

WeatherPy

Starter Code to Generate Random Geographic Coordinates and a List of Cities

```
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

# 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: 603

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?"

# 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 = f"{url}q={city}&units=metric&appid={weather_api_key}"

    # 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:
        # Parse the JSON and retrieve data
        city_weather = (requests.get(city_url)).json()

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

        # 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 | grytviken
Processing Record 2 of Set 1 | punta arenas
Processing Record 3 of Set 1 | marudi
City not found. Skipping...
Processing Record 4 of Set 1 | axum
Processing Record 5 of Set 1 | rio guayabal de yateras
Processing Record 6 of Set 1 | arkhangel'sk
Processing Record 7 of Set 1 | edinburgh of the seven seas
Processing Record 8 of Set 1 | puerto natales
Processing Record 9 of Set 1 | taiohae
City not found. Skipping...
Processing Record 10 of Set 1 | bathsheba
Processing Record 11 of Set 1 | ilulissat
Processing Record 12 of Set 1 | talnakh
Processing Record 13 of Set 1 | puerto ayora
Processing Record 14 of Set 1 | mogoytuy
Processing Record 15 of Set 1 | port-aux-francais
Processing Record 16 of Set 1 | bilibino
Processing Record 17 of Set 1 | waitangi
Processing Record 18 of Set 1 | west island
Processing Record 19 of Set 1 | papatowai
Processing Record 20 of Set 1 | lavrio
Processing Record 21 of Set 1 | port mathurin
Processing Record 22 of Set 1 | vorkuta
Processing Record 23 of Set 1 | lima
Processing Record 24 of Set 1 | alofi
Processing Record 25 of Set 1 | ushuaia
Processing Record 26 of Set 1 | haiku-pauwela
Processing Record 27 of Set 1 | albany
Processing Record 28 of Set 1 | devinuwara
City not found. Skipping...
Processing Record 29 of Set 1 | thompson
Processing Record 30 of Set 1 | butterworth
Processing Record 31 of Set 1 | olonkinbyen
Processing Record 32 of Set 1 | ambalangoda
Processing Record 33 of Set 1 | yuzhno-kurilsk
Processing Record 34 of Set 1 | vadso
Processing Record 35 of Set 1 | aasiaat
Processing Record 36 of Set 1 | la palma
Processing Record 37 of Set 1 | udachny
Processing Record 38 of Set 1 | veraval
Processing Record 39 of Set 1 | shalqar
Processing Record 40 of Set 1 | dalandzadgad
Processing Record 41 of Set 1 | jamestown
Processing Record 42 of Set 1 | hilo
Processing Record 43 of Set 1 | muynoq
Processing Record 44 of Set 1 | longyearbyen
Processing Record 45 of Set 1 | hualien city
Processing Record 46 of Set 1 | port saint john's
Processing Record 47 of Set 1 | ta`u
Processing Record 48 of Set 1 | fale old settlement
Processing Record 49 of Set 1 | lebu
Processing Record 50 of Set 1 | general villegas
Processing Record 0 of Set 2 | hoby
Processing Record 1 of Set 2 | ramon castilla
Processing Record 2 of Set 2 | gaalkacyo
Processing Record 3 of Set 2 | isafjordur
Processing Record 4 of Set 2 | carlow

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Processing Record 5 of Set 2 | afaahiti
Processing Record 6 of Set 2 | peniche
Processing Record 7 of Set 2 | viqueque
Processing Record 8 of Set 2 | merizo village
Processing Record 9 of Set 2 | kingscliff
Processing Record 10 of Set 2 | governor's harbour
City not found. Skipping...
Processing Record 11 of Set 2 | pangody
Processing Record 12 of Set 2 | wailua homesteads
Processing Record 13 of Set 2 | san sebastian de la gomera
Processing Record 14 of Set 2 | pisco
Processing Record 15 of Set 2 | constantia
Processing Record 16 of Set 2 | mugia
Processing Record 17 of Set 2 | iskateley
Processing Record 18 of Set 2 | nemuro
Processing Record 19 of Set 2 | geraldton
Processing Record 20 of Set 2 | igaluit
Processing Record 21 of Set 2 | qaqortoq
Processing Record 22 of Set 2 | tubbergen
Processing Record 23 of Set 2 | cannonvale
Processing Record 24 of Set 2 | dame-marie
Processing Record 25 of Set 2 | colonia
Processing Record 26 of Set 2 | blackmans bay
Processing Record 27 of Set 2 | saipan
Processing Record 28 of Set 2 | hasaki
Processing Record 29 of Set 2 | la passe
Processing Record 30 of Set 2 | cloverdale
Processing Record 31 of Set 2 | talara
Processing Record 32 of Set 2 | lesozavodsk
Processing Record 33 of Set 2 | college
Processing Record 34 of Set 2 | tromso
Processing Record 35 of Set 2 | antsohihy
Processing Record 36 of Set 2 | adamstown
Processing Record 37 of Set 2 | niebull
Processing Record 38 of Set 2 | sitka
Processing Record 39 of Set 2 | hithadhoo
Processing Record 40 of Set 2 | saint-philippe
Processing Record 41 of Set 2 | port shepstone
Processing Record 42 of Set 2 | tiksi
Processing Record 43 of Set 2 | selfoss
Processing Record 44 of Set 2 | vila franca do campo
Processing Record 45 of Set 2 | kanpur
Processing Record 46 of Set 2 | invercargill
Processing Record 47 of Set 2 | yellowknife
Processing Record 48 of Set 2 | ouadda
Processing Record 49 of Set 2 | dudinka
Processing Record 0 of Set 3 | pacific grove
Processing Record 1 of Set 3 | okotoks
Processing Record 2 of Set 3 | fuglafjordur
Processing Record 3 of Set 3 | kerman
Processing Record 4 of Set 3 | halifax
Processing Record 5 of Set 3 | port elizabeth
Processing Record 6 of Set 3 | kodiak
Processing Record 7 of Set 3 | coreau
Processing Record 8 of Set 3 | shahr-e babak
Processing Record 9 of Set 3 | lerwick
Processing Record 10 of Set 3 | peterhead
Processing Record 11 of Set 3 | magadan
Processing Record 12 of Set 3 | kargasok
Processing Record 13 of Set 3 | avarua

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Processing Record 14 of Set 3 | ust-nera
Processing Record 15 of Set 3 | turbat
Processing Record 16 of Set 3 | whitehorse
Processing Record 17 of Set 3 | vega de alatorre
Processing Record 18 of Set 3 | mar del plata
Processing Record 19 of Set 3 | scottburgh
Processing Record 20 of Set 3 | fort st. john
Processing Record 21 of Set 3 | gokwe
Processing Record 22 of Set 3 | broken hill
Processing Record 23 of Set 3 | sines
Processing Record 24 of Set 3 | bredasdorp
Processing Record 25 of Set 3 | weno
Processing Record 26 of Set 3 | prince rupert
Processing Record 27 of Set 3 | klyuchi
Processing Record 28 of Set 3 | stanley
Processing Record 29 of Set 3 | chos malal
Processing Record 30 of Set 3 | salahonda
Processing Record 31 of Set 3 | obock
Processing Record 32 of Set 3 | praia da vitoria
Processing Record 33 of Set 3 | ebon
Processing Record 34 of Set 3 | khilok
Processing Record 35 of Set 3 | kolonia
Processing Record 36 of Set 3 | port douglas
Processing Record 37 of Set 3 | new norfolk
Processing Record 38 of Set 3 | kirkuk
Processing Record 39 of Set 3 | lata
Processing Record 40 of Set 3 | hami
Processing Record 41 of Set 3 | ihosy
Processing Record 42 of Set 3 | gizo
Processing Record 43 of Set 3 | turaif
Processing Record 44 of Set 3 | labrador city
Processing Record 45 of Set 3 | mount isa
Processing Record 46 of Set 3 | hamilton
Processing Record 47 of Set 3 | birao
Processing Record 48 of Set 3 | waddan
Processing Record 49 of Set 3 | luderitz
Processing Record 0 of Set 4 | coihueco
Processing Record 1 of Set 4 | yangor
City not found. Skipping...
Processing Record 2 of Set 4 | nabire
Processing Record 3 of Set 4 | ola
Processing Record 4 of Set 4 | klaksvik
Processing Record 5 of Set 4 | sinabang
Processing Record 6 of Set 4 | sabancuy
Processing Record 7 of Set 4 | pandan
Processing Record 8 of Set 4 | niceville
Processing Record 9 of Set 4 | bardai
Processing Record 10 of Set 4 | embi
Processing Record 11 of Set 4 | jeddah
Processing Record 12 of Set 4 | tazacorte
Processing Record 13 of Set 4 | carnarvon
Processing Record 14 of Set 4 | goundam
Processing Record 15 of Set 4 | enewetak
Processing Record 16 of Set 4 | bethel
Processing Record 17 of Set 4 | quang ngai
Processing Record 18 of Set 4 | hermanus
Processing Record 19 of Set 4 | atakpame
Processing Record 20 of Set 4 | itoman
Processing Record 21 of Set 4 | agadez
Processing Record 22 of Set 4 | hihifo

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City not found. Skipping...

Processing Record 23 of Set 4 | arandelovac

City not found. Skipping...

Processing Record 24 of Set 4 | coronel dorrego

Processing Record 25 of Set 4 | lompoc

Processing Record 26 of Set 4 | antofagasta

Processing Record 27 of Set 4 | remire-montjoly

Processing Record 28 of Set 4 | tchaourou

Processing Record 29 of Set 4 | susuman

Processing Record 30 of Set 4 | tsiombe

Processing Record 31 of Set 4 | yerofey pavlovich

Processing Record 32 of Set 4 | manacapuru

Processing Record 33 of Set 4 | keflavik

Processing Record 34 of Set 4 | ust-tsilma

Processing Record 35 of Set 4 | vodnyy

Processing Record 36 of Set 4 | mejit

Processing Record 37 of Set 4 | balezino

Processing Record 38 of Set 4 | petropavlovsk-kamchatsky

Processing Record 39 of Set 4 | georgetown

Processing Record 40 of Set 4 | kapuskasing

Processing Record 41 of Set 4 | muisne

Processing Record 42 of Set 4 | alaghsas

Processing Record 43 of Set 4 | uturoa

Processing Record 44 of Set 4 | antsohimbondrona

City not found. Skipping...

Processing Record 45 of Set 4 | margaret river

Processing Record 46 of Set 4 | mount gambier

Processing Record 47 of Set 4 | nguigmi

Processing Record 48 of Set 4 | tomatlan

Processing Record 49 of Set 4 | 'ohonua

City not found. Skipping...

Processing Record 0 of Set 5 | nar'yan-mar

Processing Record 1 of Set 5 | ust'-ilimsk

Processing Record 2 of Set 5 | little cayman

City not found. Skipping...

Processing Record 3 of Set 5 | hawaiian paradise park

Processing Record 4 of Set 5 | nelson bay

Processing Record 5 of Set 5 | belyy yar

Processing Record 6 of Set 5 | tranovaho

City not found. Skipping...

Processing Record 7 of Set 5 | dien bien phu

Processing Record 8 of Set 5 | sovetskoye

Processing Record 9 of Set 5 | savave village

City not found. Skipping...

Processing Record 10 of Set 5 | kyren

Processing Record 11 of Set 5 | anadyr

Processing Record 12 of Set 5 | mlyniv

Processing Record 13 of Set 5 | kultali

City not found. Skipping...

Processing Record 14 of Set 5 | talodi

Processing Record 15 of Set 5 | yagry

City not found. Skipping...

Processing Record 16 of Set 5 | langsa

Processing Record 17 of Set 5 | touros

Processing Record 18 of Set 5 | buala

Processing Record 19 of Set 5 | nova sintra

Processing Record 20 of Set 5 | oral

Processing Record 21 of Set 5 | fortuna

Processing Record 22 of Set 5 | borogontsy

Processing Record 23 of Set 5 | leticia

Processing Record 24 of Set 5		palmer
Processing Record 25 of Set 5		oldenburg in holstein
Processing Record 26 of Set 5		stettler
Processing Record 27 of Set 5		kapit
Processing Record 28 of Set 5		fort bragg
Processing Record 29 of Set 5		ribeira grande
Processing Record 30 of Set 5		san andres
Processing Record 31 of Set 5		xiongzhou
Processing Record 32 of Set 5		kiunga
Processing Record 33 of Set 5		las tablas
Processing Record 34 of Set 5		dosso
Processing Record 35 of Set 5		sibenik
Processing Record 36 of Set 5		chonchi
Processing Record 37 of Set 5		evergreen
Processing Record 38 of Set 5		howrah
Processing Record 39 of Set 5		kazerun
Processing Record 40 of Set 5		chipata
Processing Record 41 of Set 5		taltal
Processing Record 42 of Set 5		mossel bay
Processing Record 43 of Set 5		seka
Processing Record 44 of Set 5		badger
Processing Record 45 of Set 5		neiafu
Processing Record 46 of Set 5		kamina
Processing Record 47 of Set 5		cestos city
Processing Record 48 of Set 5		rosarito
Processing Record 49 of Set 5		gilgit
Processing Record 0 of Set 6		east london
Processing Record 1 of Set 6		dover
Processing Record 2 of Set 6		imbituba
Processing Record 3 of Set 6		al-`ula
City not found. Skipping...		
Processing Record 4 of Set 6		vorgashor
Processing Record 5 of Set 6		weiser
Processing Record 6 of Set 6		howard springs
Processing Record 7 of Set 6		suhbaatar
Processing Record 8 of Set 6		nea moudhanian
City not found. Skipping...		
Processing Record 9 of Set 6		island harbour
Processing Record 10 of Set 6		lihue
Processing Record 11 of Set 6		portales
Processing Record 12 of Set 6		barranca
Processing Record 13 of Set 6		vangaindrano
Processing Record 14 of Set 6		shingu
Processing Record 15 of Set 6		kangal
Processing Record 16 of Set 6		tam ky
Processing Record 17 of Set 6		tegina
Processing Record 18 of Set 6		vredenburg
City not found. Skipping...		
Processing Record 19 of Set 6		ancud
Processing Record 20 of Set 6		st. john's
Processing Record 21 of Set 6		saldanha
Processing Record 22 of Set 6		chizhou
Processing Record 23 of Set 6		nyrob
Processing Record 24 of Set 6		barletta
Processing Record 25 of Set 6		smithers
Processing Record 26 of Set 6		coahuayana de hidalgo
Processing Record 27 of Set 6		tralee
Processing Record 28 of Set 6		santa cruz
Processing Record 29 of Set 6		cambria
Processing Record 30 of Set 6		laojunmiao

Processing Record 31 of Set 6		tolanaro
Processing Record 32 of Set 6		kohtla-jarve
Processing Record 33 of Set 6		tabarka
Processing Record 34 of Set 6		porto novo
Processing Record 35 of Set 6		kropyvnytskyi
Processing Record 36 of Set 6		tofol
Processing Record 37 of Set 6		ojinaga
Processing Record 38 of Set 6		patrasaer
Processing Record 39 of Set 6		wynyard
Processing Record 40 of Set 6		lasam
Processing Record 41 of Set 6		coursan
Processing Record 42 of Set 6		coquimbo
Processing Record 43 of Set 6		codrington
Processing Record 44 of Set 6		yeppoon
Processing Record 45 of Set 6		usogorsk
Processing Record 46 of Set 6		sogndal
Processing Record 47 of Set 6		salinas
Processing Record 48 of Set 6		sault ste. marie
Processing Record 49 of Set 6		alamos
Processing Record 0 of Set 7		dunedin
Processing Record 1 of Set 7		antsiranana
Processing Record 2 of Set 7		bam
Processing Record 3 of Set 7		utrik
Processing Record 4 of Set 7		limon
Processing Record 5 of Set 7		nadym
Processing Record 6 of Set 7		trinidad
Processing Record 7 of Set 7		minas de marcona
Processing Record 8 of Set 7		cable beach
City not found. Skipping...		
Processing Record 9 of Set 7		richards bay
Processing Record 10 of Set 7		ginir
Processing Record 11 of Set 7		whakatane
Processing Record 12 of Set 7		greenville
Processing Record 13 of Set 7		otjiwarongo
Processing Record 14 of Set 7		atafu village
Processing Record 15 of Set 7		betio village
Processing Record 16 of Set 7		puerto san carlos
City not found. Skipping...		
Processing Record 17 of Set 7		nuku'alofa
Processing Record 18 of Set 7		nowy dwor gdanski
Processing Record 19 of Set 7		crane
Processing Record 20 of Set 7		taman'
Processing Record 21 of Set 7		talakan
Processing Record 22 of Set 7		santiago papasquiario
City not found. Skipping...		
Processing Record 23 of Set 7		laguna
Processing Record 24 of Set 7		arraial do cabo
Processing Record 25 of Set 7		semnan
Processing Record 26 of Set 7		boende
Processing Record 27 of Set 7		vilyuchinsk
Processing Record 28 of Set 7		plastun
Processing Record 29 of Set 7		damboa
Processing Record 30 of Set 7		chu
Processing Record 31 of Set 7		bereznik
Processing Record 32 of Set 7		manakara
Processing Record 33 of Set 7		gamba
Processing Record 34 of Set 7		naifaru
Processing Record 35 of Set 7		shenkursk
Processing Record 36 of Set 7		tadine
Processing Record 37 of Set 7		al kharj

Processing Record 38 of Set 7 | gurupa
Processing Record 39 of Set 7 | pariaman
Processing Record 40 of Set 7 | namie
Processing Record 41 of Set 7 | swan hill
Processing Record 42 of Set 7 | al 'alamayn
City not found. Skipping...
Processing Record 43 of Set 7 | belmonte
Processing Record 44 of Set 7 | bonthe
Processing Record 45 of Set 7 | greenfields
Processing Record 46 of Set 7 | terra santa
Processing Record 47 of Set 7 | orchard homes
Processing Record 48 of Set 7 | gueltat zemmour
City not found. Skipping...
Processing Record 49 of Set 7 | bowen
Processing Record 0 of Set 8 | tobi village
City not found. Skipping...
Processing Record 1 of Set 8 | lorengau
Processing Record 2 of Set 8 | palopo
Processing Record 3 of Set 8 | brevard
Processing Record 4 of Set 8 | wangaratta
Processing Record 5 of Set 8 | newman
Processing Record 6 of Set 8 | mirzapur
Processing Record 7 of Set 8 | flying fish cove
Processing Record 8 of Set 8 | qamdo
Processing Record 9 of Set 8 | ghat
Processing Record 10 of Set 8 | daru
Processing Record 11 of Set 8 | namibe
Processing Record 12 of Set 8 | nenjiang
Processing Record 13 of Set 8 | yeniseysk
Processing Record 14 of Set 8 | debre werk'
Processing Record 15 of Set 8 | argo
Processing Record 16 of Set 8 | alice springs
Processing Record 17 of Set 8 | malvan
Processing Record 18 of Set 8 | trincomalee
Processing Record 19 of Set 8 | mariental
Processing Record 20 of Set 8 | sisimiut
Processing Record 21 of Set 8 | acarau
Processing Record 22 of Set 8 | horta
Processing Record 23 of Set 8 | saanen
Processing Record 24 of Set 8 | saijo
Processing Record 25 of Set 8 | westport
Processing Record 26 of Set 8 | frontera
Processing Record 27 of Set 8 | tazovsky
Processing Record 28 of Set 8 | jinchang
Processing Record 29 of Set 8 | kataragama
City not found. Skipping...
Processing Record 30 of Set 8 | dwarka
Processing Record 31 of Set 8 | sharkan
Processing Record 32 of Set 8 | al jawf
Processing Record 33 of Set 8 | bengkulu
Processing Record 34 of Set 8 | tanrake village
City not found. Skipping...
Processing Record 35 of Set 8 | villa hidalgo
Processing Record 36 of Set 8 | koster
Processing Record 37 of Set 8 | katsuren-haebaru
Processing Record 38 of Set 8 | kavaratti
Processing Record 39 of Set 8 | bikenibeu village
Processing Record 40 of Set 8 | san pedro
Processing Record 41 of Set 8 | karratha
Processing Record 42 of Set 8 | benguela

Processing Record 43 of Set 8		ghadamis
Processing Record 44 of Set 8		ha'il
Processing Record 45 of Set 8		chadron
Processing Record 46 of Set 8		broome
Processing Record 47 of Set 8		la punta
Processing Record 48 of Set 8		ardakan
Processing Record 49 of Set 8		arzgir
Processing Record 0 of Set 9		kuching
Processing Record 1 of Set 9		fu'an
Processing Record 2 of Set 9		margate
Processing Record 3 of Set 9		nanticoke
Processing Record 4 of Set 9		eyl
Processing Record 5 of Set 9		polyarnyy
Processing Record 6 of Set 9		sydney
Processing Record 7 of Set 9		bantva
Processing Record 8 of Set 9		carbonear
Processing Record 9 of Set 9		tari
Processing Record 10 of Set 9		ar ruways
Processing Record 11 of Set 9		ulladulla
Processing Record 12 of Set 9		galliano
Processing Record 13 of Set 9		nadi
Processing Record 14 of Set 9		twon-brass
Processing Record 15 of Set 9		guerrero
Processing Record 16 of Set 9		san julian
Processing Record 17 of Set 9		vila velha
Processing Record 18 of Set 9		muzayri'
City not found. Skipping...		
Processing Record 19 of Set 9		champerico
Processing Record 20 of Set 9		tura
Processing Record 21 of Set 9		ouargla
Processing Record 22 of Set 9		cartagena del chaira
Processing Record 23 of Set 9		nogliki
Processing Record 24 of Set 9		gunjur
Processing Record 25 of Set 9		sikasso
Processing Record 26 of Set 9		tsurusaki
Processing Record 27 of Set 9		yaren
Processing Record 28 of Set 9		palikir - national government center
Processing Record 29 of Set 9		saint augustine beach
Processing Record 30 of Set 9		ljusdal
Processing Record 31 of Set 9		cargados carajos
City not found. Skipping...		
Processing Record 32 of Set 9		sorong
Processing Record 33 of Set 9		duliagaon
Processing Record 34 of Set 9		inekar
City not found. Skipping...		
Processing Record 35 of Set 9		puerto madryn
Processing Record 36 of Set 9		swellendam
Processing Record 37 of Set 9		oliver
Processing Record 38 of Set 9		argostolion
Processing Record 39 of Set 9		al artawiyah
Processing Record 40 of Set 9		chinde
Processing Record 41 of Set 9		kapa'a
Processing Record 42 of Set 9		suntar
Processing Record 43 of Set 9		bandarbeyla
Processing Record 44 of Set 9		khamis mushait
Processing Record 45 of Set 9		espargos
City not found. Skipping...		
Processing Record 46 of Set 9		guerrero negro
Processing Record 47 of Set 9		gebeit
Processing Record 48 of Set 9		kingston

Processing Record 49 of Set 9		ostroda
Processing Record 0 of Set 10		kuqa
Processing Record 1 of Set 10		al khawr
Processing Record 2 of Set 10		ornskoldsvik
Processing Record 3 of Set 10		alappuzha
Processing Record 4 of Set 10		luau
Processing Record 5 of Set 10		kudahuvadhoo
Processing Record 6 of Set 10		cockburn town
Processing Record 7 of Set 10		barakani
Processing Record 8 of Set 10		sar-e pul
Processing Record 9 of Set 10		taglio di po
Processing Record 10 of Set 10		mettur
Processing Record 11 of Set 10		bocanda
Processing Record 12 of Set 10		viet tri
Processing Record 13 of Set 10		chandler
Processing Record 14 of Set 10		hotan
Processing Record 15 of Set 10		pochaiv
Processing Record 16 of Set 10		hammerfest
Processing Record 17 of Set 10		bahia de kino
Processing Record 18 of Set 10		peace river
Processing Record 19 of Set 10		viedma
Processing Record 20 of Set 10		eatonton
Processing Record 21 of Set 10		hadibu
Processing Record 22 of Set 10		kodok
City not found. Skipping...		
Processing Record 23 of Set 10		puerto baquerizo moreno
Processing Record 24 of Set 10		mil'kovo
Processing Record 25 of Set 10		sarmanovo
Processing Record 26 of Set 10		luorong
Processing Record 27 of Set 10		ouesso
Processing Record 28 of Set 10		belomorsk
Processing Record 29 of Set 10		kirakira
Processing Record 30 of Set 10		castillos
Processing Record 31 of Set 10		ouellah
City not found. Skipping...		
Processing Record 32 of Set 10		port lincoln
Processing Record 33 of Set 10		kuala belait
Processing Record 34 of Set 10		carnot
Processing Record 35 of Set 10		port alfred
Processing Record 36 of Set 10		shillong
Processing Record 37 of Set 10		cabo san lucas
Processing Record 38 of Set 10		sabang
Processing Record 39 of Set 10		byford
Processing Record 40 of Set 10		mount pearl
Processing Record 41 of Set 10		kerikeri
Processing Record 42 of Set 10		afif
Processing Record 43 of Set 10		aceuchal
Processing Record 44 of Set 10		ceeldheer
Processing Record 45 of Set 10		khandyga
Processing Record 46 of Set 10		sao gabriel da cachoeira
Processing Record 47 of Set 10		east ballina
Processing Record 48 of Set 10		livingston
Processing Record 49 of Set 10		greymouth
Processing Record 0 of Set 11		i-n-salah
Processing Record 1 of Set 11		bandon
Processing Record 2 of Set 11		pingliang
Processing Record 3 of Set 11		banapur
Processing Record 4 of Set 11		sao jose da coroa grande
Processing Record 5 of Set 11		beau vallon
Processing Record 6 of Set 11		sao joao da barra

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Processing Record 7 of Set 11 | antonio enes
Processing Record 8 of Set 11 | arno
Processing Record 9 of Set 11 | srandakan
Processing Record 10 of Set 11 | fuvahmulah
City not found. Skipping...
Processing Record 11 of Set 11 | coari
Processing Record 12 of Set 11 | vargashi
Processing Record 13 of Set 11 | kasongo-lunda
Processing Record 14 of Set 11 | piacabucu
Processing Record 15 of Set 11 | oltinko'l
Processing Record 16 of Set 11 | sao paulo de Olivença
Processing Record 17 of Set 11 | walvis bay
Processing Record 18 of Set 11 | sokcho
Processing Record 19 of Set 11 | miyanoura
City not found. Skipping...
Processing Record 20 of Set 11 | vryburg
Processing Record 21 of Set 11 | ho
City not found. Skipping...
Processing Record 22 of Set 11 | nuuk
Processing Record 23 of Set 11 | zdvinsk
Processing Record 24 of Set 11 | wakkanai
Processing Record 25 of Set 11 | taro
Processing Record 26 of Set 11 | sarangani
Processing Record 27 of Set 11 | linqiong
Processing Record 28 of Set 11 | el calafate
Processing Record 29 of Set 11 | kitee
Processing Record 30 of Set 11 | tamanrasset
Processing Record 31 of Set 11 | nova vicosa
Processing Record 32 of Set 11 | nova olimpia
Processing Record 33 of Set 11 | dryden
Processing Record 34 of Set 11 | correntina
Processing Record 35 of Set 11 | kampene
Processing Record 36 of Set 11 | buena vista
Processing Record 37 of Set 11 | menongue
Processing Record 38 of Set 11 | alpena
Processing Record 39 of Set 11 | puerto aysen
Processing Record 40 of Set 11 | khanty-mansiysk
Processing Record 41 of Set 11 | woodland park
Processing Record 42 of Set 11 | paradip garh
Processing Record 43 of Set 11 | pauini
Processing Record 44 of Set 11 | shahrak
Processing Record 45 of Set 11 | toliara
Processing Record 46 of Set 11 | cururupu
Processing Record 47 of Set 11 | aomori
Processing Record 48 of Set 11 | puerto armuelles
Processing Record 49 of Set 11 | katsuura
Processing Record 0 of Set 12 | wau
Processing Record 1 of Set 12 | tambacounda
Processing Record 2 of Set 12 | neftcala
Processing Record 3 of Set 12 | siwa oasis
Processing Record 4 of Set 12 | pahrup
Processing Record 5 of Set 12 | pitkyaranta
Processing Record 6 of Set 12 | rakops
Processing Record 7 of Set 12 | rehoboth
Processing Record 8 of Set 12 | pueblo nuevo
Processing Record 9 of Set 12 | cleveland
Processing Record 10 of Set 12 | as pontes de garcia rodriguez
Processing Record 11 of Set 12 | chichiriviche
Processing Record 12 of Set 12 | reggane
Processing Record 13 of Set 12 | taiyuan
```

```

Processing Record 14 of Set 12 | machico
Processing Record 15 of Set 12 | gowurdak
Processing Record 16 of Set 12 | tasbuget
City not found. Skipping...
Processing Record 17 of Set 12 | el abiodh sidi cheikh
Processing Record 18 of Set 12 | hirara
Processing Record 19 of Set 12 | n'djamena
Processing Record 20 of Set 12 | nikolayevsk-on-amure
Processing Record 21 of Set 12 | seosan
Processing Record 22 of Set 12 | dawson creek
Processing Record 23 of Set 12 | marina di ardea-tor san lorenzo
City not found. Skipping...
Processing Record 24 of Set 12 | ulan bator
Processing Record 25 of Set 12 | zeribet el oued
Processing Record 26 of Set 12 | bharatpur
Processing Record 27 of Set 12 | homer
Processing Record 28 of Set 12 | mezhdureshensk
Processing Record 29 of Set 12 | amursk
Processing Record 30 of Set 12 | santa ana
Processing Record 31 of Set 12 | shahrud
Processing Record 32 of Set 12 | al hazm
Processing Record 33 of Set 12 | al qusayr
Processing Record 34 of Set 12 | mulanje
Processing Record 35 of Set 12 | cangucu
Processing Record 36 of Set 12 | vicuna
Processing Record 37 of Set 12 | saurimo
Processing Record 38 of Set 12 | guadalupe
Processing Record 39 of Set 12 | wotho
Processing Record 40 of Set 12 | leava
Processing Record 41 of Set 12 | kiana
Processing Record 42 of Set 12 | waterloo
Processing Record 43 of Set 12 | vingt cinq
City not found. Skipping...
Processing Record 44 of Set 12 | alta
Processing Record 45 of Set 12 | rongelap
Processing Record 46 of Set 12 | huanuni
Processing Record 47 of Set 12 | xiaoweizhai
Processing Record 48 of Set 12 | santa ana de yacuma
Processing Record 49 of Set 12 | solnechnyy
Processing Record 0 of Set 13 | awjilah
Processing Record 1 of Set 13 | hengchun
Processing Record 2 of Set 13 | floro

```

```

-----
Data Retrieval Complete
-----

```

```

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

# Show Record Count
city_data_df.count()

```

Out[4]:

City	566
Lat	566
Lng	566
Max Temp	566
Humidity	566
Cloudiness	566
Wind Speed	566
Country	566
Date	566

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	grytviken	-54.2811	-36.5092	2.19	98	100	3.12	GS	1686167174
1	punta arenas	-53.1500	-70.9167	4.06	75	20	6.69	CL	1686167174
2	axum	14.1245	38.7244	17.59	69	100	3.10	ET	1686167174
3	rio guayabal de yateras	20.3667	-75.0167	28.82	64	58	2.39	CU	1686167174
4	arkhangel'sk	64.5401	40.5433	2.69	77	4	1.52	RU	1686167091

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	I
City_ID									
0	grytviken	-54.2811	-36.5092	2.19	98	100	3.12	GS	168616
1	punta arenas	-53.1500	-70.9167	4.06	75	20	6.69	CL	168616
2	axum	14.1245	38.7244	17.59	69	100	3.10	ET	168616
3	rio guayabal de yateras	20.3667	-75.0167	28.82	64	58	2.39	CU	168616
4	arkhangel'sk	64.5401	40.5433	2.69	77	4	1.52	RU	168616

Create the Scatter Plots Requested

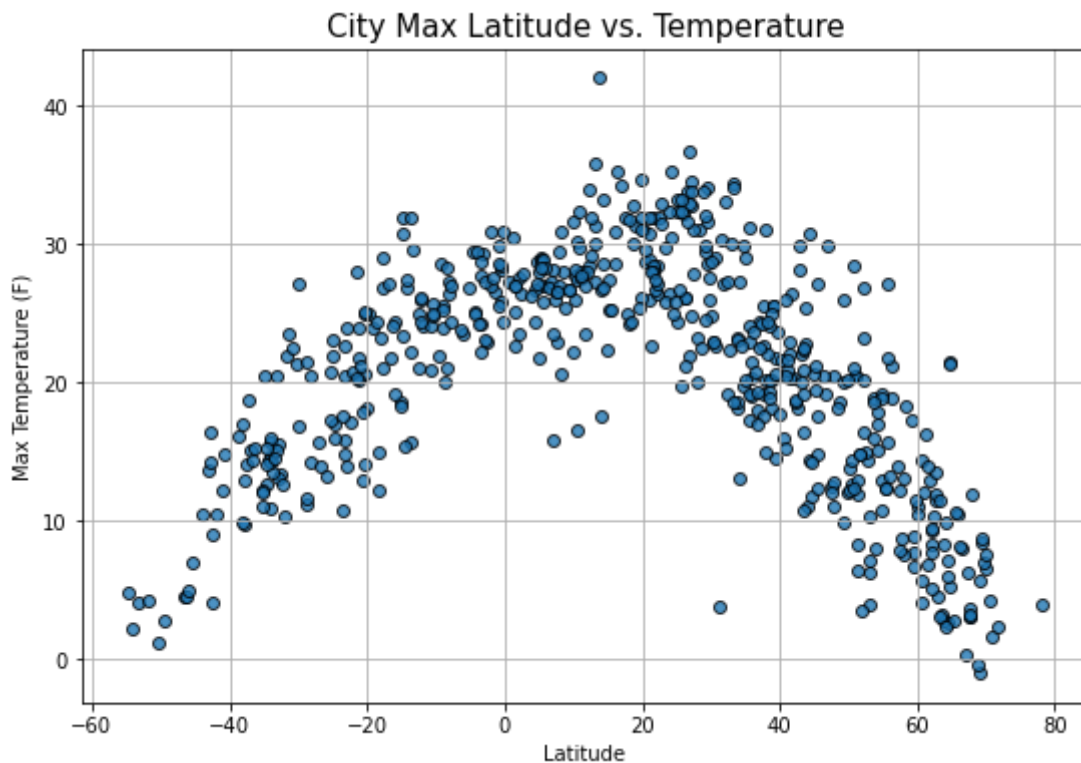
Latitude Vs. Temperature

```
In [8]: # Build scatter plot for latitude vs. temperature
plt.figure(figsize=(9,6))
plt.scatter(city_data_df["Lat"],
            city_data_df["Max Temp"],
            marker="o",
            edgecolor="black",
            linewidth=1,
            alpha=0.8,
            label="Cities")

# Incorporate the other graph properties
plt.title("City Max Latitude vs. Temperature", fontsize=15)
plt.ylabel("Max Temperature (F)")
plt.xlabel("Latitude")
plt.grid(True)

# Save the figure
plt.savefig("output_data/Fig1.png")

# Show plot
plt.show()
```



Latitude Vs. Humidity

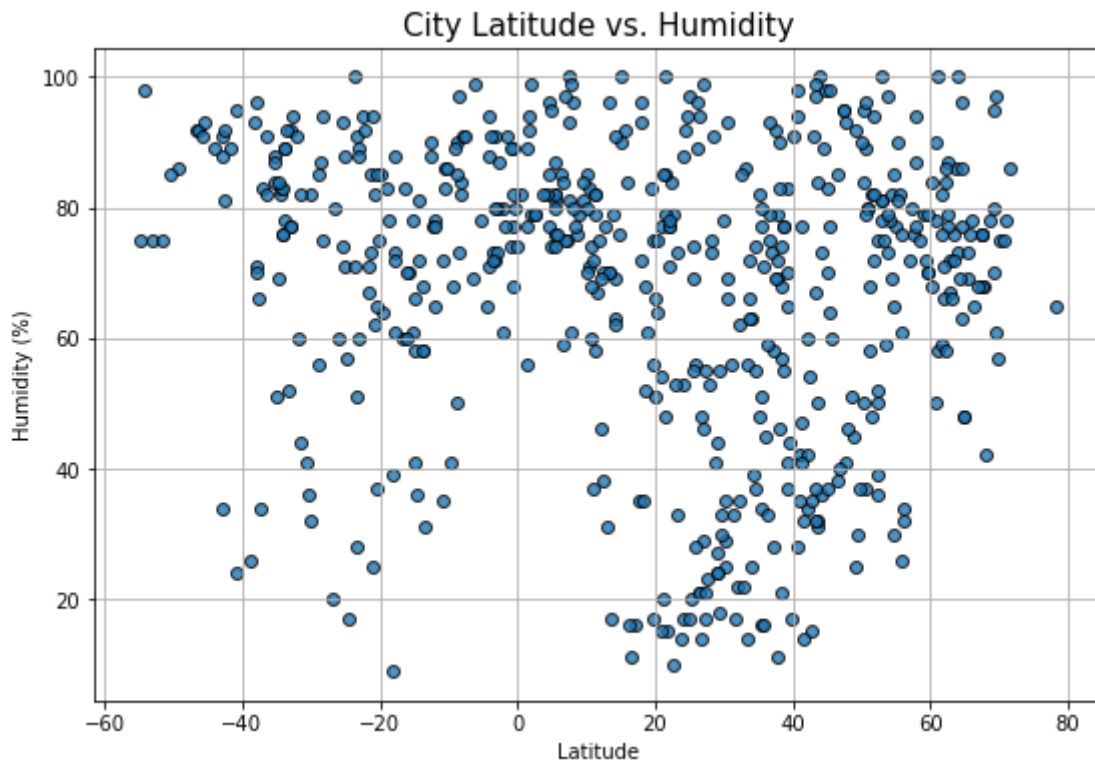
```
In [9]: # Build the scatter plots for latitude vs. humidity
plt.figure(figsize=(9,6))
plt.scatter(city_data_df["Lat"],
            city_data_df["Humidity"],
            marker="o",
            edgecolor="black",
            linewidth=1,
            alpha=0.8,
            label="Cities")
```



```
# Incorporate the other graph properties
plt.title("City Latitude vs. Humidity", fontsize=15)
plt.ylabel("Humidity (%)")
plt.xlabel("Latitude")
plt.grid(True)

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

# Show plot
plt.show()
```



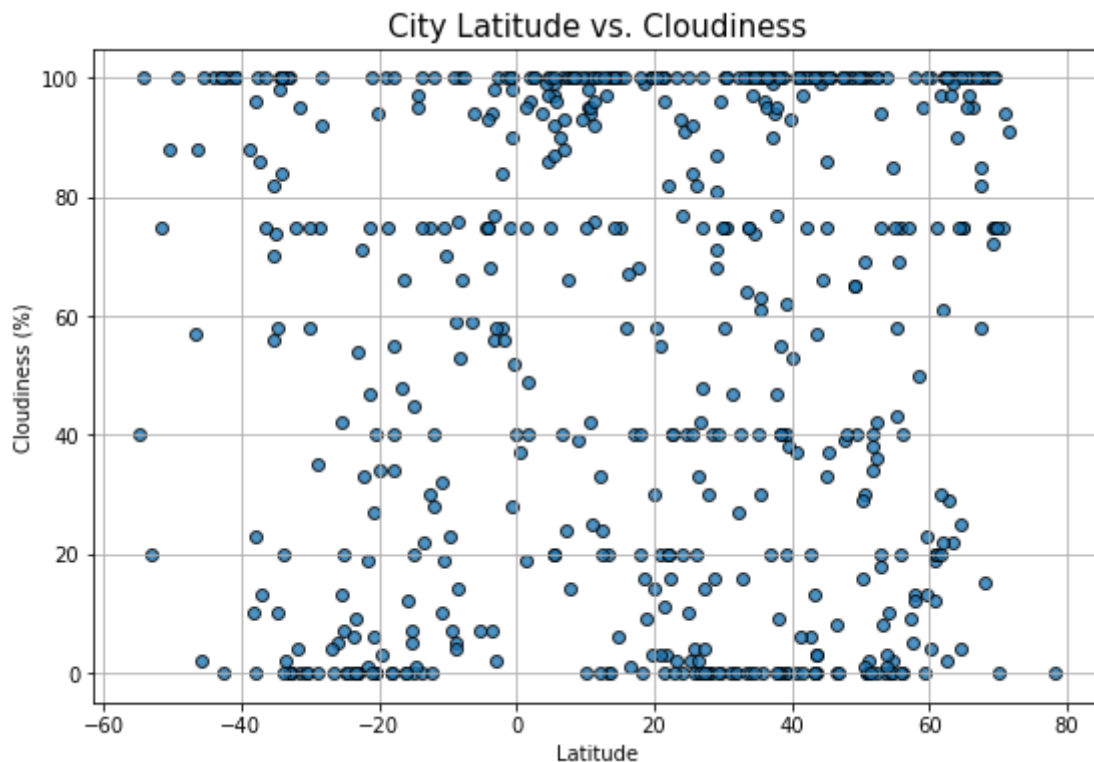
Latitude Vs. Cloudiness

```
In [10]: # Build the scatter plots for latitude vs. cloudiness
plt.figure(figsize=(9,6))
plt.scatter(city_data_df["Lat"],
            city_data_df["Cloudiness"],
            marker="o",
            edgecolor="black",
            linewidth=1,
            alpha=0.8,
            label="Cities")

# Incorporate the other graph properties
plt.title("City Latitude vs. Cloudiness", fontsize=15)
plt.ylabel("Cloudiness (%)")
plt.xlabel("Latitude")
plt.grid(True)

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

```
# Show plot
plt.show()
```



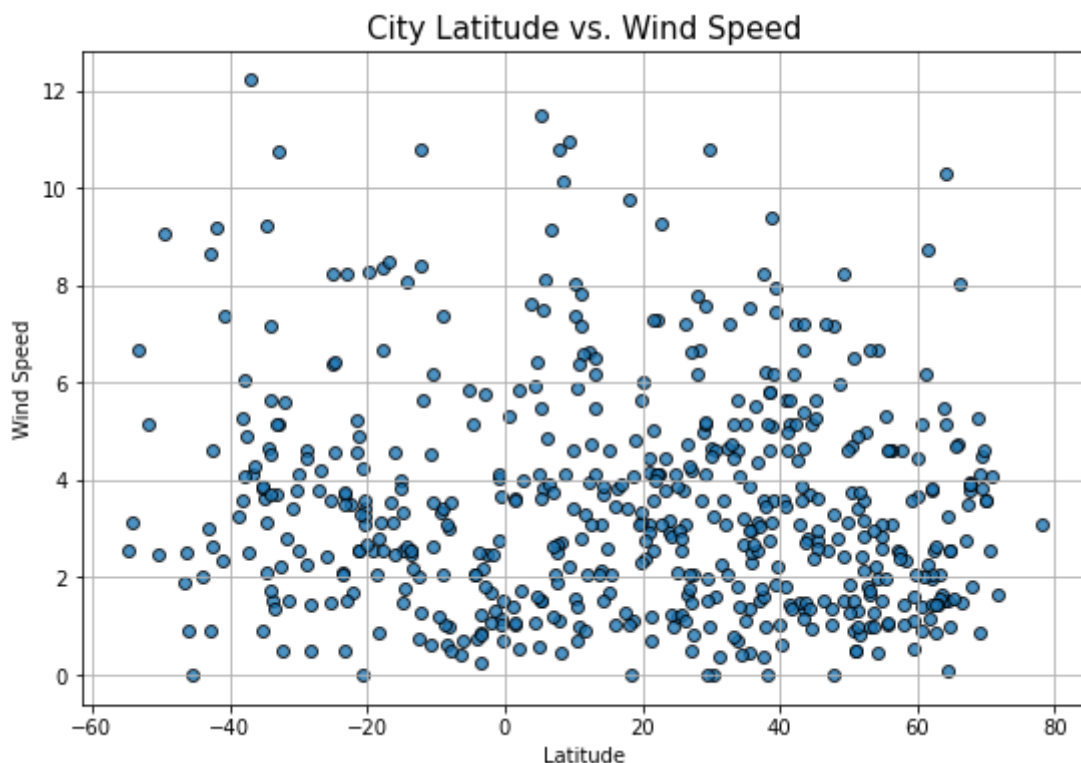
Latitude vs. Wind Speed Plot

```
In [11]: # Build the scatter plots for latitude vs. wind speed
plt.figure(figsize=(9,6))
plt.scatter(city_data_df["Lat"],
            city_data_df["Wind Speed"],
            marker="o",
            edgecolor="black",
            linewidths=1,
            alpha=0.8,
            label="Cities")

# Incorporate the other graph properties
plt.title("City Latitude vs. Wind Speed", fontsize=15)
plt.ylabel("Wind Speed")
plt.xlabel("Latitude")
plt.grid(True)

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

# Show plot
plt.show()
```



Requirement 2: Compute Linear Regression for Each Relationship

```
In [12]: # 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[12]:
```

	City	Lat	Lng	Max Temp	Humidity	Cloudiness	Wind Speed	Country	D
City_ID									
2	axum	14.1245	38.7244	17.59	69	100	3.10	ET	1686167
3	rio guayabal de yateras	20.3667	-75.0167	28.82	64	58	2.39	CU	1686167
4	arkhangel'sk	64.5401	40.5433	2.69	77	4	1.52	RU	1686167
7	bathsheba	13.2167	-59.5167	31.34	70	20	6.17	BB	1686167
8	ilulissat	69.2167	-51.1000	-0.99	80	75	4.12	GL	1686167

```
In [13]: # 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[13]:

	City	Lat	Lng	Max Temp	Humidity	Cloudiness	Wind Speed	Country	Date
City_ID									
0	grytviken	-54.2811	-36.5092	2.19	98	100	3.12	GS	168616717
1	punta arenas	-53.1500	-70.9167	4.06	75	20	6.69	CL	168616717
5	edinburgh of the seven seas	-37.0676	-12.3116	15.11	83	13	12.22	SH	168616717
6	puerto natales	-51.7236	-72.4875	4.25	75	75	5.14	CL	168616717
10	puerto ayora	-0.7393	-90.3518	29.98	89	98	4.02	EC	168616717

Temperature vs. Latitude Linear Regression Plot

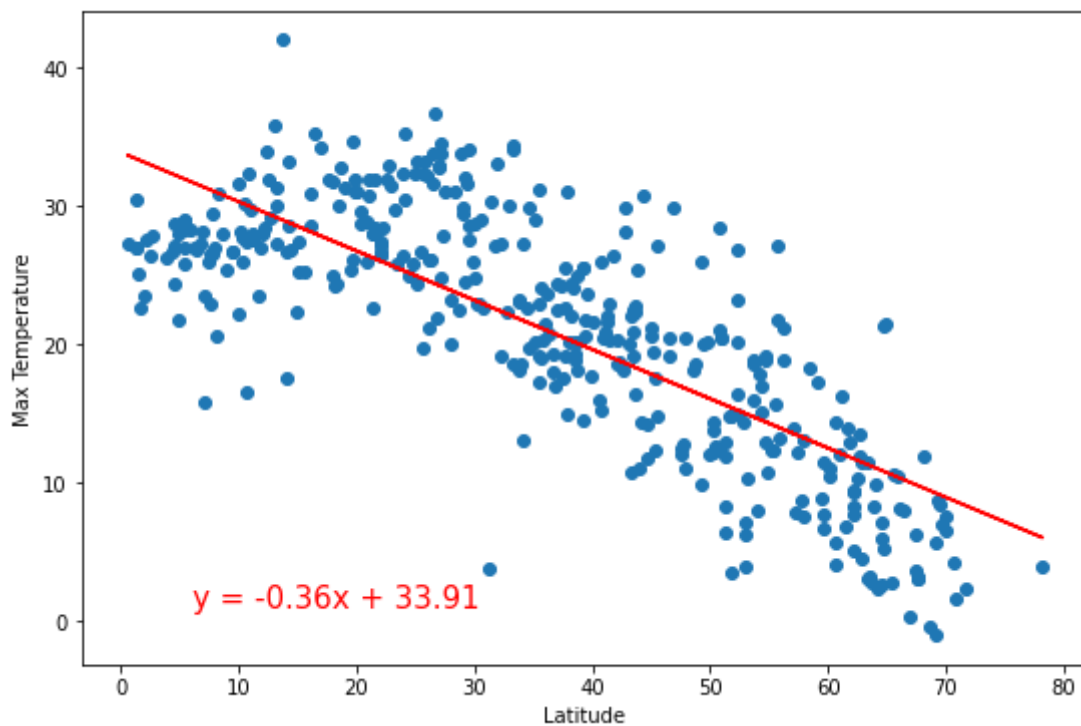
```
In [14]: # Linear regression on Northern Hemisphere
plt.figure(figsize=(9,6))
x_values = northern_hemi_df["Lat"]
y_values = northern_hemi_df["Max Temp"]
(slope, intercept, rvalue, pvalue, stderr) = linregress(x_values, y_values)
regress_values = x_values * slope + intercept
line_eq = "y = " + str(round(slope,2)) + "x + " + str(round(intercept,2))

plt.scatter(x_values,y_values)
plt.plot(x_values,regress_values,"r-")
plt.annotate(line_eq,(6,1),fontsize=15,color="red")
plt.xlabel("Latitude")
plt.ylabel("Max Temperature")

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

plt.show()
```

The r-value is: -0.7852645305815822



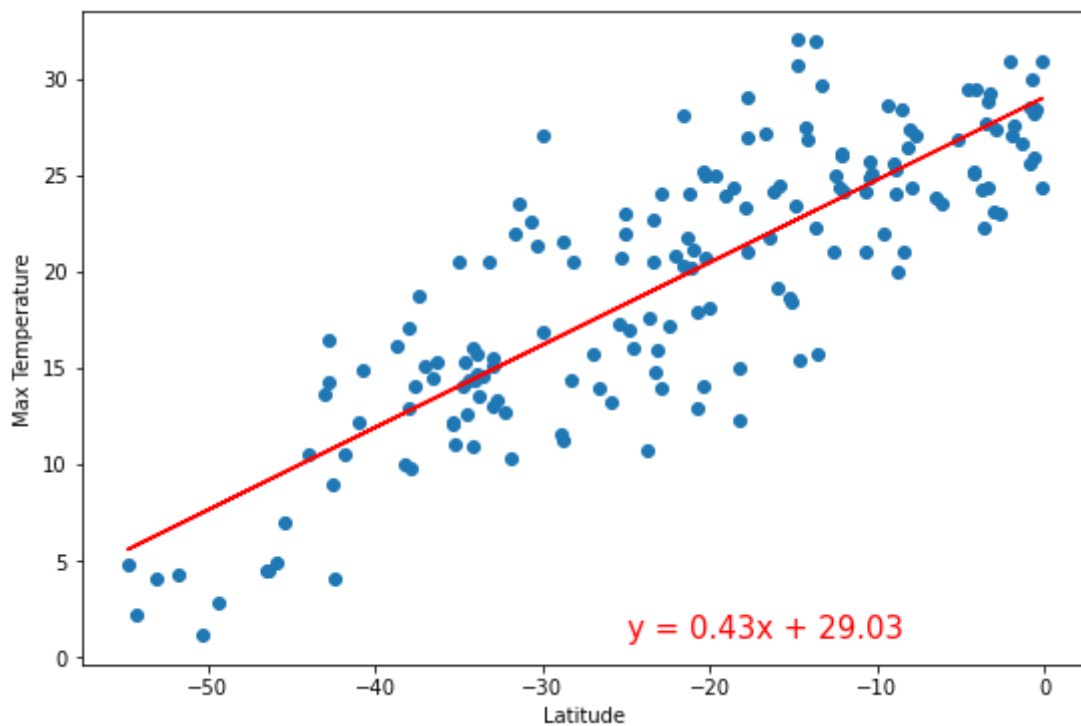
```
In [15]: # Linear regression on Southern Hemisphere
plt.figure(figsize=(9,6))
x_values = southern_hemi_df["Lat"]
y_values = southern_hemi_df["Max Temp"]
(slope, intercept, rvalue, pvalue, stderr) = linregress(x_values, y_values)
regress_values = x_values * slope + intercept
line_eq = "y = " + str(round(slope,2)) + "x + " + str(round(intercept,2))

plt.scatter(x_values,y_values)
plt.plot(x_values,regress_values,"r-")
plt.annotate(line_eq,(-25,1),fontsize=15,color="red")
plt.xlabel("Latitude")
plt.ylabel("Max Temperature")

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

plt.show()
```

The r-value is: 0.842073843596426



Discussion about the linear relationship: In the Northern hemisphere there is a negative correlation between latitude and maximum temperature, while in the Southern hemisphere there is a positive correlation. From this we can see that if a city is located away of the equator the temperature decreases, while if it is closer to the equator it increases.

Humidity vs. Latitude Linear Regression Plot

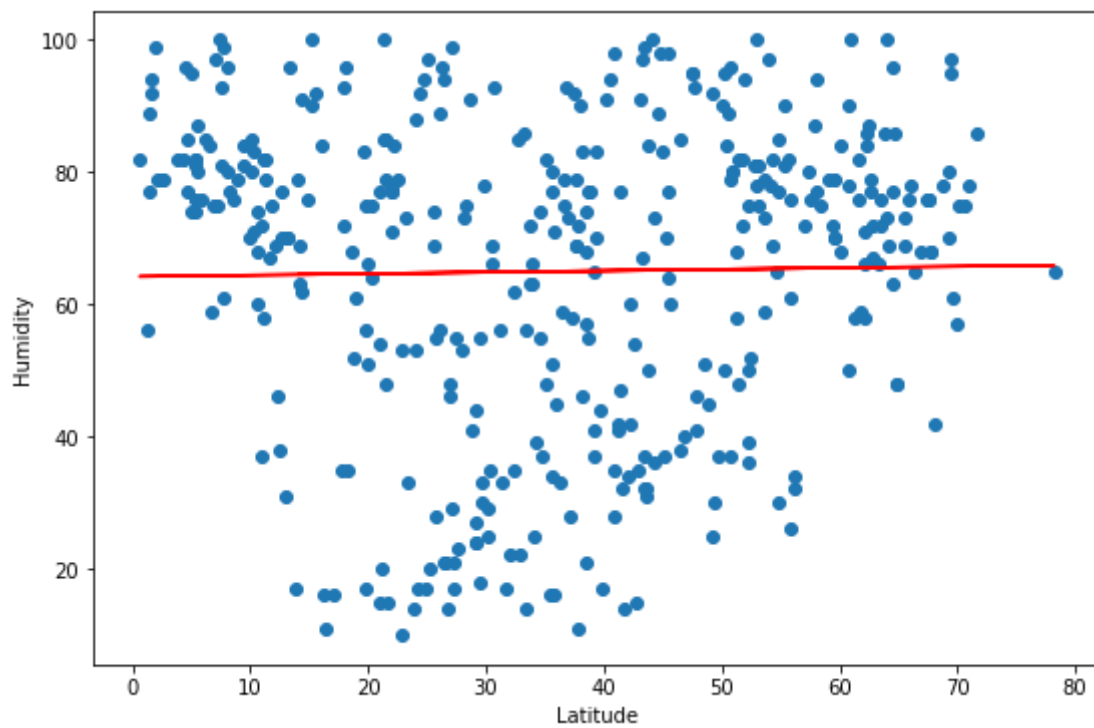
```
In [16]: # Northern Hemisphere
plt.figure(figsize=(9,6))
x_values = northern_hemi_df["Lat"]
y_values = northern_hemi_df["Humidity"]
(slope, intercept, rvalue, pvalue, stderr) = linregress(x_values, y_values)
regress_values = x_values * slope + intercept
line_eq = "y = " + str(round(slope,2)) + "x + " + str(round(intercept,2))

plt.scatter(x_values,y_values)
plt.plot(x_values,regress_values,"r-")
plt.annotate(line_eq, (45,5), fontsize=15,color="red")
plt.xlabel("Latitude")
plt.ylabel("Humidity")

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

plt.show()
```

The r-value is: 0.018078716777789515



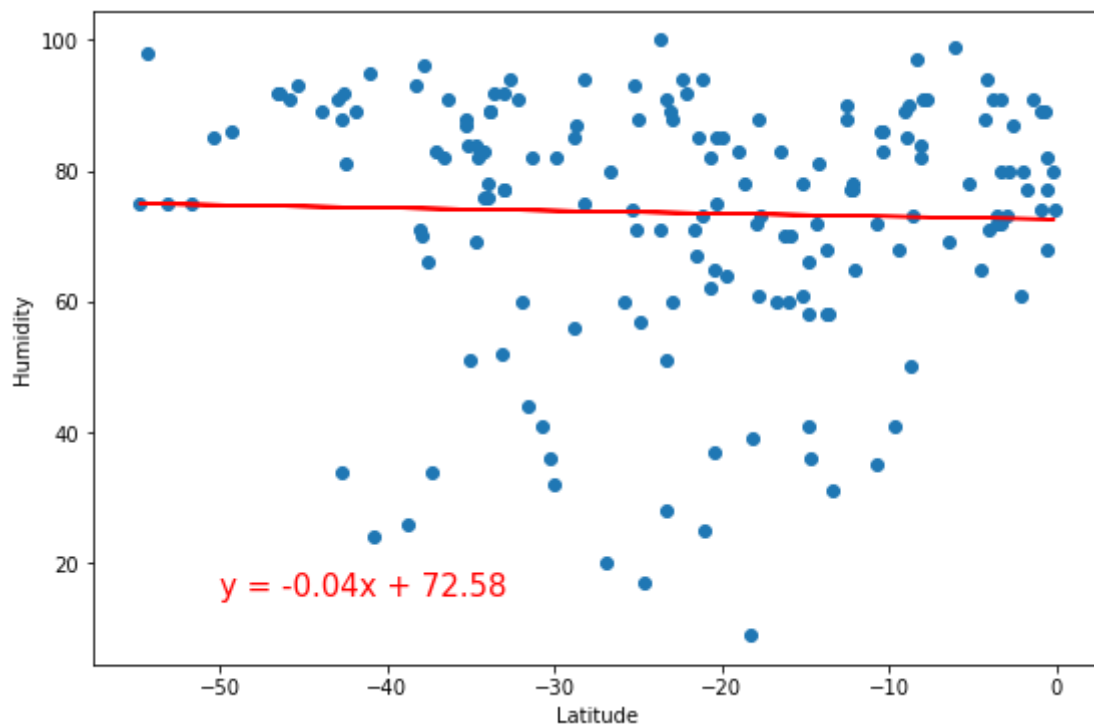
```
In [17]: # Southern Hemisphere
plt.figure(figsize=(9,6))
x_values = southern_hemi_df["Lat"]
y_values = southern_hemi_df["Humidity"]
(slope, intercept, rvalue, pvalue, stderr) = linregress(x_values, y_values)
regress_values = x_values * slope + intercept
line_eq = "y = " + str(round(slope,2)) + "x + " + str(round(intercept,2))

plt.scatter(x_values,y_values)
plt.plot(x_values,regress_values,"r-")
plt.annotate(line_eq,(-50,15),fontsize=15,color="red")
plt.xlabel("Latitude")
plt.ylabel("Humidity")

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

plt.show()
```

The r-value is: -0.031820733276064106



Discussion about the linear relationship: From the r-value and the graphs we can deduct that there is no correlation between the humidity levels and the location of the city from the equator.

Cloudiness vs. Latitude Linear Regression Plot

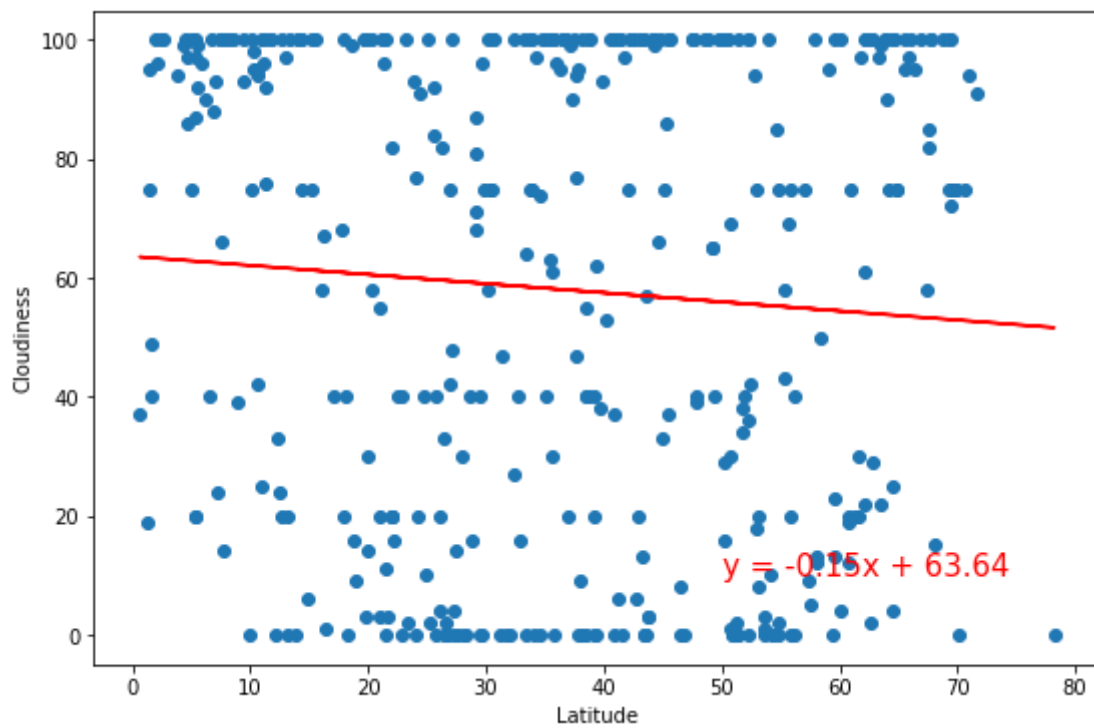
```
In [18]: # Northern Hemisphere
plt.figure(figsize=(9,6))
x_values = northern_hemi_df["Lat"]
y_values = northern_hemi_df["Cloudiness"]
(slope, intercept, rvalue, pvalue, stderr) = linregress(x_values, y_values)
regress_values = x_values * slope + intercept
line_eq = "y = " + str(round(slope,2)) + "x + " + str(round(intercept,2))

plt.scatter(x_values,y_values)
plt.plot(x_values,regress_values,"r-")
plt.annotate(line_eq, (50,10), fontsize=15,color="red")
plt.xlabel("Latitude")
plt.ylabel("Cloudiness")

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

plt.show()
```

The r-value is: -0.0747018412782814



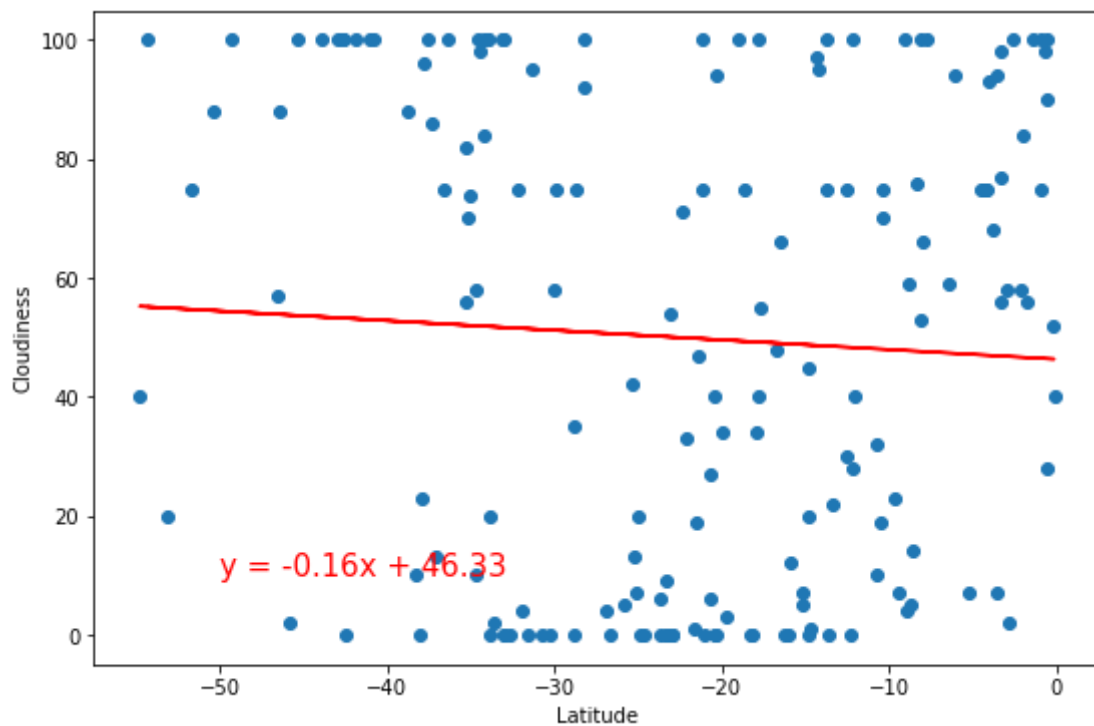
```
In [19]: # Southern Hemisphere
plt.figure(figsize=(9,6))
x_values = southern_hemi_df["Lat"]
y_values = southern_hemi_df["Cloudiness"]
(slope, intercept, rvalue, pvalue, stderr) = linregress(x_values, y_values)
regress_values = x_values * slope + intercept
line_eq = "y = " + str(round(slope,2)) + "x + " + str(round(intercept,2))

plt.scatter(x_values,y_values)
plt.plot(x_values,regress_values,"r-")
plt.annotate(line_eq,(-50,10),fontsize=15,color="red")
plt.xlabel("Latitude")
plt.ylabel("Cloudiness")

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

plt.show()
```

The r-value is: -0.05748025565440918



Discussion about the linear relationship: With a small r-value and the graphs we can see that there is no correlation between the cloudiness and the position of the city related to the equator. The cloudiness points are spread across the graph.

Wind Speed vs. Latitude Linear Regression Plot

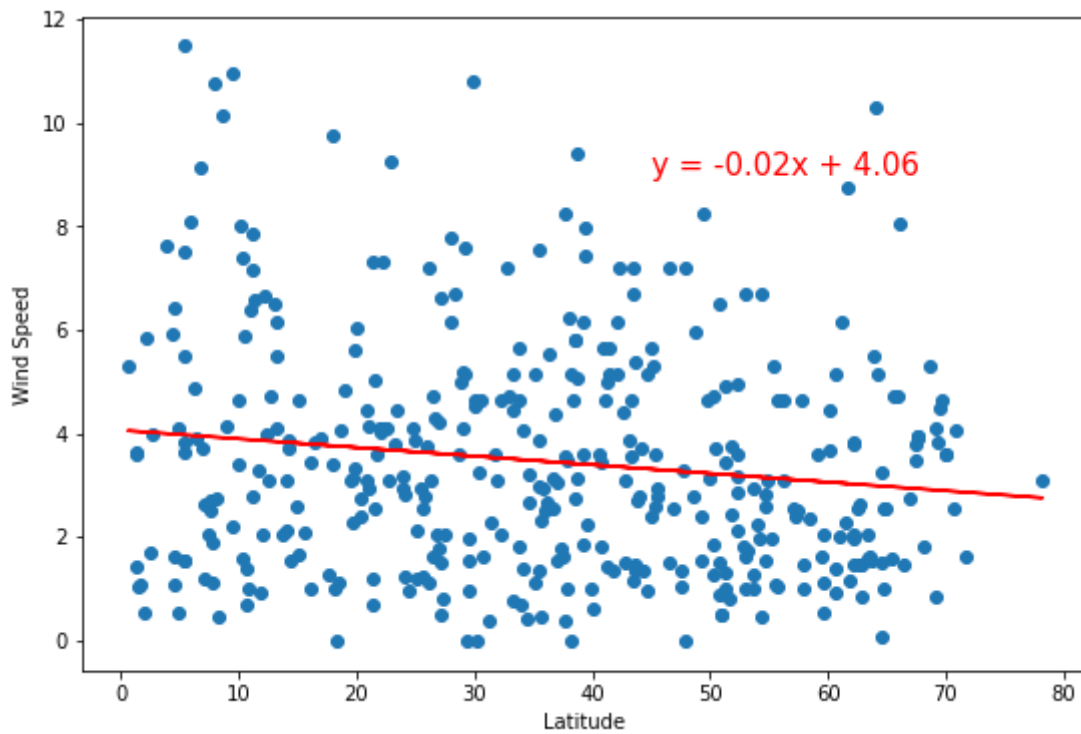
```
In [20]: # Northern Hemisphere
plt.figure(figsize=(9,6))
x_values = northern_hemi_df["Lat"]
y_values = northern_hemi_df["Wind Speed"]
(slope, intercept, rvalue, pvalue, stderr) = linregress(x_values, y_values)
regress_values = x_values * slope + intercept
line_eq = "y = " + str(round(slope,2)) + "x + " + str(round(intercept,2))

plt.scatter(x_values,y_values)
plt.plot(x_values,regress_values,"r-")
plt.annotate(line_eq, (45,9), fontsize=15,color="red")
plt.xlabel("Latitude")
plt.ylabel("Wind Speed")

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

plt.show()
```

The r-value is: -0.14517705163805297



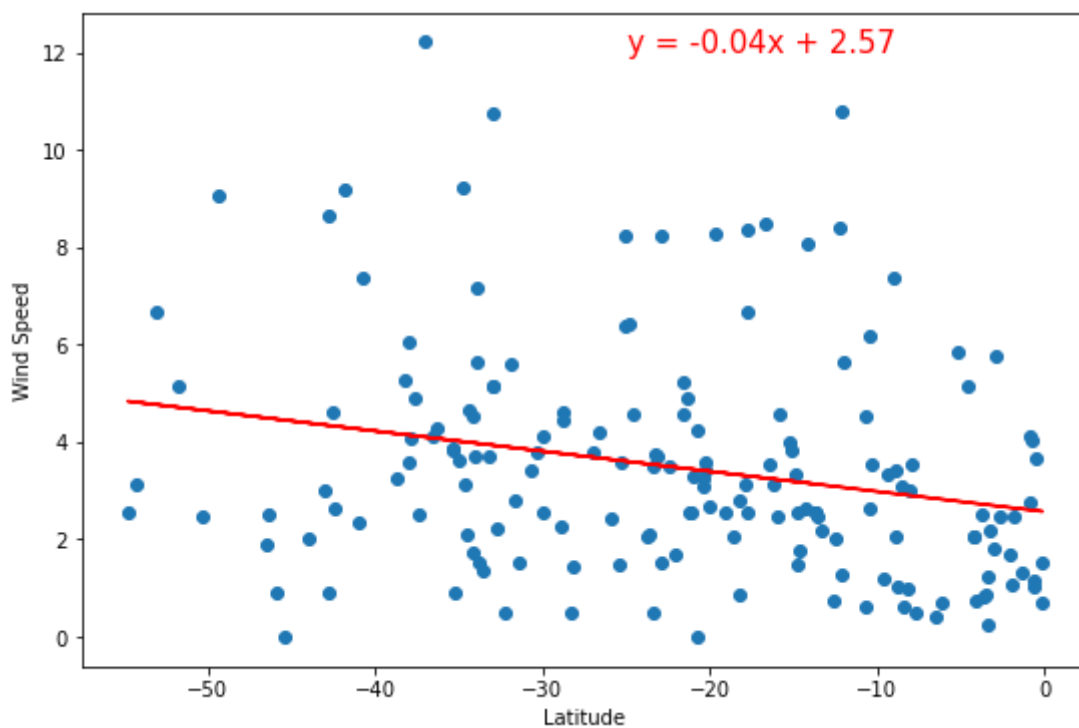
```
In [21]: # Southern Hemisphere
plt.figure(figsize=(9,6))
x_values = southern_hemi_df["Lat"]
y_values = southern_hemi_df["Wind Speed"]
(slope, intercept, rvalue, pvalue, stderr) = linregress(x_values, y_values)
regress_values = x_values * slope + intercept
line_eq = "y = " + str(round(slope,2)) + "x + " + str(round(intercept,2))

plt.scatter(x_values,y_values)
plt.plot(x_values,regress_values,"r-")
plt.annotate(line_eq,(-25,12),fontsize=15,color="red")
plt.xlabel("Latitude")
plt.ylabel("Wind Speed")

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

plt.show()
```

The r-value is: -0.24470196196834693



Discussion about the linear relationship: The correlation between the wind speed and a latitude on both the Northern and Southern Hemispheres is low. When the city moves away from the equator the wind speed lightly increases.

In []: