

```
In [2]: # Dependencies
import csv
import numpy as np
import time
import matplotlib.pyplot as plt
import requests
import pandas as pd
from api_keys import api_key
from citipy import citipy
# Output File (CSV)
output_data_file = "output_data/cities.csv"

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

```
In [3]: # List for holding lat_lngs and cities
lat_lngs = []
cities = []

# Create a set of random lat and lng combinations
lats = np.random.uniform(low=-90.000, high=90.000, size=1500)
lngs = np.random.uniform(low=-180.000, high=180.000, 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 a our cities list
    if city not in cities:
        cities.append(city)

#Print the city count to confirm sufficient count
print(len(cities))
```

635

```
In [4]: # Save config information.
url = "http://api.openweathermap.org/data/2.5/weather?"
units = "metric"

# Build partial query URL
query_url = f"{url}appid={api_key}&units={units}&q="
```

```
In [12]: # cities=['london','bangalore','chicago']

# set up lists to hold reponse info
lat=[]
temp = []
cloudiness=[]
humidity=[]
wind=[]
city_exist=[]
count_city=1
response = requests.get(query_url + city).json()
response
# Loop through the list of cities and perform a request for data on each
for city in cities:
    response = requests.get(query_url + city).json()
    if response['cod']==200:
        city_exist.append(city)
        lat.append(response['coord']['lat'])
        temp.append(response['main']['temp'])
        humidity.append(response['main']['humidity'])
        wind.append(response['wind']['speed'])
        cloudiness.append(response['clouds']['all'])
        print(f"city found{count_city} - {city}")
        count_city+=1
    else:
        print("City not found. Moving on...")
#         lat.append("null")
#         temp.append('null')
#         humidity.append('null')
#         wind.append('null')
#         cloudiness.append('null')
```

City not found. Moving on...
city found1 - atambua
city found2 - chistogorskiy
city found3 - punta arenas
city found4 - kaseda
city found5 - petropavlovsk-kamchatskiy
city found6 - jalu
city found7 - jinka
city found8 - tuktoyaktuk
city found9 - bambous virieux
City not found. Moving on...
city found10 - busselton
city found11 - port alfred
city found12 - taloqan
city found13 - bluff
city found14 - bidor
city found15 - srednekolymsk
City not found. Moving on...
city found16 - manggar
city found17 - beringovski
city found18 - albany
city found19 - mataura
city found20 - grindavik
city found21 - hamilton
city found22 - tambun
city found23 - chuy
city found24 - saint-philippe
city found25 - rikitea
city found26 - new norfolk
city found27 - nome
city found28 - kavieng
city found29 - hobart
city found30 - tezu
city found31 - saint george
city found32 - arraial do cabo
city found33 - barrow
city found34 - vysokogornyy
city found35 - upernavik
city found36 - niigata
city found37 - nsanje
city found38 - qaanaaq
city found39 - katsuura
City not found. Moving on...
city found40 - soligalich
city found41 - yerbogachen
city found42 - vaini
city found43 - buin
city found44 - oblivskaya
city found45 - hermanus
city found46 - pittsfield
city found47 - barras
city found48 - verkhoyansk
city found49 - vila franca do campo
city found50 - bethel
City not found. Moving on...
city found51 - tautira
city found52 - leningradskiy

city found53 - saint anthony
city found54 - pevek
city found55 - avarua
city found56 - margate
City not found. Moving on...
city found57 - provideniya
city found58 - mahebourg
City not found. Moving on...
city found59 - ukiah
city found60 - ngunguru
city found61 - havoysund
city found62 - tasiilaq
city found63 - noumea
city found64 - otjimbingwe
city found65 - yellowknife
City not found. Moving on...
city found66 - sur
city found67 - emba
city found68 - falam
city found69 - port pirie
city found70 - cidreira
City not found. Moving on...
city found71 - salalah
city found72 - ayorou
city found73 - clyde river
city found74 - cap malheureux
city found75 - ahipara
city found76 - san cristobal
City not found. Moving on...
city found77 - xinyu
city found78 - kenai
city found79 - geraldton
city found80 - matay
city found81 - nouadhibou
city found82 - cape town
city found83 - methoni
city found84 - hinche
city found85 - assiniboia
city found86 - acajutla
city found87 - bure
city found88 - xuddur
city found89 - tiksi
city found90 - santa cruz
city found91 - redlands
city found92 - gwadar
city found93 - flin flon
city found94 - kieta
city found95 - atuona
city found96 - cabo san lucas
city found97 - kukushtan
city found98 - san vicente
City not found. Moving on...
city found99 - ushuaia
city found100 - puerto ayora
city found101 - san isidro
city found102 - mianyang
city found103 - kawalu

city found104 - tuatapere
city found105 - kavaratti
city found106 - faanui
city found107 - nha trang
city found108 - victoria
city found109 - wad rawah
city found110 - cayenne
City not found. Moving on...
city found111 - rio gallegos
city found112 - airai
city found113 - portlethen
city found114 - maraa
city found115 - butaritari
City not found. Moving on...
city found116 - linhares
city found117 - lavrentiya
city found118 - nikolskoye
city found119 - chapais
city found120 - severo-kurilsk
city found121 - sibi
city found122 - sinnamary
city found123 - alofi
city found124 - vostok
city found125 - vilhena
city found126 - mitsamiouli
city found127 - kodiak
city found128 - jamestown
city found129 - ilulissat
city found130 - altamont
city found131 - presidente medici
city found132 - sao francisco
city found133 - chernyshevskiy
city found134 - gushikawa
city found135 - kruisfontein
city found136 - east london
City not found. Moving on...
city found137 - pacifica
city found138 - vila velha
city found139 - verkhnyaya toyma
city found140 - sarkand
city found141 - atar
city found142 - lebu
city found143 - samarai
city found144 - isangel
city found145 - husavik
city found146 - carnarvon
city found147 - kalengwa
city found148 - hervey bay
city found149 - tazovskiy
city found150 - dikson
City not found. Moving on...
City not found. Moving on...
city found151 - khatanga
city found152 - broome
city found153 - jutai
city found154 - auki
city found155 - igrim

city found156 - ruteng
city found157 - sambava
city found158 - high rock
City not found. Moving on...
city found159 - scarborough
city found160 - kapaa
City not found. Moving on...
city found161 - namatanai
city found162 - san jose
city found163 - mitu
city found164 - ponta do sol
City not found. Moving on...
city found165 - georgetown
City not found. Moving on...
City not found. Moving on...
city found166 - te anau
city found167 - hithadhoo
city found168 - roma
city found169 - coihaïque
city found170 - obo
city found171 - kalmunai
city found172 - pangnirtung
city found173 - visnes
city found174 - along
city found175 - vardo
city found176 - san benito
city found177 - luanda
city found178 - ambilobe
city found179 - norman wells
city found180 - sorland
city found181 - tiznit
city found182 - bathsheba
city found183 - comodoro rivadavia
city found184 - port blair
city found185 - vila do maio
city found186 - villeneuve-les-avignon
city found187 - gambela
city found188 - yenagoa
city found189 - zhigansk
city found190 - biasca
city found191 - arona
city found192 - alamor
city found193 - progreso
city found194 - oranjestad
city found195 - oudtshoorn
city found196 - dukat
City not found. Moving on...
city found197 - tres arroyos
city found198 - pichayevo
city found199 - wamba
city found200 - gat
city found201 - todos santos
City not found. Moving on...
city found202 - nakhon thai
city found203 - mehamn
city found204 - koulikoro
city found205 - constitucion

city found206 - saldanha
city found207 - canavieiras
city found208 - mar del plata
city found209 - talnakh
city found210 - taltal
city found211 - maningrida
city found212 - alta floresta
City not found. Moving on...
city found213 - nemuro
city found214 - kuzino
city found215 - rochester
city found216 - saint-ambroise
city found217 - lompoc
city found218 - raudeberg
city found219 - tevaitoa
city found220 - shingu
city found221 - kosa
city found222 - brookhaven
city found223 - san martin
city found224 - turukhansk
city found225 - bredasdorp
city found226 - komsomolskiy
city found227 - agadez
City not found. Moving on...
City not found. Moving on...
city found228 - pisco
city found229 - luderitz
city found230 - ribeira grande
city found231 - castro
city found232 - den helder
city found233 - de aar
city found234 - verkhnevilyuysk
city found235 - sao filipe
city found236 - hasaki
city found237 - touros
city found238 - davila
city found239 - aden
city found240 - shaoguan
city found241 - aksarka
city found242 - namwala
city found243 - karratha
city found244 - catuday
city found245 - mount gambier
city found246 - port hedland
city found247 - zhangdian
city found248 - saucillo
City not found. Moving on...
city found249 - warrnambool
city found250 - bumba
city found251 - balakhta
city found252 - avera
city found253 - labuhan
city found254 - saskylakh
city found255 - baruun-urt
city found256 - grants
city found257 - hilo
City not found. Moving on...

City not found. Moving on...
city found258 - krasnoye-na-volge
city found259 - iranshahr
city found260 - hualmay
city found261 - ust-tsilma
city found262 - praia
City not found. Moving on...
city found263 - novosergiyevka
city found264 - am timan
city found265 - chokurdakh
city found266 - padang
city found267 - hanko
city found268 - puertollano
city found269 - meulaboh
city found270 - katherine
city found271 - zhaodong
city found272 - yar-sale
city found273 - santa cruz de la palma
City not found. Moving on...
city found274 - concepcion
city found275 - uribia
city found276 - praesto
city found277 - vuktyl
city found278 - constantine
city found279 - aldan
city found280 - puerto escondido
city found281 - hirara
city found282 - freeport
city found283 - tartagal
City not found. Moving on...
City not found. Moving on...
city found284 - manado
City not found. Moving on...
city found285 - deputatskiy
city found286 - colinas
City not found. Moving on...
City not found. Moving on...
city found287 - fairbanks
city found288 - kashmor
city found289 - port lincoln
city found290 - torbay
city found291 - sitka
city found292 - vredendal
city found293 - luzhou
city found294 - la salle
city found295 - prince george
city found296 - lagoa
city found297 - chor
City not found. Moving on...
city found298 - gberia fotombu
city found299 - moose factory
city found300 - narsaq
city found301 - fereydun kenar
city found302 - kiunga
city found303 - alamogordo
city found304 - legnica
city found305 - hudson bay

city found306 - ust-koksa
city found307 - necochea
City not found. Moving on...
city found308 - kloulklubed
city found309 - thompson
city found310 - nanortalik
city found311 - chingirlau
city found312 - cananeia
city found313 - porosozero
city found314 - madimba
city found315 - port hardy
city found316 - khorixas
city found317 - kotka
city found318 - ust-ilimsk
city found319 - delvada
city found320 - waipawa
city found321 - ibra
city found322 - port-gentil
city found323 - lata
city found324 - havre-saint-pierre
city found325 - belaya gora
city found326 - devonport
City not found. Moving on...
city found327 - buritizeiro
city found328 - henties bay
city found329 - koumac
city found330 - pocos de caldas
City not found. Moving on...
city found331 - san giovanni in fiore
city found332 - college
city found333 - rosario do sul
city found334 - shimanovsk
city found335 - whitianga
city found336 - aripuana
City not found. Moving on...
city found337 - ayr
city found338 - mikhaylovka
city found339 - moron
city found340 - aquiraz
city found341 - iqaluit
city found342 - trat
city found343 - port elizabeth
city found344 - goderich
city found345 - alibag
city found346 - zelenoborskiy
city found347 - izhma
city found348 - tibati
city found349 - yulara
city found350 - tual
city found351 - san antonio
city found352 - srivardhan
city found353 - cherskiy
city found354 - muzhi
City not found. Moving on...
city found355 - magistralnyy
city found356 - male
city found357 - baykit

city found358 - madang
city found359 - zarubino
city found360 - nizhnevartovsk
city found361 - santa fe
city found362 - hami
City not found. Moving on...
city found363 - sainte-rose
city found364 - flinders
city found365 - khasan
city found366 - slave lake
City not found. Moving on...
city found367 - ahuimanu
city found368 - muyezerkiy
city found369 - toora-khem
city found370 - awbari
city found371 - ust-shonosha
city found372 - matara
city found373 - isiro
city found374 - antofagasta
city found375 - yeppoon
city found376 - menongue
city found377 - souillac
city found378 - abeche
city found379 - beihai
city found380 - san diego
city found381 - lorengau
city found382 - sao joao da barra
city found383 - anadyr
city found384 - pailon
city found385 - vilsbiburg
city found386 - lauria
city found387 - prieska
city found388 - mabaruma
city found389 - okhotsk
city found390 - esperance
City not found. Moving on...
city found391 - longyearbyen
city found392 - owosso
city found393 - skovorodino
city found394 - esil
city found395 - watsa
city found396 - fort nelson
city found397 - malinyi
city found398 - rehoboth
city found399 - quelimane
city found400 - novokayakent
city found401 - hofn
city found402 - codrington
city found403 - klaksvik
city found404 - shenjiamen
city found405 - huntington
city found406 - sola
City not found. Moving on...
city found407 - new iberia
city found408 - banda aceh
city found409 - itarema
city found410 - manokwari

city found411 - araouane
city found412 - varhaug
city found413 - jadu
city found414 - nhulunbuy
city found415 - mercedes
city found416 - amapa
city found417 - emirdag
city found418 - santa maria
city found419 - san jeronimo
City not found. Moving on...
city found420 - hambantota
city found421 - valparaiso
City not found. Moving on...
city found422 - fortuna
city found423 - somerville
City not found. Moving on...
city found424 - shubarshi
city found425 - huarmey
city found426 - pochutla
City not found. Moving on...
city found427 - moerai
city found428 - lahat
city found429 - dolores
city found430 - san ramon
city found431 - sobolevo
city found432 - belen
City not found. Moving on...
city found433 - van buren
city found434 - kutum
city found435 - whitehorse
city found436 - ndola
City not found. Moving on...
city found437 - kaitangata
city found438 - novyy urgal
city found439 - ambovombe
city found440 - opuwo
city found441 - mocuba
city found442 - saint-pierre
city found443 - zverinogolovskoye
city found444 - prince rupert
City not found. Moving on...
City not found. Moving on...
city found445 - grand-lahou
City not found. Moving on...
city found446 - chalala
city found447 - show low
city found448 - hokitika
city found449 - nantucket
city found450 - varva
city found451 - vilyuysk
city found452 - virginia beach
City not found. Moving on...
city found453 - lashio
city found454 - udachnyy
city found455 - troyes
City not found. Moving on...
city found456 - tateyama

City not found. Moving on...

- city found457 - guiyang
- city found458 - meridian
- city found459 - san javier
- city found460 - murdochville
- city found461 - marzuq
- city found462 - pingliang
- city found463 - marsa matruh
- city found464 - marolambo
- city found465 - bandon
- city found466 - cockburn town
- city found467 - tyukalinsk
- city found468 - sembakung
- city found469 - batouri
- city found470 - waitara
- city found471 - milove

City not found. Moving on...

- city found472 - arlit
- city found473 - qaqortoq
- city found474 - natal
- city found475 - burnie
- city found476 - muravlenko
- city found477 - vila
- city found478 - berlevag
- city found479 - chongwe
- city found480 - luxor
- city found481 - new ulm
- city found482 - buxton
- city found483 - wabana
- city found484 - koygorodok
- city found485 - esmeralda
- city found486 - san carlos de bariloche
- city found487 - poum
- city found488 - nadadores
- city found489 - biak
- city found490 - nioki
- city found491 - talaya
- city found492 - rio grande
- city found493 - teshie
- city found494 - mount pleasant
- city found495 - verkhnyaya inta
- city found496 - ixtapa
- city found497 - erenhot
- city found498 - dire dawa

City not found. Moving on...

- city found499 - arroyo
- city found500 - valdivia
- city found501 - sal rei
- city found502 - hobbyo
- city found503 - hailar
- city found504 - svetlaya
- city found505 - sao domingos

City not found. Moving on...

- city found506 - praia da vitoria
- city found507 - fare
- city found508 - springfield
- city found509 - lasa

city found510 - rancho palos verdes
City not found. Moving on...
city found511 - fort-shevchenko
city found512 - kodinsk
city found513 - coquimbo
city found514 - mogadishu
city found515 - namtsy
city found516 - khaniotis
city found517 - alto paraguai
city found518 - nagato
city found519 - aksu
city found520 - asosa
City not found. Moving on...
city found521 - egvekinot
city found522 - san francisco
city found523 - sidi ali
city found524 - dingle
city found525 - teguldet
city found526 - kirakira
city found527 - caravelas
city found528 - puerto carreno
City not found. Moving on...
city found529 - reconquista
city found530 - raposa
city found531 - redmond
city found532 - ust-nera
city found533 - mwinilunga
city found534 - broken hill
city found535 - portland
city found536 - maceio
city found537 - port said
city found538 - la orilla
city found539 - wuxue
city found540 - sisimiut
City not found. Moving on...
city found541 - dembi dolo
city found542 - bam
city found543 - qinggang
city found544 - challans
city found545 - fuling
city found546 - naze
city found547 - abbeville
city found548 - sterling
city found549 - ajaccio
city found550 - birao
city found551 - san luis
city found552 - tvoroyri
city found553 - tomatlan
city found554 - inta
city found555 - sydney
City not found. Moving on...
City not found. Moving on...
city found556 - huntsville
city found557 - limbang
City not found. Moving on...
city found558 - porto novo
city found559 - eyrarbakki

```

city found560 - port macquarie
city found561 - eureka
city found562 - doha
city found563 - los llanos de aridane
City not found. Moving on...
City not found. Moving on...
city found564 - carutapera
City not found. Moving on...

```

```

In [13]: print(len(city_exist))
         print(len(lat))
         print(len(temp))
         print(len(humidity))
         print(len(wind))
         print(len(cloudiness))

```

```

564
564
564
564
564
564

```

```

In [14]: # create a data frame from cities, lat, and temp
weather_dict = {
    "city": city_exist,
    "lat": lat,
    "temp": temp,
    "humidity": humidity,
    "wind speed": wind,
    "cloudiness": cloudiness
}
weather_data = pd.DataFrame(weather_dict)
weather_data.head()

```

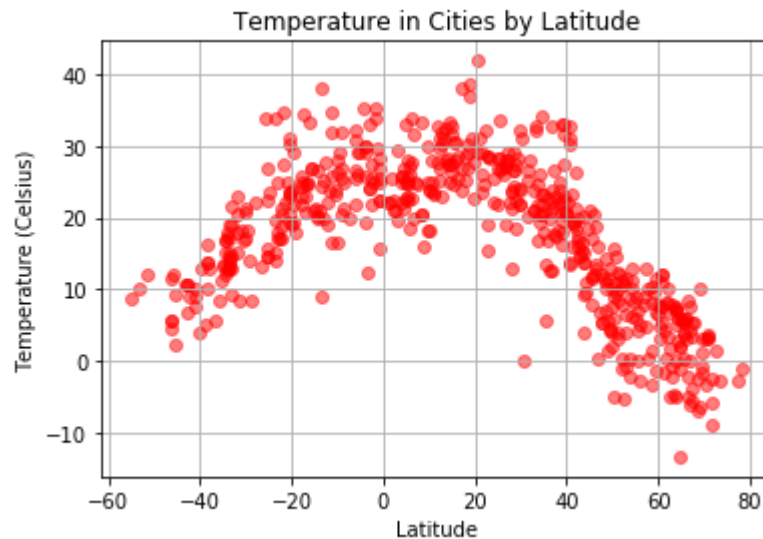
Out[14]:

	city	lat	temp	humidity	wind speed	cloudiness
0	atambua	-9.11	25.41	76	4.25	80
1	chistogorskiy	53.98	0.21	69	0.42	0
2	punta arenas	-53.16	10.00	53	14.90	75
3	kaseda	31.42	26.61	83	10.35	5
4	petropavlovsk-kamchatskiy	53.05	4.00	93	2.00	100

```
In [15]: # Build a scatter plot for each data type
plt.scatter(weather_data["lat"], weather_data["temp"], marker="o", color='red',
            , alpha=0.5)
# Incorporate the other graph properties
plt.title("Temperature in Cities by Latitude")
plt.ylabel("Temperature (Celsius)")
plt.xlabel("Latitude")
plt.grid(True)

# Save the figure
plt.savefig("TemperaturebyLatitude.png")

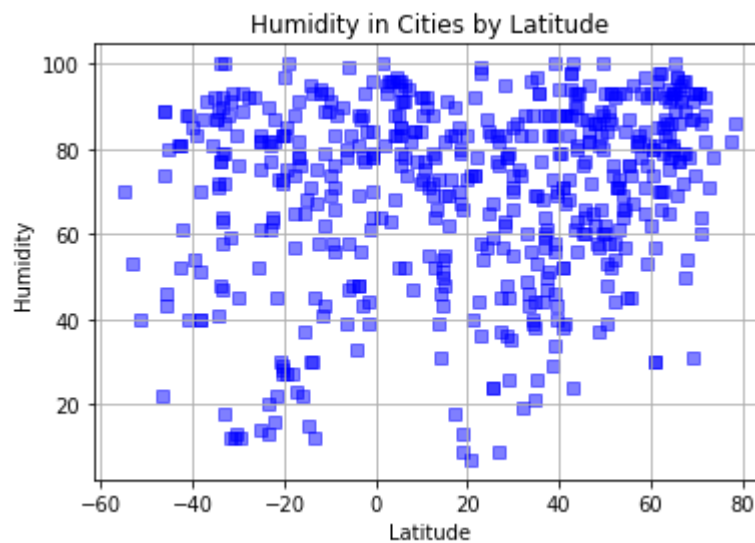
# Show plot
plt.show()
```



```
In [17]: plt.scatter(weather_data["lat"], weather_data["humidity"], marker="s", color=
'blue', alpha=0.5)
# Incorporate the other graph properties
plt.title("Humidity in Cities by Latitude")
plt.ylabel("Humidity")
plt.xlabel("Latitude")
plt.grid(True)

# Save the figure
plt.savefig("HumiditybyLatitude.png")

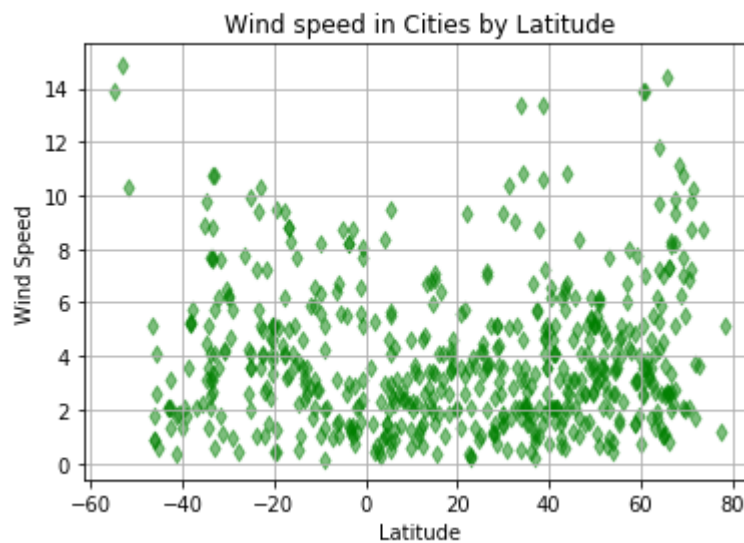
# Show plot
plt.show()
```




```
In [19]: plt.scatter(weather_data["lat"], weather_data["wind speed"], marker="d", color
          = 'green', alpha=0.5)
          # Incorporate the other graph properties
          plt.title("Wind speed in Cities by Latitude")
          plt.ylabel("Wind Speed")
          plt.xlabel("Latitude")
          plt.grid(True)

          # Save the figure
          plt.savefig("windspeedbyLatitude.png")

          # Show plot
          plt.show()
```

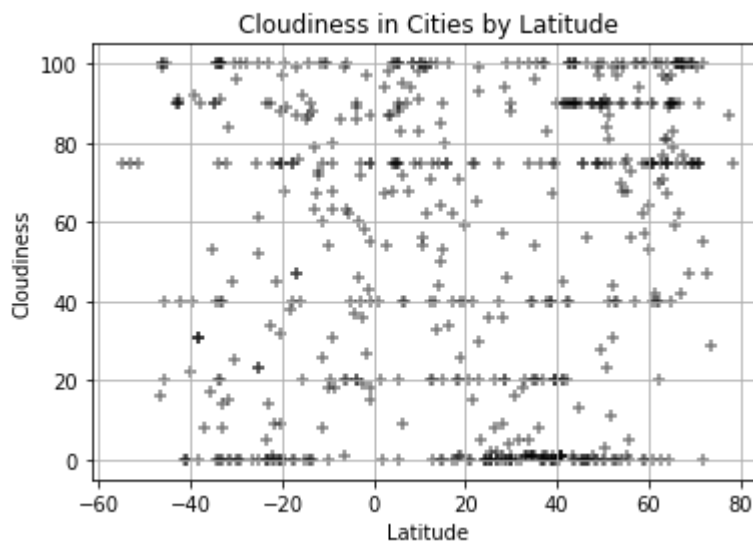


In []:

```
In [20]: plt.scatter(weather_data["lat"], weather_data["cloudiness"], marker="+", color
            = 'black', alpha=0.5)
            # Incorporate the other graph properties
            plt.title("Cloudiness in Cities by Latitude")
            plt.ylabel("Cloudiness")
            plt.xlabel("Latitude")
            plt.grid(True)

            # Save the figure
            plt.savefig("cloudinessbyLatitude.png")

            # Show plot
            plt.show()
```



```
In [23]: weather_data.to_csv("cities.csv", sep='\t', encoding='utf-8')
```

Trends:

1. The temperature increases as you get closer to 0 degree latitude ie the equator
2. Latitude has no effect on windiness or cloudiness of a city
3. Humidity is mostly high near the equator