of Set 5 | aykhal
Processing Record 12 of Set 5 | faanui
Processing Record 13 of Set 5 | sinkat

City not found. Skipping...

Processing Record 14 of Set 5 | zvishavane
Processing Record 15 of Set 5 | makakilo city
Processing Record 16 of Set 5 | kaitangata
Processing Record 17 of Set 5 | luderitz
Processing Record 18 of Set 5 | yerofey pavlovich

City not found. Skipping...

Processing Record 19 of Set 5 | ust-maya
Processing Record 20 of Set 5 | pendleton
Processing Record 21 of Set 5 | san quintin
Processing Record 22 of Set 5 | awbari
Processing Record 23 of Set 5 | daru
Processing Record 24 of Set 5 | rach gia
Processing Record 25 of Set 5 | norman wells
Processing Record 26 of Set 5 | junagarh
Processing Record 27 of Set 5 | kudahuvadhoo
Processing Record 28 of Set 5 | taunton
Processing Record 29 of Set 5 | kurchum
Processing Record 30 of Set 5 | belyy yar
Processing Record 31 of Set 5 | bengkulu
Processing Record 32 of Set 5 | seydi
Processing Record 33 of Set 5 | port lincoln
Processing Record 34 of Set 5 | grand gaube
Processing Record 35 of Set 5 | saint-philippe
Processing Record 36 of Set 5 | pahrump
Processing Record 37 of Set 5 | yaan
Processing Record 38 of Set 5 | tumannyy

City not found. Skipping...

Processing Record 39 of Set 5 | sola
Processing Record 40 of Set 5 | remanso
Processing Record 41 of Set 5 | saint george

City not found. Skipping...

Processing Record 42 of Set 5 | faya
Processing Record 43 of Set 5 | tabuk
Processing Record 44 of Set 5 | bairiki
Processing Record 45 of Set 5 | amderma

City not found. Skipping...

Processing Record 46 of Set 5 | panguna
Processing Record 47 of Set 5 | maragogi
Processing Record 48 of Set 5 | talnakh
Processing Record 49 of Set 5 | sinnamary
Processing Record 0 of Set 6 | yeppoon
Processing Record 1 of Set 6 | dongsheng
Processing Record 2 of Set 6 | marzuq
Processing Record 3 of Set 6 | surt
Processing Record 4 of Set 6 | erzin
Processing Record 5 of Set 6 | charters towers
Processing Record 6 of Set 6 | noglik
Processing Record 7 of Set 6 | touros
Processing Record 8 of Set 6 | iqaluit
Processing Record 9 of Set 6 | huarmey
Processing Record 10 of Set 6 | podor
Processing Record 11 of Set 6 | mys shmidta
Processing Record 12 of Set 6 | cartagena
Processing Record 13 of Set 6 | chardara
Processing Record 14 of Set 6 | airai
Processing Record 15 of Set 6 | shimoda
Processing Record 16 of Set 6 | cabedelo
Processing Record 17 of Set 6 | geraldton
Processing Record 18 of Set 6 | narsaq

Processing Record 19 of Set 6 | ayan
Processing Record 20 of Set 6 | shitkino
Processing Record 21 of Set 6 | vao
Processing Record 22 of Set 6 | baykit
Processing Record 23 of Set 6 | yaring
Processing Record 24 of Set 6 | bara
Processing Record 25 of Set 6 | mount gambier
Processing Record 26 of Set 6 | inhapim
Processing Record 27 of Set 6 | krasnaya poyma
City not found. Skipping...
Processing Record 28 of Set 6 | beloha
Processing Record 29 of Set 6 | lavrentiya
Processing Record 30 of Set 6 | quatre cocos
City not found. Skipping...
Processing Record 31 of Set 6 | toyooka
Processing Record 32 of Set 6 | coromandel
Processing Record 33 of Set 6 | havoysund
Processing Record 34 of Set 6 | fram
Processing Record 35 of Set 6 | calabozo
Processing Record 36 of Set 6 | placido de castro
City not found. Skipping...
Processing Record 37 of Set 6 | pathalgaon
Processing Record 38 of Set 6 | barranca
Processing Record 39 of Set 6 | nanortalik
Processing Record 40 of Set 6 | vardo
Processing Record 41 of Set 6 | balgazyn
Processing Record 42 of Set 6 | kavieng
Processing Record 43 of Set 6 | suzu
City not found. Skipping...
Processing Record 44 of Set 6 | yirol
City not found. Skipping...
Processing Record 45 of Set 6 | chuy
Processing Record 46 of Set 6 | fare
Processing Record 47 of Set 6 | banda aceh
Processing Record 48 of Set 6 | kavaratti
Processing Record 49 of Set 6 | batemans bay
City not found. Skipping...
Processing Record 0 of Set 7 | baghdad
Processing Record 1 of Set 7 | bintulu
Processing Record 2 of Set 7 | hay river
Processing Record 3 of Set 7 | balimo
City not found. Skipping...
Processing Record 4 of Set 7 | nara
Processing Record 5 of Set 7 | meulaboh
Processing Record 6 of Set 7 | esperance
Processing Record 7 of Set 7 | yar-sale
Processing Record 8 of Set 7 | margate
Processing Record 9 of Set 7 | mana
Processing Record 10 of Set 7 | nizhnyaya omka
Processing Record 11 of Set 7 | erenhot
Processing Record 12 of Set 7 | ostrovnoy
Processing Record 13 of Set 7 | westerlo
Processing Record 14 of Set 7 | west plains
Processing Record 15 of Set 7 | bayir
Processing Record 16 of Set 7 | kiunga
Processing Record 17 of Set 7 | roald
Processing Record 18 of Set 7 | yumen
Processing Record 19 of Set 7 | tsabong
Processing Record 20 of Set 7 | mayor pablo lagerenza
City not found. Skipping...

Processing Record 21 of Set 7 | coelho neto
Processing Record 22 of Set 7 | cherskiy
Processing Record 23 of Set 7 | ojinaga
Processing Record 24 of Set 7 | gorno-chuyskiy
City not found. Skipping...
Processing Record 25 of Set 7 | morondava
Processing Record 26 of Set 7 | kushiro
Processing Record 27 of Set 7 | mujiayingzi
Processing Record 28 of Set 7 | sal rei
Processing Record 29 of Set 7 | fukue
Processing Record 30 of Set 7 | adrar
Processing Record 31 of Set 7 | los llanos de aridane
City not found. Skipping...
Processing Record 32 of Set 7 | riyadh
Processing Record 33 of Set 7 | shibarghan
City not found. Skipping...
Processing Record 34 of Set 7 | senanga
Processing Record 35 of Set 7 | brae
Processing Record 36 of Set 7 | olafsvik
Processing Record 37 of Set 7 | katunino
Processing Record 38 of Set 7 | nanakuli
Processing Record 39 of Set 7 | russell
Processing Record 40 of Set 7 | mrakovo
Processing Record 41 of Set 7 | broome
Processing Record 42 of Set 7 | samut sakhon
Processing Record 43 of Set 7 | mao
Processing Record 44 of Set 7 | jiangyou
Processing Record 45 of Set 7 | bilibino
Processing Record 46 of Set 7 | san cristobal
Processing Record 47 of Set 7 | chagda
City not found. Skipping...
Processing Record 48 of Set 7 | chapais
Processing Record 49 of Set 7 | esna
Processing Record 0 of Set 8 | aden
Processing Record 1 of Set 8 | darhan
Processing Record 2 of Set 8 | tarskoye
Processing Record 3 of Set 8 | vilhena
Processing Record 4 of Set 8 | padang
Processing Record 5 of Set 8 | fernie
Processing Record 6 of Set 8 | qasigiannguit
Processing Record 7 of Set 8 | marmarion
Processing Record 8 of Set 8 | anadyr
Processing Record 9 of Set 8 | llanes
Processing Record 10 of Set 8 | calvinia
Processing Record 11 of Set 8 | veraval
Processing Record 12 of Set 8 | malakal
Processing Record 13 of Set 8 | sirpur
Processing Record 14 of Set 8 | boca do acre
Processing Record 15 of Set 8 | shelburne
Processing Record 16 of Set 8 | gandia
Processing Record 17 of Set 8 | hasaki
Processing Record 18 of Set 8 | ancud
Processing Record 19 of Set 8 | bilma
Processing Record 20 of Set 8 | haines junction
Processing Record 21 of Set 8 | manati
Processing Record 22 of Set 8 | viking
Processing Record 23 of Set 8 | picui
Processing Record 24 of Set 8 | taoudenni
Processing Record 25 of Set 8 | leningradskiy
Processing Record 26 of Set 8 | almaznyy

Processing Record 27 of Set 8 | bubaque
Processing Record 28 of Set 8 | ardakan
Processing Record 29 of Set 8 | keffi
Processing Record 30 of Set 8 | jalu
Processing Record 31 of Set 8 | zanjan
Processing Record 32 of Set 8 | jintur
Processing Record 33 of Set 8 | maine-soroa
Processing Record 34 of Set 8 | haibowan
City not found. Skipping...
Processing Record 35 of Set 8 | tobermory
Processing Record 36 of Set 8 | galgani
City not found. Skipping...
Processing Record 37 of Set 8 | necochea
Processing Record 38 of Set 8 | altar
Processing Record 39 of Set 8 | bandarbeyla
Processing Record 40 of Set 8 | barsovo
Processing Record 41 of Set 8 | bourail
Processing Record 42 of Set 8 | indramayu
Processing Record 43 of Set 8 | luganville
Processing Record 44 of Set 8 | mwense
Processing Record 45 of Set 8 | pisco
Processing Record 46 of Set 8 | skibbereen
Processing Record 47 of Set 8 | fuerte olimpo
Processing Record 48 of Set 8 | tanda
Processing Record 49 of Set 8 | berlevag
Processing Record 0 of Set 9 | trinidad
Processing Record 1 of Set 9 | huaiyin
Processing Record 2 of Set 9 | khandyga
Processing Record 3 of Set 9 | mackay
Processing Record 4 of Set 9 | tutoia
Processing Record 5 of Set 9 | villavicencio
Processing Record 6 of Set 9 | ilulissat
Processing Record 7 of Set 9 | versalles
Processing Record 8 of Set 9 | naryan-mar
Processing Record 9 of Set 9 | safwah
City not found. Skipping...
Processing Record 10 of Set 9 | rungata
City not found. Skipping...
Processing Record 11 of Set 9 | youkounkoun
Processing Record 12 of Set 9 | emerald
Processing Record 13 of Set 9 | kieta
Processing Record 14 of Set 9 | rovaniemi
Processing Record 15 of Set 9 | beisfjord
Processing Record 16 of Set 9 | jian
Processing Record 17 of Set 9 | nishihara
Processing Record 18 of Set 9 | grafton
Processing Record 19 of Set 9 | brovst
Processing Record 20 of Set 9 | mukhen
Processing Record 21 of Set 9 | nizhneyansk
City not found. Skipping...
Processing Record 22 of Set 9 | pasighat
Processing Record 23 of Set 9 | jiaocheng
Processing Record 24 of Set 9 | gat
Processing Record 25 of Set 9 | pevek
Processing Record 26 of Set 9 | puerto madryn
Processing Record 27 of Set 9 | la ronge
City not found. Skipping...
Processing Record 28 of Set 9 | babanusah
City not found. Skipping...
Processing Record 29 of Set 9 | constitucion

Processing Record 30 of Set 9	tawang
Processing Record 31 of Set 9	strezhevoy
Processing Record 32 of Set 9	chicama
Processing Record 33 of Set 9	aksha
Processing Record 34 of Set 9	beringovskiy
Processing Record 35 of Set 9	vitim
Processing Record 36 of Set 9	prince rupert
Processing Record 37 of Set 9	yenagoa
Processing Record 38 of Set 9	vostok
Processing Record 39 of Set 9	tecoanapa
Processing Record 40 of Set 9	ak-dovurak
Processing Record 41 of Set 9	cabul-an
Processing Record 42 of Set 9	paamiut
Processing Record 43 of Set 9	katangli
Processing Record 44 of Set 9	solnechnyy
Processing Record 45 of Set 9	korla
Processing Record 46 of Set 9	dongying
Processing Record 47 of Set 9	jutai
Processing Record 48 of Set 9	evensk
Processing Record 49 of Set 9	rawson
Processing Record 0 of Set 10	macapa
Processing Record 1 of Set 10	suluq
Processing Record 2 of Set 10	atambua
Processing Record 3 of Set 10	oranjemund
Processing Record 4 of Set 10	mabama
Processing Record 5 of Set 10	catalao
Processing Record 6 of Set 10	maceio
Processing Record 7 of Set 10	komsomolskiy
Processing Record 8 of Set 10	kununurra
Processing Record 9 of Set 10	otavi
Processing Record 10 of Set 10	katy
Processing Record 11 of Set 10	klyuchi
Processing Record 12 of Set 10	manaure
Processing Record 13 of Set 10	bushehr
Processing Record 14 of Set 10	arona
Processing Record 15 of Set 10	hofn
Processing Record 16 of Set 10	nichinan
Processing Record 17 of Set 10	thinadhoo
Processing Record 18 of Set 10	peyima
Processing Record 19 of Set 10	colon
Processing Record 20 of Set 10	fort saint john
Processing Record 21 of Set 10	sabang
Processing Record 22 of Set 10	akyab
Processing Record 23 of Set 10	altamira
Processing Record 24 of Set 10	goderich
Processing Record 25 of Set 10	saint-francois
Processing Record 26 of Set 10	port hardy
Processing Record 27 of Set 10	imbituba
Processing Record 28 of Set 10	mariental
Processing Record 29 of Set 10	port blair
Processing Record 30 of Set 10	capinzal
Processing Record 31 of Set 10	sepolno krajenskie
City not found. Skipping...	
Processing Record 32 of Set 10	vetluzhskiy
Processing Record 33 of Set 10	vung tau
City not found. Skipping...	
Processing Record 34 of Set 10	moron
Processing Record 35 of Set 10	oriximina
Processing Record 36 of Set 10	svetlogorsk
Processing Record 37 of Set 10	dunmore east

Processing Record 38 of Set 10 | port shepstone
Processing Record 39 of Set 10 | peterhead
Processing Record 40 of Set 10 | belaya gora
Processing Record 41 of Set 10 | acapulco
Processing Record 42 of Set 10 | cairns
Processing Record 43 of Set 10 | hervey bay
Processing Record 44 of Set 10 | avera
Processing Record 45 of Set 10 | nanchang
Processing Record 46 of Set 10 | hami
Processing Record 47 of Set 10 | jijiga
Processing Record 48 of Set 10 | temaraia
City not found. Skipping...
Processing Record 49 of Set 10 | nome
Processing Record 0 of Set 11 | gladstone
Processing Record 1 of Set 11 | aflu
City not found. Skipping...
Processing Record 2 of Set 11 | benalla
Processing Record 3 of Set 11 | marcona
City not found. Skipping...
Processing Record 4 of Set 11 | healdsburg
Processing Record 5 of Set 11 | uong bi
City not found. Skipping...
Processing Record 6 of Set 11 | lasa
Processing Record 7 of Set 11 | baker city
Processing Record 8 of Set 11 | sembakung
Processing Record 9 of Set 11 | vikindu
Processing Record 10 of Set 11 | lompoc
Processing Record 11 of Set 11 | tunoshna
Processing Record 12 of Set 11 | anchorage
Processing Record 13 of Set 11 | tungor
Processing Record 14 of Set 11 | sri aman
Processing Record 15 of Set 11 | boundiali
Processing Record 16 of Set 11 | japura
Processing Record 17 of Set 11 | balikpapan
Processing Record 18 of Set 11 | souillac
Processing Record 19 of Set 11 | manzil jamil
City not found. Skipping...
Processing Record 20 of Set 11 | nyurba
Processing Record 21 of Set 11 | turkistan
Processing Record 22 of Set 11 | zharkent
Processing Record 23 of Set 11 | port hueneme
Processing Record 24 of Set 11 | mala
Processing Record 25 of Set 11 | kisarazu
Processing Record 26 of Set 11 | ulladulla
Processing Record 27 of Set 11 | sovetskaya gavan
Processing Record 28 of Set 11 | priiskovyy
Processing Record 29 of Set 11 | mahadday weyne
City not found. Skipping...
Processing Record 30 of Set 11 | saint-andre-avellin
Processing Record 31 of Set 11 | san lorenzo
Processing Record 32 of Set 11 | namagiripettai
Processing Record 33 of Set 11 | luau
Processing Record 34 of Set 11 | magadan
Processing Record 35 of Set 11 | boguchany
Processing Record 36 of Set 11 | vila velha
Processing Record 37 of Set 11 | irmo
Processing Record 38 of Set 11 | caravelas
Processing Record 39 of Set 11 | santiago del estero
Processing Record 40 of Set 11 | urtenen
Processing Record 41 of Set 11 | arlit

Processing Record 42 of Set 11 | umzimvubu
City not found. Skipping...
Processing Record 43 of Set 11 | kalengwa
Processing Record 44 of Set 11 | grajau
Processing Record 45 of Set 11 | kawalu
Processing Record 46 of Set 11 | mankono
Processing Record 47 of Set 11 | debre zeyit
Processing Record 48 of Set 11 | haimen
Processing Record 49 of Set 11 | corrente
Processing Record 0 of Set 12 | mehamn
Processing Record 1 of Set 12 | naze
Processing Record 2 of Set 12 | road town
City not found. Skipping...
Processing Record 3 of Set 12 | kruisfontein
Processing Record 4 of Set 12 | kasempa
Processing Record 5 of Set 12 | pringsewu
Processing Record 6 of Set 12 | waddan
Processing Record 7 of Set 12 | kiama
Processing Record 8 of Set 12 | loukhi
Processing Record 9 of Set 12 | kasiri
Processing Record 10 of Set 12 | pala
Processing Record 11 of Set 12 | leeton
Processing Record 12 of Set 12 | boende
Processing Record 13 of Set 12 | beidao
Processing Record 14 of Set 12 | sladkovo
Processing Record 15 of Set 12 | tha bo
Processing Record 16 of Set 12 | batticaloa
Processing Record 17 of Set 12 | big rapids
City not found. Skipping...
Processing Record 18 of Set 12 | snezhnogorsk
Processing Record 19 of Set 12 | half moon bay
Processing Record 20 of Set 12 | trnavia
Processing Record 21 of Set 12 | buraydah
Processing Record 22 of Set 12 | belmonte
Processing Record 23 of Set 12 | kandrian
Processing Record 24 of Set 12 | bestobe
Processing Record 25 of Set 12 | sunrise manor
Processing Record 26 of Set 12 | ponta delgada
Processing Record 27 of Set 12 | suntar
Processing Record 28 of Set 12 | bolsheustikinskoye
City not found. Skipping...
Processing Record 29 of Set 12 | saint-denis
Processing Record 30 of Set 12 | ambodifototra
City not found. Skipping...
Processing Record 31 of Set 12 | klaksvik
Processing Record 32 of Set 12 | westport
Processing Record 33 of Set 12 | inhambane
Processing Record 34 of Set 12 | yichang
Processing Record 35 of Set 12 | saint-joseph
Processing Record 36 of Set 12 | rio gallegos
Processing Record 37 of Set 12 | moratuwa
Processing Record 38 of Set 12 | samana
Processing Record 39 of Set 12 | coihaique
Processing Record 40 of Set 12 | kalaleh
Processing Record 41 of Set 12 | tselinnoye
Processing Record 42 of Set 12 | dossor
Processing Record 43 of Set 12 | chengmai
City not found. Skipping...
Processing Record 44 of Set 12 | phalaborwa
Processing Record 45 of Set 12 | oyama

```
Processing Record 46 of Set 12 | kajaani
Processing Record 47 of Set 12 | kungurtug
Processing Record 48 of Set 12 | ron phibun
Processing Record 49 of Set 12 | severodvinsk
Processing Record 0 of Set 13 | buala
Processing Record 1 of Set 13 | la asuncion
City not found. Skipping...
Processing Record 2 of Set 13 | aksarka
Processing Record 3 of Set 13 | dzhebariki-khaya
Processing Record 4 of Set 13 | egvekinot
Processing Record 5 of Set 13 | sibolga
Processing Record 6 of Set 13 | arnstadt
-----
Data Retrieval Complete
-----
```

```
In [4]: # Convert the cities weather data into a Pandas DataFrame
city_data_df = pd.DataFrame(city_data)

# Show Record Count
city_data_df.count()
```

```
Out[4]: City      544
Lat       544
Lng       544
Max Temp  544
Humidity   544
Cloudiness 544
Wind Speed 544
Country    544
Date       544
dtype: int64
```

```
In [5]: # Display sample data
city_data_df.head()
```

```
Out[5]:
```

	City	Lat	Lng	Max Temp	Humidity	Cloudiness	Wind Speed	Country	Date
0	chokurdakh	70.6333	147.9167	-31.94	96	100	2.44	RU	02/08/2023 22:42:43
1	verkhoyansk	67.5447	133.3850	-43.10	95	75	0.33	RU	02/08/2023 22:46:23
2	albany	42.6001	-73.9662	0.15	80	81	1.23	US	02/08/2023 22:41:57
3	cidreira	-30.1811	-50.2056	24.49	83	24	8.46	BR	02/08/2023 22:40:27
4	vaini	-21.2000	-175.2000	29.09	79	75	2.06	TO	02/08/2023 22:41:55

```
In [6]: # Export the City_Data into a csv
city_data_df.to_csv("../output_data/cities.csv", index_label="City_ID")
```

```
In [7]: # Read saved data
city_data_df = pd.read_csv("../output_data/cities.csv", index_col="City_ID")
```

```
# Display sample data  
city_data_df.head()
```

Out[7]:

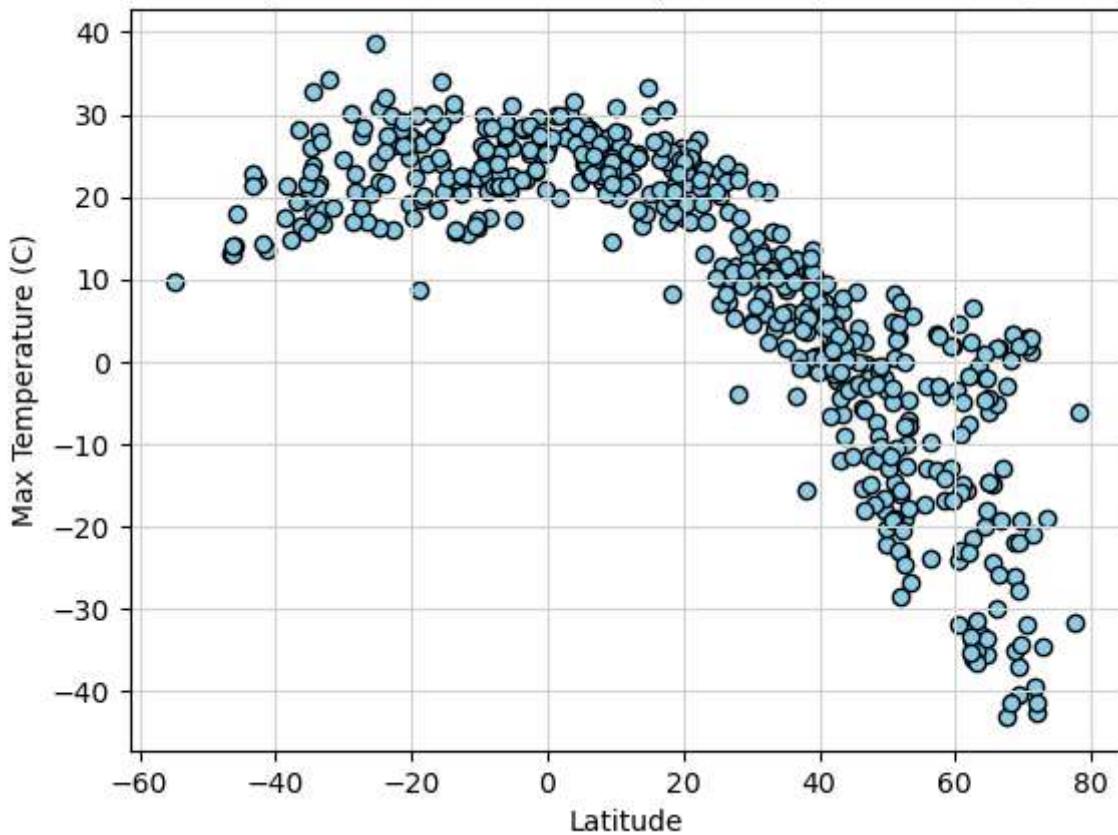
	City	Lat	Lng	Max Temp	Humidity	Cloudiness	Wind Speed	Country	Date
	City_ID								
0	chokurdakh	70.6333	147.9167	-31.94	96	100	2.44	RU	02/08/2023 22:42:43
1	verkhoyansk	67.5447	133.3850	-43.10	95	75	0.33	RU	02/08/2023 22:46:23
2	albany	42.6001	-73.9662	0.15	80	81	1.23	US	02/08/2023 22:41:57
3	cidreira	-30.1811	-50.2056	24.49	83	24	8.46	BR	02/08/2023 22:40:27
4	vaini	-21.2000	-175.2000	29.09	79	75	2.06	TO	02/08/2023 22:41:55

Scatter Plots

Latitude Vs. Max Temperature

```
In [8]: # Build scatter plot for latitude vs. temperature  
plt.scatter(city_data_df["Lat"],city_data_df["Max Temp"],edgecolors="black",facecolors="white")  
plt.title("City Latitude vs. Max Temperature (" + city_data_df['Date'][0][0:10] + ")")  
plt.xlabel("Latitude")  
plt.ylabel("Max Temperature (C)")  
  
# Incorporate the other graph properties  
plt.grid (axis="both",linestyle="-",color="lightgrey")  
  
# Save the figure  
plt.savefig("../output_data/Fig1.png")  
  
# Show plot  
plt.show()
```

City Latitude vs. Max Temperature (02/08/2023)



Latitude Vs. Humidity

In [9]:

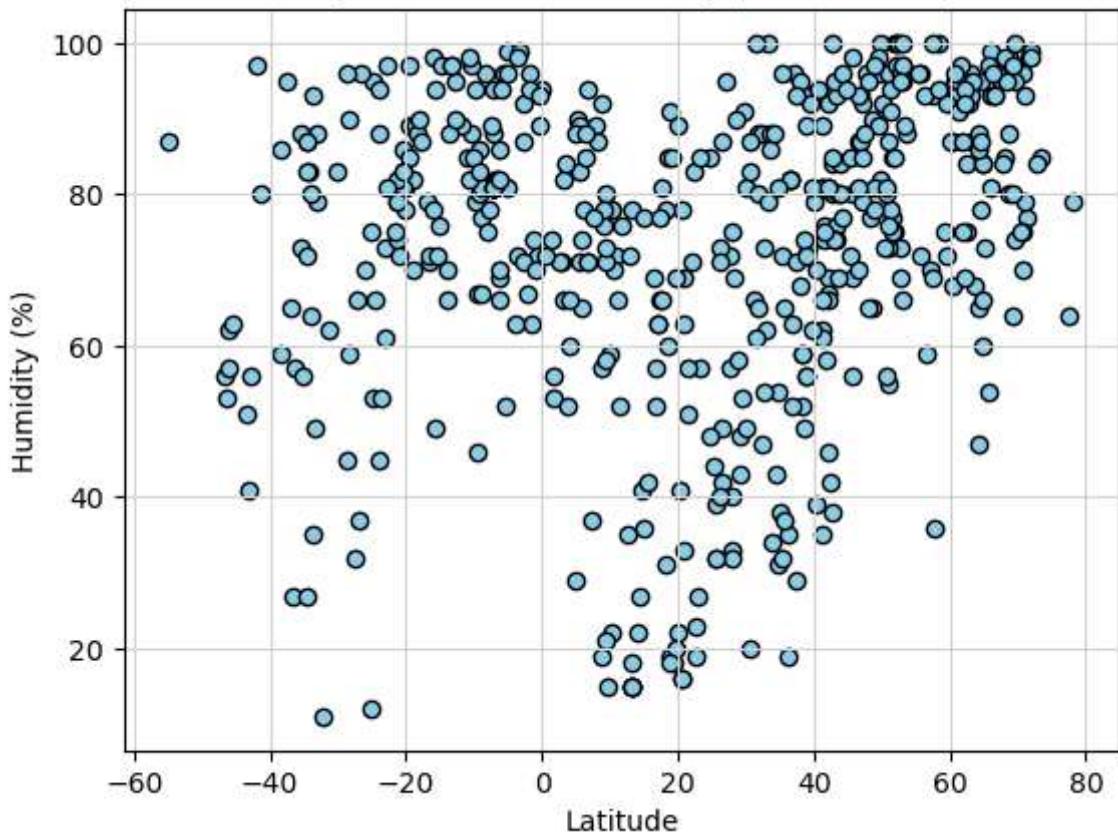
```
# Build the scatter plots for Latitude vs. humidity
plt.scatter(city_data_df["Lat"],city_data_df["Humidity"],edgecolors="black",facecolors="lightblue")
plt.title("City Latitude vs. Humidity (" + city_data_df['Date'][0][0:10] + ")")
plt.xlabel("Latitude")
plt.ylabel("Humidity (%)")

# Incorporate the other graph properties
plt.grid (axis="both",linestyle="-",color="lightgrey")

# Save the figure
plt.savefig("../output_data/Fig2.png")

# Show plot
plt.show()
```

City Latitude vs. Humidity (02/08/2023)



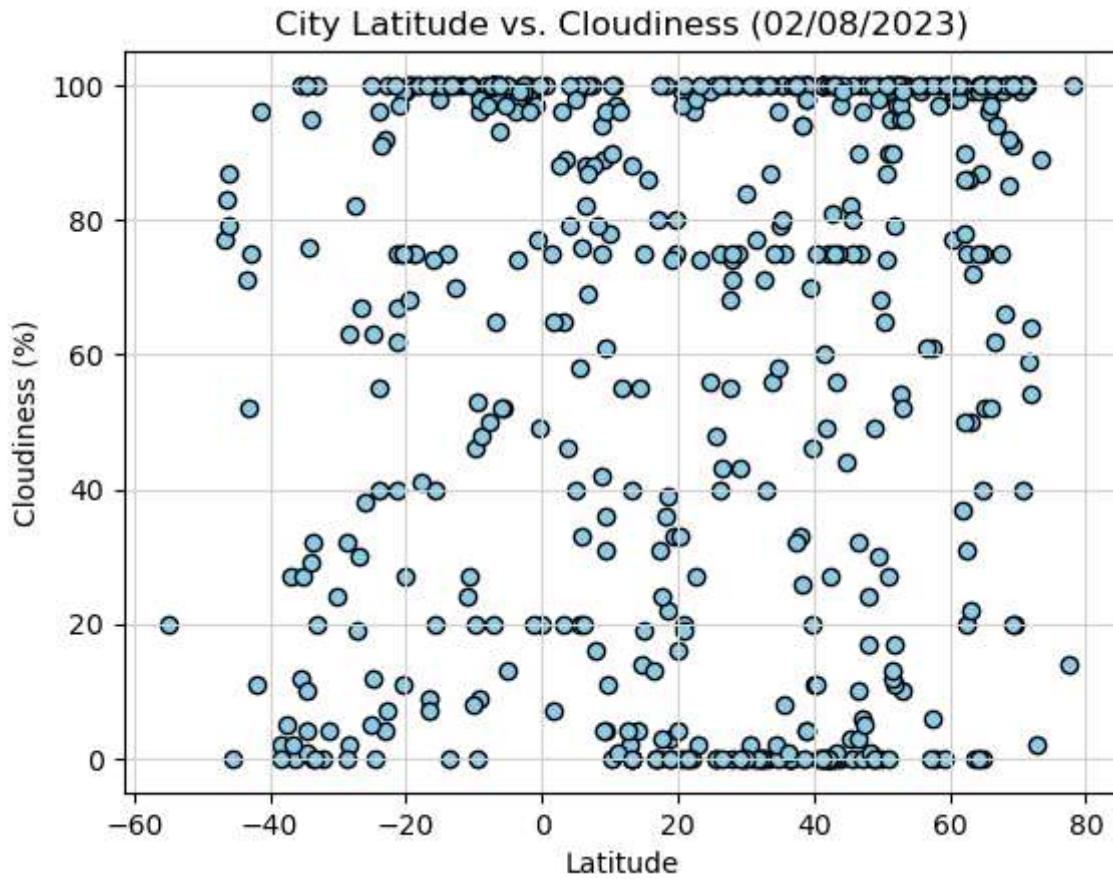
Latitude Vs. Cloudiness

```
In [10]: # Build the scatter plots for latitude vs. cloudiness
plt.scatter(city_data_df["Lat"],city_data_df["Cloudiness"],edgecolors="black",facecolor="lightblue")
plt.title("City Latitude vs. Cloudiness (" + city_data_df['Date'][0][0:10] + ")")
plt.xlabel("Latitude")
plt.ylabel("Cloudiness (%)")

# Incorporate the other graph properties
plt.grid (axis="both",linestyle="-",color="lightgrey")

# Save the figure
plt.savefig("../output_data/Fig3.png")

# Show plot
plt.show()
```



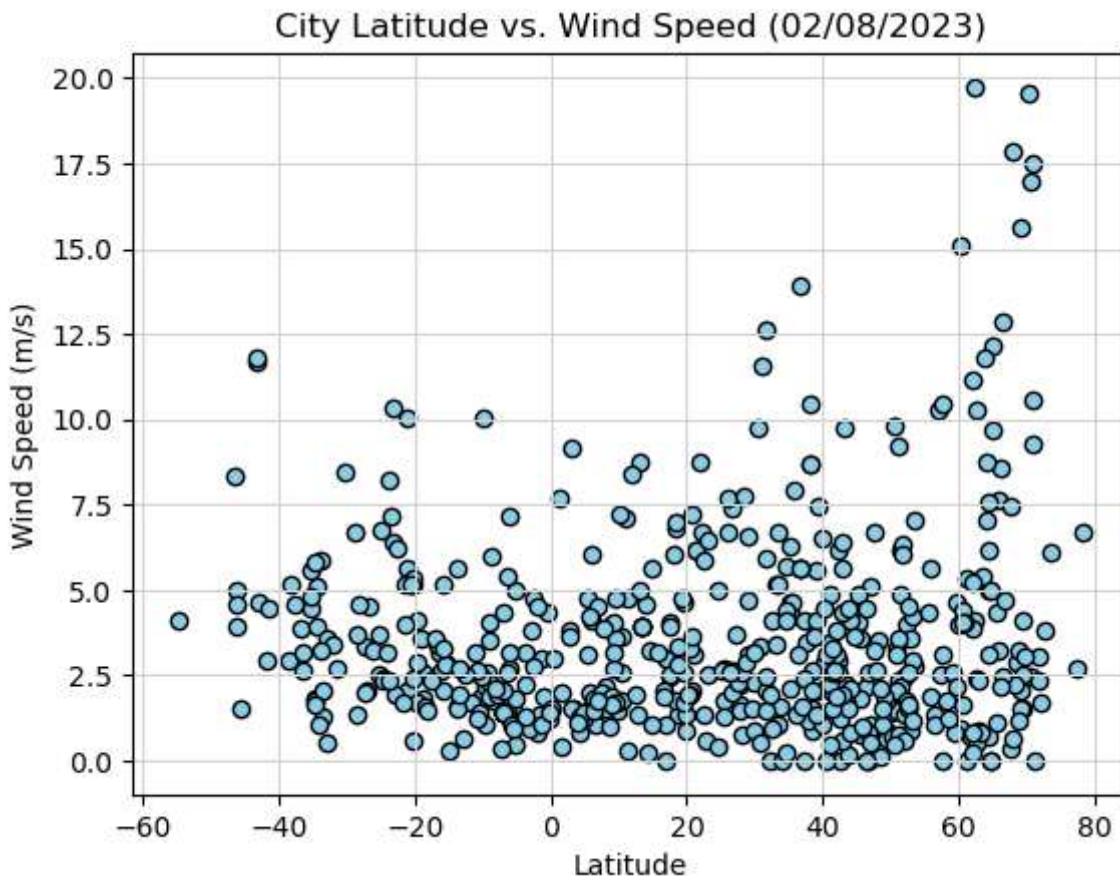
Latitude vs. Wind Speed Plot

```
In [11]: # Build the scatter plots for Latitude vs. wind speed
plt.scatter(city_data_df["Lat"],city_data_df["Wind Speed"],edgecolors="black",facecolor="lightblue")
plt.title("City Latitude vs. Wind Speed (" + city_data_df['Date'][0][0:10] + ")")
plt.xlabel("Latitude")
plt.ylabel("Wind Speed (m/s)")

# Incorporate the other graph properties
plt.grid (axis="both",linestyle="-",color="lightgrey")

# Save the figure
plt.savefig("../output_data/Fig4.png")

# Show plot
plt.show()
```



Requirement 2: Compute Linear Regression for Each Relationship

```
In [12]: # Define a function to create Linear Regression plots
def pltLinRegress(x_values, y_values, x_label, y_label, hemisphere, text_coordinates,
                  (slope, intercept, rvalue, pvalue, stderr) = linregress(x_values, y_values))

    regress_values = x_values * slope + intercept

    line_eq = "y = " + str(round(slope,2)) + "x +" + str(round(intercept,2))

    fig1, ax1 = plt.subplots(figsize=(6,3.5))
    plt.scatter(x_values, y_values, edgecolor="black", linewidth=1, marker="o", alpha=.5)
    plt.plot(x_values,regress_values,"r-")

    plt.xlabel(x_label,fontsize=10)
    plt.ylabel(y_label,fontsize=10)

    if ylim is not None:
        plt.ylim(0, ylim)
    plt.annotate(line_eq, text_coordinates, fontsize=10, color="red")
    plt.tight_layout()

    print(f"The r-value is: {rvalue**2}")
```

```
In [13]: # Create a DataFrame with the Northern Hemisphere data (Latitude >= 0)
northern_hemi_df = city_data_df[city_data_df['Lat'] >= 0]

# Display sample data
northern_hemi_df.head()
```

Out[13]:

	City	Lat	Lng	Max Temp	Humidity	Cloudiness	Wind Speed	Country	Date
City_ID									
0	chokurdakh	70.6333	147.9167	-31.94	96	100	2.44	RU	02/08/2023 22:42:43
1	verkhoyansk	67.5447	133.3850	-43.10	95	75	0.33	RU	02/08/2023 22:46:23
2	albany	42.6001	-73.9662	0.15	80	81	1.23	US	02/08/2023 22:41:57
5	tiksi	71.6872	128.8694	-39.37	98	59	2.35	RU	02/08/2023 22:43:01
7	yellowknife	62.4560	-114.3525	-21.36	84	75	4.12	CA	02/08/2023 22:42:14

◀ ▶

```
In [14]: # Create a DataFrame with the Southern Hemisphere data (Latitude < 0)
southern_hemi_df = city_data_df[city_data_df['Lat'] < 0]

# Display sample data
southern_hemi_df.head()
```

Out[14]:

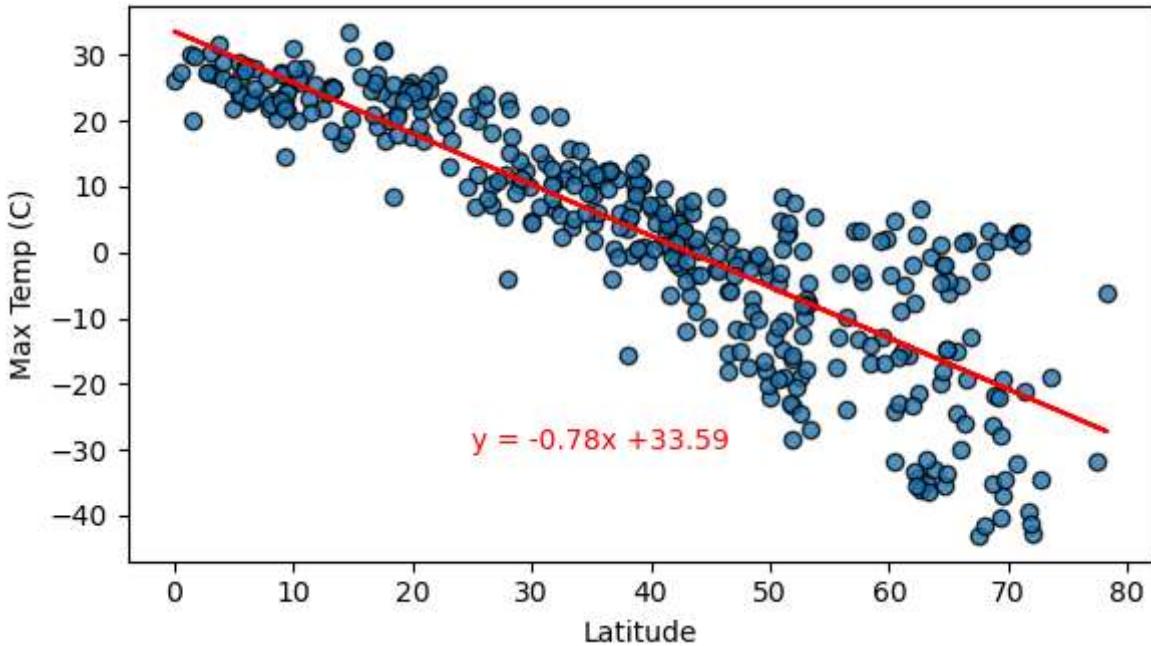
	City	Lat	Lng	Max Temp	Humidity	Cloudiness	Wind Speed	Country	Date
City_ID									
3	cidreira	-30.1811	-50.2056	24.49	83	24	8.46	BR	02/08/2023 22:40:27
4	vaini	-21.2000	-175.2000	29.09	79	75	2.06	TO	02/08/2023 22:41:55
6	port alfred	-7.0349	29.7638	21.43	81	100	1.42	CD	02/08/2023 22:46:24
8	bluff	-46.6000	168.3333	13.22	56	77	8.33	NZ	02/08/2023 22:41:54
11	arraial do cabo	-22.8362	-46.6460	16.13	97	7	1.95	BR	02/08/2023 22:46:25

Max Temperature vs. Latitude Linear Regression Plot

```
In [15]: # Linear regression on Northern Hemisphere
x_values = northern_hemi_df["Lat"]
y_values = northern_hemi_df["Max Temp"]
```

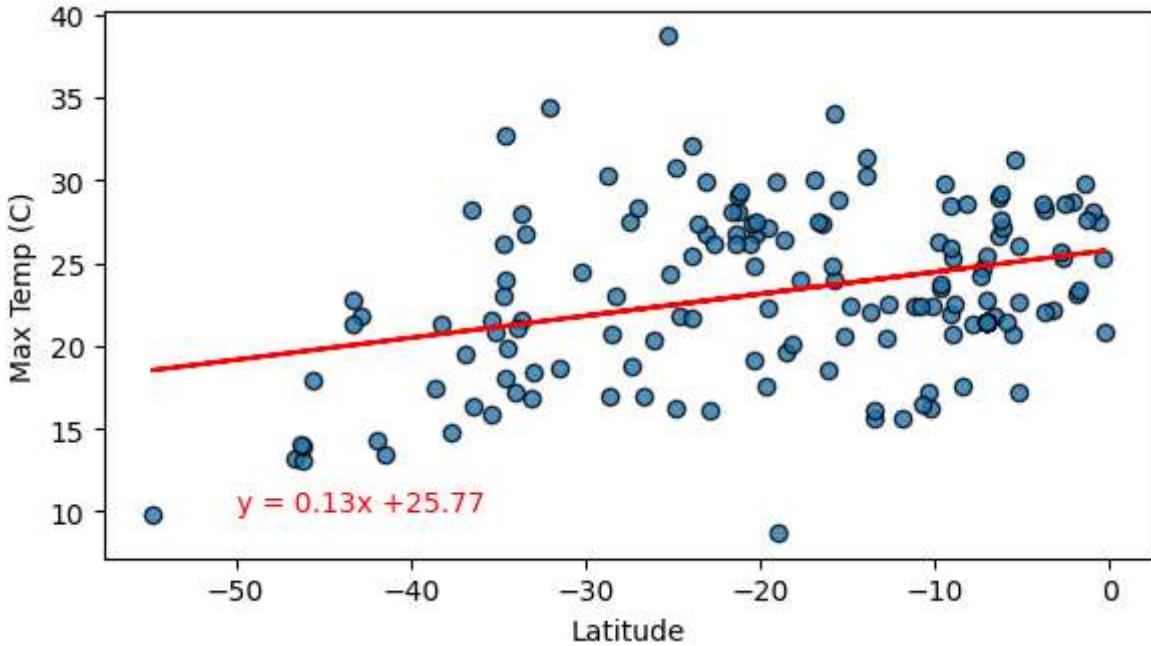
```
pltLinRegress(x_values, y_values, "Latitude", "Max Temp (C)", "Northern", (25, -30))
plt.show()
```

The r-value is: 0.7478261384839981



```
In [17]: # Linear regression on Southern Hemisphere
x_values = southern_hemi_df["Lat"]
y_values = southern_hemi_df["Max Temp"]
pltLinRegress(x_values, y_values, "Latitude", "Max Temp (C)", "Southern", (-50, 10))
plt.show()
```

The r-value is: 0.10815041718558399

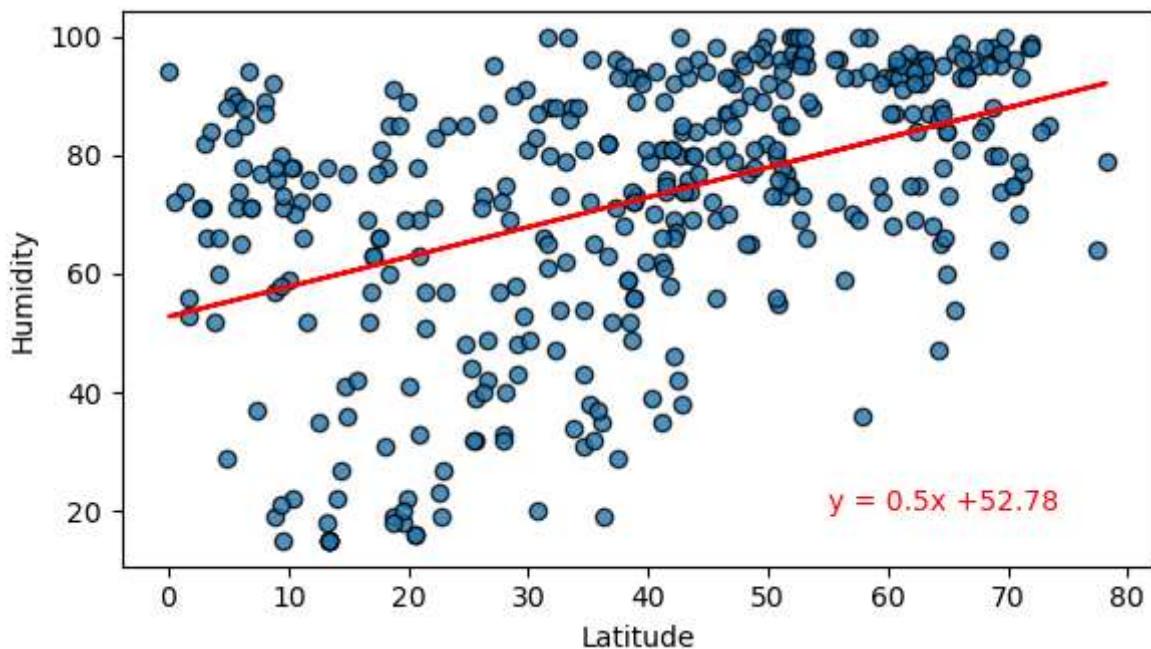


Discussion about the linear relationship: The correlation between latitude and max temperature is highly notorious for northern and southern hemispheres. The farther the city is from the equator, the max temperature goes down linearly.

Humidity vs. Latitude Linear Regression Plot

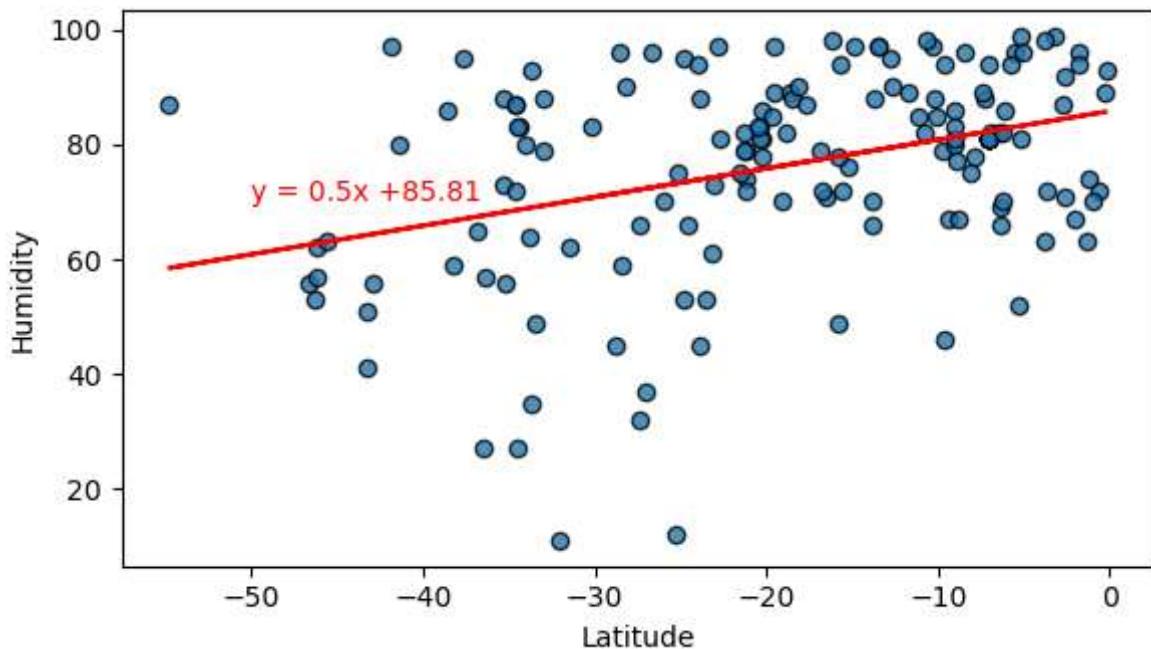
```
In [20]: # Northern Hemisphere  
x_values = northern_hemi_df['Lat']  
y_values = northern_hemi_df['Humidity']  
pltLinRegress(x_values, y_values, "Latitude", "Humidity", "Northern", (55, 20))  
plt.show()
```

The r-value is: 0.2060109926134811



```
In [21]: # Southern Hemisphere  
x_values = southern_hemi_df['Lat']  
y_values = southern_hemi_df['Humidity']  
pltLinRegress(x_values, y_values, "Latitude", "Humidity", "Southern", (-50, 70))
```

The r-value is: 0.13243229062386966



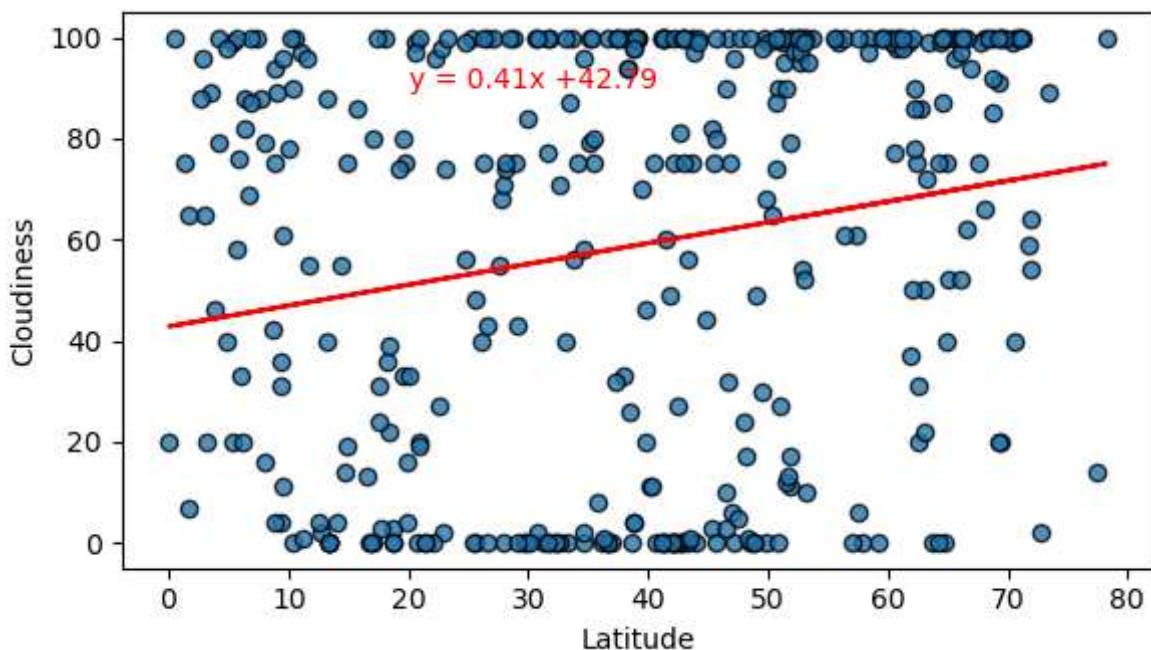
Discussion about the linear relationship: There is no clear correlation between humidity & latitude for either hemisphere

Cloudiness vs. Latitude Linear Regression Plot

In [22]:

```
# Northern Hemisphere
x_values = northern_hemi_df['Lat']
y_values = northern_hemi_df['Cloudiness']
pltLinRegress(x_values, y_values, "Latitude", "Cloudiness", "Northern", (20, 90))
```

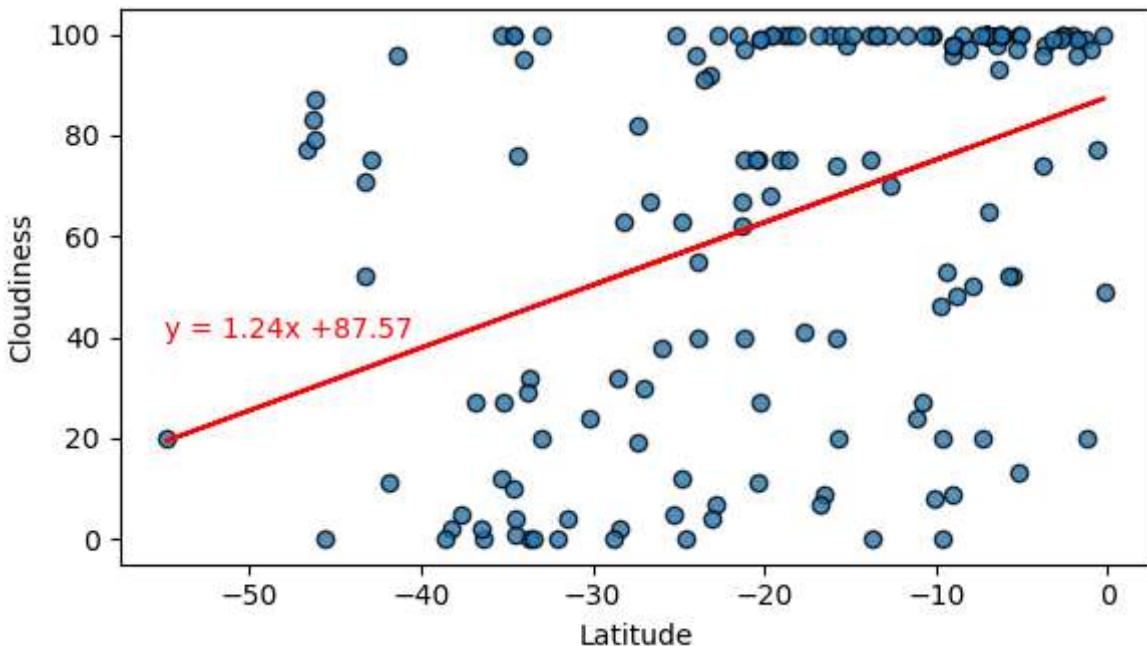
The r-value is: 0.040907830601902666



In [26]:

```
# Southern Hemisphere
x_values = southern_hemi_df['Lat']
y_values = southern_hemi_df['Cloudiness']
pltLinRegress(x_values, y_values, "Latitude", "Cloudiness", "Southern", (-55, 40))
```

The r-value is: 0.17414596298073323

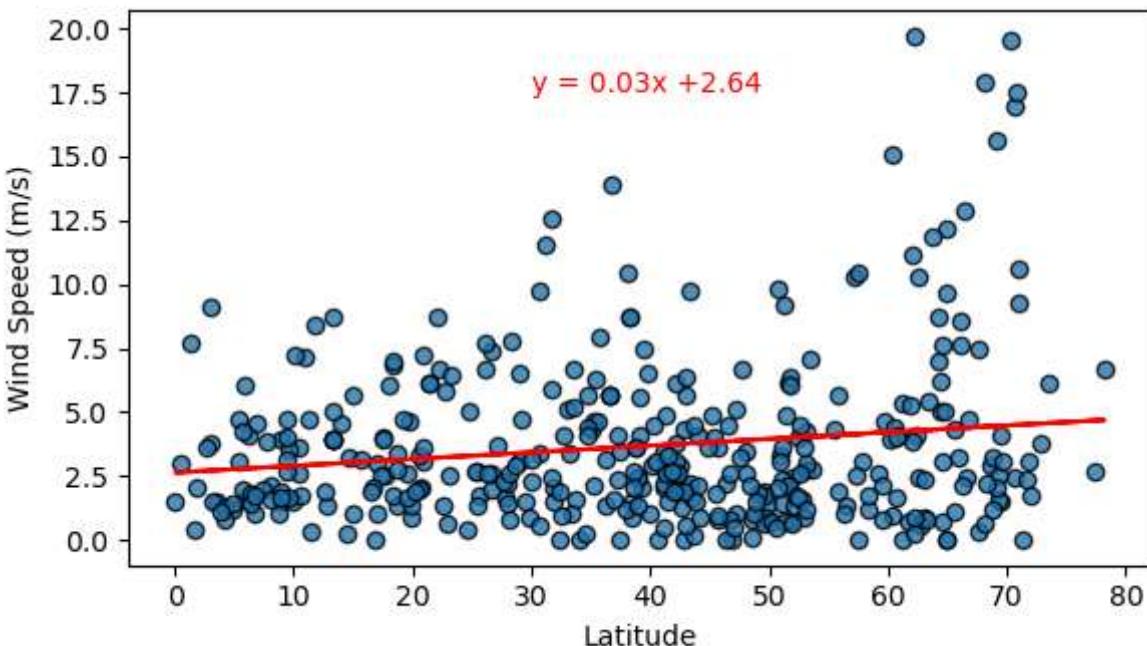


Discussion about the linear relationship: There is no clear correlation between cloudiness & latitude for either hemisphere

Wind Speed vs. Latitude Linear Regression Plot

```
In [28]: # Northern Hemisphere
x_values = northern_hemi_df['Lat']
y_values = northern_hemi_df['Wind Speed']
pltLinRegress(x_values, y_values, "Latitude", "Wind Speed (m/s)", "Northern", (30, 17.5))
```

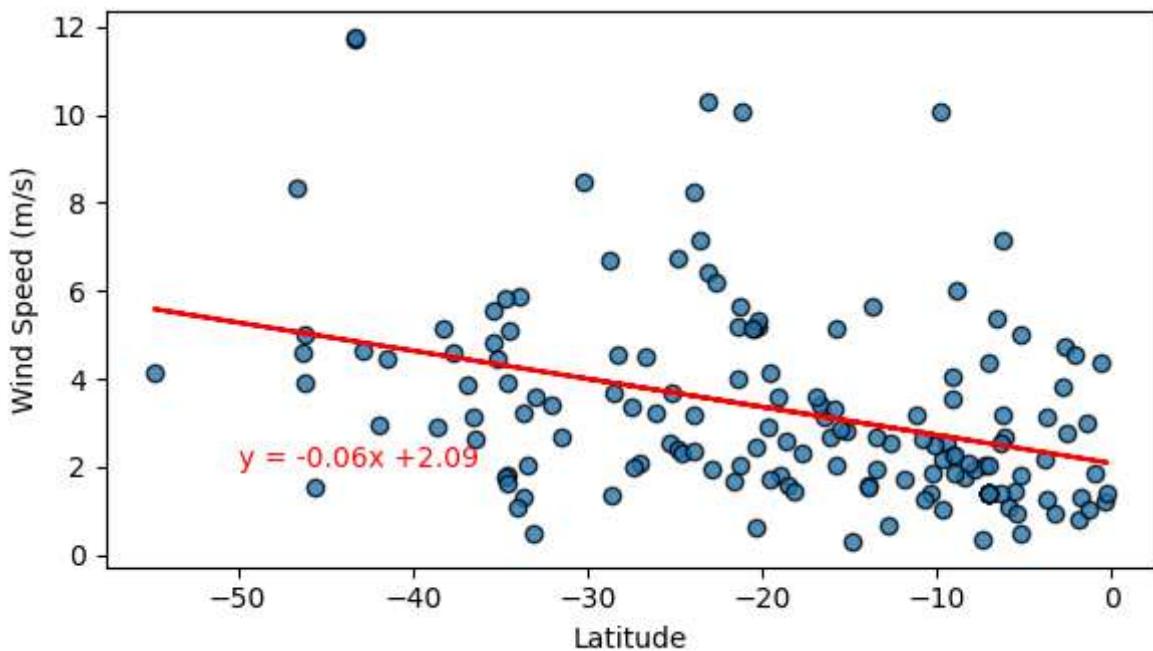
The r-value is: 0.026026988579110025



```
In [29]: # Southern Hemisphere
x_values = southern_hemi_df['Lat']
```

```
y_values = southern_hemi_df['Wind Speed']
pltLinRegress(x_values, y_values, "Latitude", "Wind Speed (m/s)", "Southern", (-50, 2))
```

The r-value is: 0.13739114751896753



Discussion about the linear relationship: There is no clear correlation between wind speed & latitude for either hemisphere