WeatherPy

Note

- Instructions have been included for each segment. You do not have to follow them exactly, but they are included to help you think through the steps.

```python
In [1]: # Dependencies and Setup
        import matplotlib.pyplot as plt
        import pandas as pd
        import numpy as np
        import requests
        import time
        import json

        # Import API key
        from api_keys import api_key

        # Incorporated citipy to determine city and country code based on latitude and
        longitude
        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)
```

```python
In [2]: # Save config information.
        weatherUrl = "http://api.openweathermap.org/data/2.5/weather?"
        units = "imperial"

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

Generate Cities List

NOTE: citipy only looks for cities with at least 500 people. This may impact our ability to find cities near the two poles if population density is not high enough.

In [3]:
```python
# List for holding lat_lngs and cities
lat_lngs = []
locations = pd.DataFrame()

# 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)

# Create a dataframe to store the locations
# NOTE:  Because these are randomly generated, some will not be mapped to a ci
ty
latLngs = pd.DataFrame(list(zip(lats,lngs)), columns=["Latitude", "Longitude"
])

# Identify nearest city for each lat, lng combination
i = 0
for lat_lng in lat_lngs:
    result = citipy.nearest_city(lat_lng[0], lat_lng[1])
    city = result.city_name
    countryCode = result.country_code

    # add it to a our cities list
    locations.loc[i,"City"] = city
    locations.loc[i, "Country Code"] = countryCode

    # add in the original latitude and Longitude for comparison to the found c
ity lat,Lon later
    locations.loc[i,"Latitude Random"] = lat_lng[0]
    locations.loc[i,"Longitude Random"] = lat_lng[1]
    i+=1


# Display the locations after removing duplicates
locations = locations.drop_duplicates(keep="first")
locations.head()
```

Out[3]:

	City	Country Code	Latitude Random	Longitude Random
0	sioux lookout	ca	56.313708	-90.938303
1	arraial do cabo	br	-34.083396	-36.430073
2	mar del plata	ar	-50.476492	-46.792455
3	assiniboia	ca	49.007427	-106.608226
4	tamandare	br	-8.841016	-33.743823

```
In [4]:  # Ensure that at least 500 unique cities were found
         if len(locations) >= 500:
             print(f"Good to proceed!  {len(locations)} unique cities were identified!"
         )
         else:
             print(f"Restart!  Increase the number of random locations.  Only {len(loca
         tions)} were identified.  500 are required.")
```
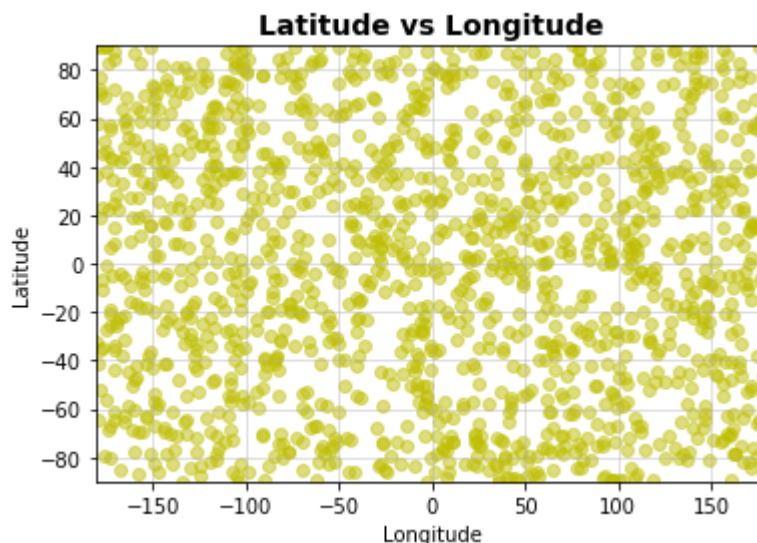
```
Good to proceed!  1500 unique cities were identified!
```

Latitude vs Longitude

Check for even distribution amongst the random locations

```
In [71]:  # Plot Latitude vs Longitude across the random data points we started with
          plt.scatter(lngs, lats, c="y", alpha=0.5)
          plt.title(f'Latitude vs Longitude', size=14, weight='bold')
          plt.xlabel('Longitude')
          plt.ylabel('Latitude')
          plt.xlim(lng_range)
          plt.ylim(lat_range)
          plt.grid(alpha=0.5)

          # Save the image
          plt.savefig("../Images/LatvsLonDisbursement_RandomNoCityYet.png")
          plt.show()
```


Perform API Calls

- Perform a weather check on each city using a series of successive API calls.
- Include a print log of each city as it'sbeing processed (with the city number and city name).

In [6]:
```python
# Create a data frame for our results
weather = pd.DataFrame()
weather
```

Out[6]:

In [7]:
```python
# Loop through the cities and if a result is obtained, append to the weather d
ataframe
for index, location in locations.iterrows():

    # Limit of 60 calls per minute or we get locked out, so sleep between call
s
    time.sleep(2)

    # request the weather
    response = requests.get(weatherQueryUrl + locations.loc[index]["City"] +
"," + locations.loc[index]["Country Code"]).json()

    try:

    # if at least one result is found, use the first result :  assumes it will
be the best match
        if (len(response)>0):
            weather.loc[index, "City"] = response["name"]
            weather.loc[index, "Cloudiness"] = response["clouds"]["all"]
            weather.loc[index, "Country"] = response["sys"]["country"]
            weather.loc[index, "Humidity"] = response["main"]["humidity"]
            weather.loc[index, "Lat"] = response["coord"]["lat"]
            weather.loc[index, "Lon"] = response["coord"]["lon"]
            weather.loc[index, "Temp"] = response["main"]["temp"]
            weather.loc[index, "Wind Speed"] = response["wind"]["speed"]

            # include the original lat, Lon for graphing actuals vs random lat
er
            weather.loc[index, "Latitude Random"] = location["Latitude Random"
]
            weather.loc[index, "Longitude Random"] = location["Longitude Rando
m"]

            # print out the found cities
            print(f"City [{index}] = {response['name']}, {response['sys']['cou
ntry']}")

    except(KeyError, IndexError):
        # if we hit an exception, pring out what it was for
        print(f"Missing field/result for {locations.loc[index]['City']}, {loca
tions.loc[index]['Country Code']}... skipping.")
```

```
City [0] = Sioux Lookout, CA
City [1] = Arraial do Cabo, BR
City [2] = Mar del Plata, AR
City [3] = Assiniboia, CA
City [4] = Tamandare, BR
City [5] = Rikitea, PF
City [6] = Lakes Entrance, AU
City [7] = Didwana, IN
City [8] = Mbaiki, CF
City [9] = Avarua, CK
City [10] = Slave Lake, CA
City [11] = Longyearbyen, SJ
City [12] = Severo-Kurilsk, RU
City [13] = Khatanga, RU
Missing field/result for tsihombe, mg... skipping.
City [15] = Barrow, US
City [16] = Hilo, US
City [17] = Cabo San Lucas, MX
City [18] = Ushuaia, AR
City [19] = Dikson, RU
City [20] = Bredasdorp, ZA
City [21] = Rikitea, PF
City [22] = Bosaso, SO
City [23] = Sao Filipe, CV
Missing field/result for mys shmidta, ru... skipping.
City [25] = Souillac, MU
City [26] = Port Alfred, ZA
City [27] = Carutapera, BR
City [28] = Rikitea, PF
Missing field/result for taolanaro, mg... skipping.
City [30] = Constitucion, CL
City [31] = Cascais, PT
City [32] = Ushuaia, AR
City [33] = Avarua, CK
City [34] = Santa Maria, CV
City [35] = Albany, AU
City [36] = Rabo de Peixe, PT
City [37] = Bluff, NZ
Missing field/result for thano bula khan, pk... skipping.
City [39] = Port Elizabeth, ZA
City [40] = Geraldton, AU
City [41] = Kahului, US
City [42] = Busselton, AU
City [43] = Albany, AU
City [44] = Pangai, TO
City [45] = Mar del Plata, AR
Missing field/result for karaul, ru... skipping.
City [47] = Bambous Virieux, MU
City [48] = Mar del Plata, AR
City [49] = New Norfolk, AU
Missing field/result for grand river south east, mu... skipping.
City [51] = Adrar, DZ
Missing field/result for georgiu-dezh, ru... skipping.
Missing field/result for amderma, ru... skipping.
Missing field/result for mys shmidta, ru... skipping.
City [55] = Castro, CL
City [56] = Pangnirtung, CA
```

```
City [57] = Cacapava do Sul, BR
City [58] = Bubaque, GW
City [59] = Busselton, AU
City [60] = Hobart, AU
City [61] = Souillac, MU
City [62] = Barcelona, PH
City [63] = Tuatapere, NZ
City [64] = Jamestown, SH
City [65] = Bethel, US
City [66] = Busselton, AU
City [67] = Leningradskiy, RU
City [68] = Lewiston, US
City [69] = Waingapu, ID
City [70] = Hobart, AU
City [71] = Yellowknife, CA
City [72] = Kaitangata, NZ
City [73] = Ushuaia, AR
City [74] = Vaini, TO
City [75] = Hovd, MN
City [76] = Hithadhoo, MV
City [77] = Narsaq, GL
City [78] = Carnarvon, AU
City [79] = Jumla, NP
City [80] = Koslan, RU
City [81] = Georgetown, SH
City [82] = Ushuaia, AR
City [83] = Ushuaia, AR
City [84] = Hasaki, JP
City [85] = Longyearbyen, SJ
City [86] = Northam, AU
City [87] = Tanete, ID
City [88] = Souillac, MU
Missing field/result for mataura, pf... skipping.
City [90] = Puerto Ayora, EC
City [91] = Tiksi, RU
City [92] = Coahuayana, MX
City [93] = Kuala Terengganu, MY
City [94] = Plettenberg Bay, ZA
City [95] = Lobito, AO
City [96] = Klaksvik, FO
City [97] = Sergeyevka, KZ
City [98] = Adrian, US
City [99] = Cap-aux-Meules, CA
City [100] = Ostrovnoy, RU
City [101] = Bodden Town, KY
City [102] = Jamestown, SH
City [103] = Ostrovnoy, RU
City [104] = Bluff, NZ
Missing field/result for barentsburg, sj... skipping.
City [106] = Guaira, BR
City [107] = Phayao, TH
City [108] = Rikitea, PF
City [109] = Morrope, PE
City [110] = Nemuro, JP
City [111] = Bredasdorp, ZA
City [112] = Port Alfred, ZA
City [113] = Portland, AU
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```
City [114] = Gannan, CN
City [115] = Pangkalanbuun, ID
City [116] = Sibu, MY
City [117] = Jamestown, SH
City [118] = Nouadhibou, MR
City [119] = Puerto Ayora, EC
City [120] = Te Anau, NZ
City [121] = Jamestown, SH
City [122] = Challans, FR
City [123] = Atuona, PF
City [124] = New Norfolk, AU
City [125] = Yellowknife, CA
City [126] = Ancud, CL
City [127] = Manzhouli, CN
City [128] = Faanui, PF
City [129] = Nikolskoye, RU
City [130] = Dikson, RU
Missing field/result for mataura, pf... skipping.
City [132] = Cape Town, ZA
City [133] = College, US
City [134] = Shu, KZ
City [135] = Campbellton, CA
City [136] = Camaqua, BR
Missing field/result for khomeynishahr, ir... skipping.
City [138] = Pitimbu, BR
City [139] = Mahebourg, MU
City [140] = Tangier, MA
City [141] = Atuona, PF
City [142] = Vaini, TO
City [143] = Monterey, US
City [144] = Coracao de Jesus, BR
Missing field/result for taolanaro, mg... skipping.
City [146] = Chiscas, CO
City [147] = Victoria, SC
City [148] = Klaksvik, FO
City [149] = Yellowknife, CA
City [150] = Kaohsiung, TW
City [151] = Sciacca, IT
City [152] = Ushuaia, AR
City [153] = Punta Arenas, CL
City [154] = Rikitea, PF
City [155] = Longyearbyen, SJ
City [156] = Rikitea, PF
City [157] = Kapaa, US
City [158] = Luderitz, NA
City [159] = Hermanus, ZA
City [160] = Beloha, MG
City [161] = Egvekinot, RU
City [162] = Santa Cruz, CR
City [163] = Kruisfontein, ZA
City [164] = Rikitea, PF
City [165] = Jamestown, SH
City [166] = Ushuaia, AR
Missing field/result for taolanaro, mg... skipping.
City [168] = Port Hardy, CA
City [169] = Acari, PE
City [170] = Rikitea, PF
```

```
City [171] = Daulatpur, PK
City [172] = Ponta do Sol, CV
Missing field/result for illoqqortoormiut, gl... skipping.
City [174] = Albany, AU
City [175] = Vung Tau, VN
City [176] = Hilo, US
City [177] = Albany, AU
City [178] = Aransas Pass, US
City [179] = Albany, AU
Missing field/result for mataura, pf... skipping.
City [181] = Bluff, NZ
Missing field/result for mataura, pf... skipping.
City [183] = Mount Isa, AU
City [184] = Port Alfred, ZA
City [185] = Bethel, US
City [186] = Victoria, SC
City [187] = Port Elizabeth, ZA
City [188] = Bluff, NZ
City [189] = Alofi, NU
City [190] = Port Elizabeth, ZA
City [191] = Busselton, AU
City [192] = Atuona, PF
City [193] = Khatanga, RU
City [194] = Durango, US
Missing field/result for kibala, ao... skipping.
City [196] = Atuona, PF
City [197] = Kaitangata, NZ
City [198] = Khandyga, RU
Missing field/result for barentsburg, sj... skipping.
City [200] = Ponta do Sol, CV
Missing field/result for mataura, pf... skipping.
City [202] = Albany, AU
City [203] = Lyuban, BY
City [204] = Adana, TR
City [205] = Vaini, TO
Missing field/result for barentsburg, sj... skipping.
Missing field/result for marcona, pe... skipping.
City [208] = Atuona, PF
City [209] = Lorengau, PG
City [210] = Kikwit, CD
City [211] = Penzance, GB
Missing field/result for tuggurt, dz... skipping.
City [213] = Bluff, NZ
City [214] = Sungairaya, ID
City [215] = Bluff, NZ
City [216] = Sohag, EG
City [217] = Husavik, IS
City [218] = Guerrero Negro, MX
City [219] = Port Elizabeth, ZA
City [220] = Vung Tau, VN
City [221] = Gobabis, NA
City [222] = Vaini, TO
City [223] = Ushuaia, AR
City [224] = Rikitea, PF
City [225] = Innisfail, AU
City [226] = Dikson, RU
City [227] = Hermanus, ZA
```

```
Missing field/result for abiy adi, et... skipping.
City [229] = Cockburn Town, TC
City [230] = Canon City, US
City [231] = Pryazha, RU
City [232] = Bredasdorp, ZA
City [233] = Butaritari, KI
City [234] = Provideniya, RU
City [235] = Cape Town, ZA
City [236] = Malkangiri, IN
Missing field/result for taolanaro, mg... skipping.
Missing field/result for mataura, pf... skipping.
City [239] = New Norfolk, AU
Missing field/result for taolanaro, mg... skipping.
City [241] = Bandarbeyla, SO
City [242] = Ketchikan, US
City [243] = Saint-Philippe, RE
City [244] = Hithadhoo, MV
City [245] = Buala, SB
City [246] = Emerald, AU
City [247] = Ushuaia, AR
City [248] = Longkou, CN
City [249] = Jining, CN
City [250] = Elko, US
City [251] = Sovetskiy, RU
City [252] = Rikitea, PF
City [253] = Chokurdakh, RU
City [254] = Lebu, CL
City [255] = Rikitea, PF
City [256] = Tuktoyaktuk, CA
City [257] = Tautira, PF
City [258] = Poso, ID
City [259] = Busselton, AU
City [260] = Bumba, CD
City [261] = San Pedro, BO
City [262] = Ushuaia, AR
City [263] = Vanavara, RU
Missing field/result for asau, tv... skipping.
City [265] = Busselton, AU
City [266] = San Patricio, MX
City [267] = Sao Filipe, CV
City [268] = Hithadhoo, MV
City [269] = Kapaa, US
City [270] = Punta Arenas, CL
City [271] = Avarua, CK
City [272] = Busselton, AU
City [273] = Port Alfred, ZA
Missing field/result for mataura, pf... skipping.
City [275] = Pathein, MM
City [276] = Evensk, RU
City [277] = Arraial do Cabo, BR
City [278] = Punta Arenas, CL
City [279] = Kapaa, US
Missing field/result for kamenskoye, ru... skipping.
City [281] = Rikitea, PF
City [282] = Kaitangata, NZ
City [283] = Auki, SB
City [284] = Tifton, US
```

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City [285] = Nishihara, JP
City [286] = Vaini, TO
Missing field/result for taolanaro, mg... skipping.
Missing field/result for lolua, tv... skipping.
City [289] = Rikitea, PF
Missing field/result for mataura, pf... skipping.
City [291] = Cape Town, ZA
City [292] = Qarqin, AF
City [293] = Avarua, CK
City [294] = Vaini, TO
City [295] = Bethel, US
City [296] = Albany, AU
City [297] = Ushuaia, AR
Missing field/result for ksenyevka, ru... skipping.
City [299] = Bathsheba, BB
City [300] = Klaksvik, FO
City [301] = Bethel, US
Missing field/result for kuche, cn... skipping.
City [303] = Ushuaia, AR
City [304] = Faanui, PF
City [305] = Mumford, GH
Missing field/result for mataura, pf... skipping.
City [307] = Port Hueneme, US
City [308] = Kedrovyy, RU
City [309] = Atuona, PF
City [310] = Kandi, BJ
City [311] = Huilong, CN
City [312] = Ushuaia, AR
City [313] = Kavieng, PG
City [314] = Ambilobe, MG
Missing field/result for belushya guba, ru... skipping.
City [316] = Salalah, OM
City [317] = Ushuaia, AR
City [318] = Port Elizabeth, ZA
City [319] = Ushuaia, AR
City [320] = Port Alfred, ZA
City [321] = Beringovskiy, RU
City [322] = Port Blair, IN
Missing field/result for sentyabrskiy, ru... skipping.
City [324] = Ugoofaaru, MV
City [325] = Punta Arenas, CL
City [326] = Albany, AU
City [327] = Hobart, AU
City [328] = Hilo, US
City [329] = Kapaa, US
City [330] = Nikolskoye, RU
City [331] = Almaznyy, RU
City [332] = Kalmunai, LK
City [333] = Clyde River, CA
City [334] = Albany, AU
City [335] = Barrow, US
City [336] = Busselton, AU
City [337] = Avarua, CK
City [338] = Hambantota, LK
City [339] = Coswig, DE
City [340] = Jamestown, SH
City [341] = Qaanaaq, GL
```

```
City [342] = Port Alfred, ZA
City [343] = Bluff, NZ
City [344] = Moussoro, TD
Missing field/result for mataura, pf... skipping.
City [346] = Tutoia, BR
City [347] = Castro, CL
Missing field/result for amderma, ru... skipping.
City [349] = Merrill, US
City [350] = Busselton, AU
Missing field/result for gorno-chuyskiy, ru... skipping.
City [352] = Olinda, BR
City [353] = Yellowknife, CA
City [354] = Dongsheng, CN
City [355] = Cayenne, GF
City [356] = Carnduff, CA
City [357] = Funadhoo, MV
City [358] = Chokurdakh, RU
City [359] = Avarua, CK
City [360] = Rikitea, PF
City [361] = Victoria, SC
City [362] = Chokurdakh, RU
City [363] = Hithadhoo, MV
City [364] = Acari, PE
City [365] = Ushuaia, AR
City [366] = Castro, CL
City [367] = Kavieng, PG
City [368] = Torbay, CA
City [369] = Nikolskoye, RU
City [370] = Port Alfred, ZA
City [371] = Port Hardy, CA
City [372] = Ancud, CL
City [373] = Turukhansk, RU
City [374] = Puerto Ayora, EC
City [375] = Albany, AU
City [376] = Hobart, AU
Missing field/result for mataura, pf... skipping.
City [378] = Constitucion, CL
City [379] = Kaitangata, NZ
City [380] = Castro, CL
City [381] = Kapaa, US
Missing field/result for fengkou, cn... skipping.
City [383] = Saint George, BM
City [384] = Arraial do Cabo, BR
City [385] = Albany, AU
City [386] = Conceicao do Araguaia, BR
City [387] = Barrow, US
City [388] = Portoferraio, IT
City [389] = Bekobod, UZ
City [390] = Iqaluit, CA
City [391] = Ushuaia, AR
City [392] = Simpang, ID
City [393] = Tuktoyaktuk, CA
City [394] = Ushuaia, AR
City [395] = Novoagansk, RU
City [396] = Channel-Port aux Basques, CA
City [397] = Atuona, PF
City [398] = Atuona, PF
```

```
City [399] = Neiafu, TO
City [400] = Port Elizabeth, ZA
Missing field/result for taolanaro, mg... skipping.
City [402] = Alofi, NU
City [403] = College, US
City [404] = Chokurdakh, RU
Missing field/result for mataura, pf... skipping.
City [406] = Punta Arenas, CL
City [407] = Usinsk, RU
Missing field/result for sentyabrskiy, ru... skipping.
City [409] = Zabol, IR
City [410] = Abancay, PE
City [411] = Qaanaaq, GL
City [412] = Chowchilla, US
Missing field/result for tsihombe, mg... skipping.
City [414] = Bethel, US
City [415] = Tuktoyaktuk, CA
City [416] = Along, IN
City [417] = Sobolevo, RU
City [418] = Tucurui, BR
City [419] = Ilulissat, GL
City [420] = Dingle, IE
City [421] = Nemuro, JP
City [422] = Deputatskiy, RU
City [423] = Hilo, US
City [424] = Haines Junction, CA
City [425] = Pisco, PE
City [426] = Rikitea, PF
City [427] = Ushuaia, AR
City [428] = Pevek, RU
City [429] = Hilo, US
City [430] = Saint-Philippe, RE
Missing field/result for palabuhanratu, id... skipping.
City [432] = Hilo, US
City [433] = Longyearbyen, SJ
City [434] = Cabedelo, BR
City [435] = Kutum, SD
City [436] = Tasiilaq, GL
City [437] = Iquitos, PE
City [438] = Oregon, US
City [439] = Provideniya, RU
City [440] = Yellowknife, CA
City [441] = Ushuaia, AR
City [442] = Jamestown, SH
Missing field/result for codrington, ag... skipping.
Missing field/result for saleaula, ws... skipping.
City [445] = Hobart, AU
City [446] = Cherskiy, RU
Missing field/result for airai, pw... skipping.
City [448] = Ondangwa, NA
City [449] = Umkomaas, ZA
City [450] = Am Timan, TD
City [451] = Pisco, PE
City [452] = Albany, AU
City [453] = Muleba, TZ
City [454] = Sao Filipe, CV
City [455] = Omsukchan, RU
```

```
City [456] = Harper, LR
City [457] = Provideniya, RU
City [458] = Hofn, IS
Missing field/result for illoqqortoormiut, gl... skipping.
City [460] = Albany, AU
City [461] = Yellowknife, CA
City [462] = Kondinskoye, RU
City [463] = Vardo, NO
City [464] = Jamestown, SH
City [465] = Lebu, CL
City [466] = Soligalich, RU
City [467] = Hilo, US
City [468] = Trinidad, US
City [469] = Hermanus, ZA
City [470] = Ulladulla, AU
City [471] = Hede, CN
City [472] = Ulladulla, AU
City [473] = Kasongo-Lunda, CD
Missing field/result for illoqqortoormiut, gl... skipping.
City [475] = Rikitea, PF
City [476] = Fortuna, US
City [477] = Mizan Teferi, ET
City [478] = Kutum, SD
Missing field/result for lasa, cn... skipping.
City [480] = Hermanus, ZA
Missing field/result for tumannyy, ru... skipping.
City [482] = Arawa, PG
Missing field/result for zhanatas, kz... skipping.
City [484] = Atuona, PF
City [485] = Havre-Saint-Pierre, CA
City [486] = Sabang, ID
City [487] = Tasiilaq, GL
City [488] = Axim, GH
City [489] = Shimoda, JP
City [490] = Port Elizabeth, ZA
City [491] = Saint-Philippe, RE
Missing field/result for mys shmidta, ru... skipping.
City [493] = Northam, AU
City [494] = Punta Arenas, CL
City [495] = Moranbah, AU
City [496] = Lamballe, FR
City [497] = Punta Arenas, CL
Missing field/result for khor, qa... skipping.
City [499] = Talcahuano, CL
City [500] = Mandera, KE
Missing field/result for yanan, cn... skipping.
Missing field/result for mataura, pf... skipping.
City [503] = Qaanaaq, GL
City [504] = Xiaoweizhai, CN
City [505] = Gunjur, GM
City [506] = East London, ZA
Missing field/result for gurskoye, ru... skipping.
Missing field/result for bentiu, sd... skipping.
City [509] = Kodiak, US
City [510] = Vaini, TO
City [511] = Hay River, CA
Missing field/result for belushya guba, ru... skipping.
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City [513] = Longyearbyen, SJ
City [514] = Paamiut, GL
City [515] = Atuona, PF
City [516] = Hilo, US
City [517] = Tiksi, RU
City [518] = Houma, US
City [519] = Noumea, NC
City [520] = Trincomalee, LK
City [521] = Aguimes, ES
Missing field/result for taburi, ph... skipping.
City [523] = Tamiahua, MX
Missing field/result for sorvag, fo... skipping.
City [525] = Ixtapa, MX
City [526] = Tuktoyaktuk, CA
Missing field/result for grand river south east, mu... skipping.
City [528] = Santa Rosa, AR
City [529] = Bluff, NZ
City [530] = Leningradskiy, RU
City [531] = Banjar, ID
City [532] = Ahipara, NZ
City [533] = Rikitea, PF
City [534] = Ilulissat, GL
City [535] = Homer, US
City [536] = Vaini, TO
City [537] = Butaritari, KI
City [538] = Cortez, US
Missing field/result for lata, sb... skipping.
City [540] = Dingle, IE
City [541] = Haifa, IL
Missing field/result for barentsburg, sj... skipping.
City [543] = Bluff, NZ
City [544] = Jizan, SA
City [545] = Barmer, IN
Missing field/result for khor, qa... skipping.
City [547] = Yerbogachen, RU
City [548] = Albany, AU
City [549] = Tuktoyaktuk, CA
City [550] = Yellowknife, CA
City [551] = Hasaki, JP
City [552] = Punta Arenas, CL
City [553] = Kutum, SD
City [554] = Nyimba, ZM
City [555] = Bethel, US
City [556] = Nome, US
City [557] = Mar del Plata, AR
City [558] = Gemena, CD
Missing field/result for marcona, pe... skipping.
City [560] = College, US
City [561] = Sao Filipe, CV
City [562] = Vaini, TO
City [563] = Touros, BR
Missing field/result for mys shmidta, ru... skipping.
City [565] = Saint-Philippe, RE
City [566] = Luderitz, NA
City [567] = Melita, CA
City [568] = Port Alfred, ZA
City [569] = Albany, AU
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City [570] = Busselton, AU
City [571] = Busselton, AU
City [572] = Yellowknife, CA
City [573] = Puerto Ayora, EC
City [574] = Maba, CN
City [575] = Dikson, RU
City [576] = Hermanus, ZA
City [577] = Ribeira Grande, PT
City [578] = Baruun-Urt, MN
City [579] = Ilulissat, GL
City [580] = Saint-Philippe, RE
Missing field/result for asau, tv... skipping.
City [582] = Bambous Virieux, MU
City [583] = Wanning, CN
Missing field/result for barentsburg, sj... skipping.
City [585] = Vaini, TO
City [586] = Leningradskiy, RU
City [587] = Kashi, CN
City [588] = Ushuaia, AR
City [589] = Iqaluit, CA
City [590] = Walvis Bay, NA
City [591] = Lebu, CL
City [592] = Nikolskoye, RU
City [593] = Tiksi, RU
City [594] = Ribeira Grande, PT
City [595] = Ust-Kuyga, RU
City [596] = Castro, CL
City [597] = Castro, CL
City [598] = Bhuj, IN
City [599] = Rikitea, PF
City [600] = Pacific Grove, US
Missing field/result for sentyabrskiy, ru... skipping.
Missing field/result for barawe, so... skipping.
City [603] = Shingu, JP
Missing field/result for taolanaro, mg... skipping.
City [605] = Iranshahr, IR
City [606] = Georgetown, SH
City [607] = Rosarito, MX
City [608] = Tiznit, MA
City [609] = Bluff, NZ
City [610] = Belle Fourche, US
City [611] = Kaitangata, NZ
City [612] = Sola, VU
City [613] = Kununurra, AU
City [614] = Kapaa, US
City [615] = Kapaa, US
Missing field/result for lata, sb... skipping.
City [617] = Majene, ID
City [618] = Albany, AU
City [619] = Qinhuangdao, CN
City [620] = Albany, AU
City [621] = Albany, AU
City [622] = Kaitangata, NZ
City [623] = Bethel, US
City [624] = Deputatskiy, RU
City [625] = Tres Arroyos, AR
City [626] = Ilulissat, GL
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City [627] = Jamestown, SH
City [628] = Faanui, PF
City [629] = Zverinogolovskoye, RU
Missing field/result for palabuhanratu, id... skipping.
City [631] = Lebu, CL
City [632] = Cape Town, ZA
City [633] = Bastia, FR
City [634] = Coquimbo, CL
Missing field/result for acuna, mx... skipping.
City [636] = Palmer, US
City [637] = Bluff, NZ
City [638] = Busselton, AU
Missing field/result for barentsburg, sj... skipping.
City [640] = Adeje, ES
City [641] = Rikitea, PF
City [642] = Yellowknife, CA
City [643] = Ushuaia, AR
Missing field/result for airai, pw... skipping.
City [645] = Mtambile, TZ
Missing field/result for mataura, pf... skipping.
City [647] = Dikson, RU
City [648] = Georgetown, SH
Missing field/result for nizhneyansk, ru... skipping.
City [650] = Hermanus, ZA
City [651] = Punta Arenas, CL
City [652] = Vaini, TO
City [653] = Esperance, AU
City [654] = Rikitea, PF
City [655] = Castro, CL
City [656] = Siavonga, ZM
City [657] = Yellowknife, CA
Missing field/result for faya, td... skipping.
Missing field/result for barentsburg, sj... skipping.
Missing field/result for nizhneyansk, ru... skipping.
City [661] = Atuona, PF
Missing field/result for tabiauea, ki... skipping.
Missing field/result for mys shmidta, ru... skipping.
City [664] = Chipinge, ZW
City [665] = Fort Nelson, CA
City [666] = Victoria, SC
City [667] = Touros, BR
City [668] = Atuona, PF
City [669] = Lebu, CL
City [670] = Alofi, NU
City [671] = Bandarbeyla, SO
City [672] = Rikitea, PF
City [673] = Port Alberni, CA
Missing field/result for lata, sb... skipping.
City [675] = Butaritari, KI
City [676] = Lagoa, PT
City [677] = Saint-Philippe, RE
City [678] = Bireun, ID
City [679] = Albany, AU
City [680] = Busselton, AU
City [681] = Jamestown, SH
City [682] = Chokurdakh, RU
Missing field/result for mys shmidta, ru... skipping.
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City [684] = Poum, NC
City [685] = Narsaq, GL
Missing field/result for fort saint john, ca... skipping.
City [687] = Elko, US
City [688] = Saint-Philippe, RE
City [689] = Ushuaia, AR
City [690] = Norman Wells, CA
City [691] = Namibe, AO
City [692] = Punta Arenas, CL
City [693] = Faanui, PF
City [694] = Cayenne, GF
City [695] = Pahrump, US
City [696] = Kodiak, US
Missing field/result for olafsvik, is... skipping.
City [698] = Butaritari, KI
City [699] = Palana, RU
City [700] = Mamit, IN
City [701] = Kaitangata, NZ
City [702] = Kavaratti, IN
City [703] = Saint-Philippe, RE
City [704] = Saint George, BM
City [705] = Hofn, IS
City [706] = Beringovskiy, RU
City [707] = Yellowknife, CA
City [708] = Shimoda, JP
City [709] = Mweka, CD
City [710] = Luena, AO
City [711] = Westport, IE
City [712] = Tuktoyaktuk, CA
City [713] = Ushuaia, AR
City [714] = Ushuaia, AR
City [715] = Nikolskoye, RU
City [716] = Butaritari, KI
City [717] = Sao Filipe, CV
City [718] = Tasiilaq, GL
City [719] = Kirakira, SB
City [720] = Albany, AU
City [721] = Sitka, US
Missing field/result for kuche, cn... skipping.
Missing field/result for taolanaro, mg... skipping.
City [724] = Hambantota, LK
City [725] = Hobart, AU
City [726] = Henties Bay, NA
City [727] = Kaitangata, NZ
City [728] = Margate, ZA
City [729] = Lethem, GY
City [730] = Nikolsk, RU
City [731] = Cockburn Town, TC
City [732] = Yellowknife, CA
City [733] = Hermanus, ZA
City [734] = Barrow, US
City [735] = Lompoc, US
City [736] = Port Alfred, ZA
Missing field/result for dzerzhinsk, by... skipping.
City [738] = Nome, US
City [739] = East London, ZA
City [740] = Saint George, BM
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City [741] = Flin Flon, CA
City [742] = Geraldton, AU
City [743] = Hermanus, ZA
City [744] = Victoria, SC
City [745] = Karasburg, NA
City [746] = Kodiak, US
City [747] = Tiksi, RU
City [748] = Pevek, RU
City [749] = Jamestown, SH
City [750] = Hermanus, ZA
Missing field/result for barawe, so... skipping.
City [752] = Ushuaia, AR
City [753] = Avarua, CK
City [754] = Rikitea, PF
Missing field/result for vaitupu, wf... skipping.
City [756] = Cabo San Lucas, MX
City [757] = Avarua, CK
City [758] = Rikitea, PF
City [759] = Hilo, US
City [760] = Dikson, RU
City [761] = Hermanus, ZA
City [762] = Punta Arenas, CL
City [763] = Katsuura, JP
City [764] = Nikolskoye, RU
City [765] = Hermanus, ZA
City [766] = Wanning, CN
City [767] = New Norfolk, AU
City [768] = Thompson, CA
City [769] = Busselton, AU
Missing field/result for saleaula, ws... skipping.
City [771] = Rikitea, PF
City [772] = Ponta do Sol, PT
City [773] = Rikitea, PF
City [774] = Nanortalik, GL
City [775] = Rio Gallegos, AR
City [776] = Dimbokro, CI
City [777] = Tasiilaq, GL
City [778] = Dikson, RU
City [779] = Paamiut, GL
City [780] = Mount Isa, AU
Missing field/result for sofiysk, ru... skipping.
City [782] = Guerrero Negro, MX
Missing field/result for jiddah, sa... skipping.
City [784] = Souillac, MU
City [785] = Avarua, CK
City [786] = Bredasdorp, ZA
City [787] = East London, ZA
City [788] = Punta Arenas, CL
City [789] = Cherskiy, RU
City [790] = Mbandaka, CD
City [791] = Koygorodok, RU
City [792] = Bloomingdale, US
City [793] = Coari, BR
City [794] = Aklavik, CA
City [795] = Merauke, ID
City [796] = Saint George, BM
City [797] = Lahaina, US
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City [798] = Butaritari, KI
City [799] = Bluff, NZ
City [800] = Bredasdorp, ZA
Missing field/result for mataura, pf... skipping.
City [802] = Klaksvik, FO
City [803] = Qaanaaq, GL
City [804] = Hilo, US
Missing field/result for bur gabo, so... skipping.
City [806] = Mahebourg, MU
City [807] = Qaanaaq, GL
City [808] = Bredasdorp, ZA
City [809] = Hofn, IS
City [810] = Lodwar, KE
City [811] = Vila Franca do Campo, PT
City [812] = Northam, AU
City [813] = Vila Velha, BR
City [814] = Marsh Harbour, BS
City [815] = Sibu, MY
City [816] = Victoria, SC
Missing field/result for taolanaro, mg... skipping.
City [818] = Cape Town, ZA
City [819] = The Pas, CA
City [820] = Omboue, GA
City [821] = Punta Arenas, CL
City [822] = Waipawa, NZ
Missing field/result for one hundred mile house, ca... skipping.
City [824] = Chino Valley, US
Missing field/result for nizhneyansk, ru... skipping.
City [826] = Ponta do Sol, CV
City [827] = Ust-Tsilma, RU
City [828] = Puerto Ayora, EC
City [829] = Abha, SA
City [830] = Crawfordsville, US
City [831] = Touros, BR
City [832] = Santa Cruz, BR
City [833] = Cape Town, ZA
City [834] = Mount Gambier, AU
Missing field/result for mys shmidta, ru... skipping.
City [836] = Seoul, KR
City [837] = Thompson, CA
City [838] = Ponta do Sol, PT
Missing field/result for felidhoo, mv... skipping.
City [840] = Kawhia, NZ
City [841] = Inirida, CO
City [842] = Punta Arenas, CL
City [843] = Rikitea, PF
City [844] = Kaiyuan, CN
City [845] = Ushuaia, AR
City [846] = Sibolga, ID
City [847] = Otradnoye, RU
City [848] = Rikitea, PF
City [849] = Ushuaia, AR
City [850] = Castro, CL
Missing field/result for sentyabrskiy, ru... skipping.
City [852] = Vaini, TO
City [853] = Clyde River, CA
City [854] = Kodinsk, RU
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City [855] = Ilheus, BR
City [856] = Bethel, US
City [857] = Hobart, AU
City [858] = Hermanus, ZA
Missing field/result for mataura, pf... skipping.
City [860] = Tasiilaq, GL
City [861] = Itapora, BR
City [862] = Beringovskiy, RU
City [863] = Qaqortoq, GL
City [864] = Port Lincoln, AU
City [865] = Rikitea, PF
City [866] = Tanhacu, BR
City [867] = Mujiayingzi, CN
City [868] = Daye, CN
City [869] = Can Tho, VN
City [870] = Adrar, DZ
City [871] = Yellowknife, CA
City [872] = Harper, LR
City [873] = Vaini, TO
City [874] = Yulara, AU
City [875] = Xinzhou, CN
City [876] = Methoni, GR
City [877] = Beringovskiy, RU
Missing field/result for mataura, pf... skipping.
City [879] = Yellowknife, CA
City [880] = Paamiut, GL
City [881] = Paita, PE
City [882] = Rikitea, PF
City [883] = Te Anau, NZ
City [884] = Jamestown, SH
City [885] = Meru, KE
City [886] = Hermanus, ZA
City [887] = Sorland, NO
Missing field/result for ulyanovo, ru... skipping.
City [889] = Verkh-Usugli, RU
Missing field/result for amderma, ru... skipping.
City [891] = Shimoda, JP
City [892] = Komsomolskiy, RU
City [893] = Mahebourg, MU
City [894] = Albany, AU
City [895] = Bredasdorp, ZA
City [896] = Zonguldak, TR
City [897] = Kyra, RU
City [898] = Vaasa, FI
City [899] = Albany, AU
City [900] = Tuatapere, NZ
City [901] = Ambilobe, MG
Missing field/result for mataura, pf... skipping.
City [903] = Richards Bay, ZA
City [904] = Jamestown, SH
City [905] = Khatanga, RU
City [906] = Hobart, AU
City [907] = Khatanga, RU
City [908] = Thompson, CA
City [909] = Nurota, UZ
City [910] = Puerto Narino, CO
City [911] = Hermanus, ZA
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City [912] = Bluff, NZ
City [913] = Saskylakh, RU
City [914] = Hermanus, ZA
City [915] = Chokurdakh, RU
City [916] = Nabire, ID
City [917] = Canavieiras, BR
City [918] = Ancud, CL
City [919] = Yellowknife, CA
City [920] = Sao Filipe, CV
City [921] = Sorong, ID
City [922] = Butaritari, KI
City [923] = Omboue, GA
Missing field/result for amderma, ru... skipping.
City [925] = Rikitea, PF
City [926] = Busselton, AU
City [927] = Toora-Khem, RU
City [928] = Hobart, AU
Missing field/result for urumqi, cn... skipping.
City [930] = Dikson, RU
City [931] = Praia da Vitoria, PT
Missing field/result for ngukurr, au... skipping.
City [933] = Qaanaaq, GL
City [934] = Ponta do Sol, CV
City [935] = Namibe, AO
City [936] = Jamestown, SH
City [937] = Klaksvik, FO
City [938] = Thompson, CA
City [939] = Alice Springs, AU
City [940] = Provideniya, RU
City [941] = Nuevitas, CU
City [942] = Butaritari, KI
City [943] = Jamestown, SH
City [944] = Busselton, AU
City [945] = Albany, AU
City [946] = Aklavik, CA
City [947] = Laiyang, CN
City [948] = Vaini, TO
City [949] = Chicama, PE
City [950] = Abu Dhabi, AE
City [951] = Nanticoke, CA
City [952] = Bad Windsheim, DE
City [953] = Avarua, CK
City [954] = Rikitea, PF
City [955] = Nardaran, AZ
City [956] = Pisco, PE
City [957] = Puerto Ayora, EC
City [958] = Port Alfred, ZA
City [959] = Kapaa, US
City [960] = Cabo San Lucas, MX
City [961] = Hobart, AU
City [962] = La Ronge, CA
City [963] = Almirante, PA
City [964] = Busselton, AU
Missing field/result for mys shmidta, ru... skipping.
City [966] = Kahului, US
City [967] = Bubaque, GW
City [968] = Haftoni, AZ
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City [969] = Marsa Matruh, EG
Missing field/result for barentsburg, sj... skipping.
City [971] = Rabagani, RO
City [972] = Rikitea, PF
City [973] = Puerto Ayora, EC
City [974] = Dikson, RU
City [975] = Hasaki, JP
City [976] = Bambous Virieux, MU
City [977] = Cazones, MX
City [978] = Butaritari, KI
City [979] = Hobart, AU
City [980] = Bandarbeyla, SO
City [981] = Hobart, AU
City [982] = Fairbanks, US
City [983] = Puerto Ayora, EC
City [984] = Sakaiminato, JP
City [985] = Vaini, TO
City [986] = Kodiak, US
City [987] = Hermanus, ZA
Missing field/result for mataura, pf... skipping.
City [989] = Pundaguitan, PH
City [990] = Hobyo, SO
City [991] = Cukai, MY
Missing field/result for san quintin, mx... skipping.
City [993] = Nikolskoye, RU
City [994] = Port Alfred, ZA
City [995] = Ilulissat, GL
City [996] = Kavieng, PG
City [997] = Luderitz, NA
Missing field/result for taolanaro, mg... skipping.
City [999] = Prince Rupert, CA
City [1000] = Arraial do Cabo, BR
City [1001] = Ribeira Grande, PT
City [1002] = Souillac, MU
City [1003] = Alofi, NU
City [1004] = Erenhot, CN
City [1005] = Kapaa, US
City [1006] = Dikson, RU
City [1007] = Ushuaia, AR
City [1008] = Shelburne, CA
City [1009] = Saint John, CA
City [1010] = Bolivar, US
City [1011] = Gejiu, CN
City [1012] = Ushuaia, AR
City [1013] = Bredasdorp, ZA
City [1014] = Arraial do Cabo, BR
Missing field/result for mataura, pf... skipping.
City [1016] = Barguzin, RU
City [1017] = Atar, MR
City [1018] = Yellowknife, CA
City [1019] = Wau, PG
City [1020] = Butaritari, KI
City [1021] = Bredasdorp, ZA
City [1022] = Hobart, AU
City [1023] = Sibolga, ID
Missing field/result for airai, pw... skipping.
City [1025] = Mattru, SL
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City [1026] = Butaritari, KI
City [1027] = Bredasdorp, ZA
Missing field/result for afmadu, so... skipping.
City [1029] = Port Alfred, ZA
Missing field/result for japura, br... skipping.
City [1031] = Ancud, CL
City [1032] = Shimoda, JP
City [1033] = Port Alfred, ZA
City [1034] = Chokurdakh, RU
Missing field/result for louisbourg, ca... skipping.
Missing field/result for pemangkat, id... skipping.
City [1037] = Strelka, RU
City [1038] = Rio Grande, BR
City [1039] = Punta Arenas, CL
City [1040] = Bluff, NZ
City [1041] = Rikitea, PF
City [1042] = Kapaa, US
City [1043] = Sumenep, ID
City [1044] = Tupik, RU
City [1045] = Leshukonskoye, RU
City [1046] = Katsuura, JP
City [1047] = Huarmey, PE
City [1048] = Bredasdorp, ZA
City [1049] = Iquique, CL
Missing field/result for illoqqortoormiut, gl... skipping.
City [1051] = Luderitz, NA
City [1052] = San Luis, AR
City [1053] = Saskylakh, RU
City [1054] = Narsaq, GL
City [1055] = Copalillo, MX
City [1056] = Yellowknife, CA
City [1057] = Ribeira Grande, PT
City [1058] = Thompson, CA
Missing field/result for mys shmidta, ru... skipping.
City [1060] = Fortuna, US
City [1061] = Mpigi, UG
Missing field/result for grand river south east, mu... skipping.
City [1063] = Saint George, BM
City [1064] = Buta, CD
Missing field/result for warqla, dz... skipping.
City [1066] = Ushuaia, AR
City [1067] = Esperance, AU
City [1068] = Seoul, KR
City [1069] = Mahebourg, MU
City [1070] = Rikitea, PF
City [1071] = Rikitea, PF
City [1072] = Ponta do Sol, CV
City [1073] = Bredasdorp, ZA
City [1074] = Busselton, AU
City [1075] = Poum, NC
Missing field/result for belushya guba, ru... skipping.
City [1077] = Busselton, AU
City [1078] = Bo Rai, TH
Missing field/result for hebertville, ca... skipping.
City [1080] = Chuy, UY
City [1081] = Meulaboh, ID
City [1082] = Jamestown, SH
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City [1083] = Puerto Ayora, EC
City [1084] = West Monroe, US
City [1085] = Vaini, TO
City [1086] = Ushuaia, AR
City [1087] = Bluff, NZ
City [1088] = Qaanaaq, GL
City [1089] = Carnarvon, AU
City [1090] = Turukhansk, RU
Missing field/result for nizhneyansk, ru... skipping.
Missing field/result for belushya guba, ru... skipping.
City [1093] = Borova, UA
City [1094] = Bethel, US
Missing field/result for chagda, ru... skipping.
City [1096] = Lagoa, PT
City [1097] = Byron Bay, AU
City [1098] = Kapaa, US
Missing field/result for mataura, pf... skipping.
City [1100] = Kurilsk, RU
City [1101] = Lagoa, PT
City [1102] = Albany, AU
City [1103] = Aksarka, RU
City [1104] = Port Elizabeth, ZA
City [1105] = Klaksvik, FO
Missing field/result for samusu, ws... skipping.
City [1107] = Rikitea, PF
City [1108] = Samarai, PG
City [1109] = Ushuaia, AR
Missing field/result for ilka, ru... skipping.
City [1111] = Albany, AU
City [1112] = Rikitea, PF
City [1113] = Monrovia, LR
City [1114] = Tacuarembo, UY
City [1115] = Saran, FR
City [1116] = Hermanus, ZA
City [1117] = Beringovskiy, RU
City [1118] = Grand Gaube, MU
City [1119] = Cape Town, ZA
City [1120] = New Norfolk, AU
City [1121] = Sinnar, SD
City [1122] = Wagar, SD
City [1123] = Wairoa, NZ
City [1124] = Bluff, NZ
City [1125] = Soe, ID
City [1126] = Usa River, TZ
City [1127] = Pevek, RU
City [1128] = Vaini, TO
City [1129] = Matagami, CA
City [1130] = Pisco, PE
City [1131] = Norman Wells, CA
City [1132] = Bambous Virieux, MU
City [1133] = Dikson, RU
City [1134] = Solano, CO
Missing field/result for barentsburg, sj... skipping.
City [1136] = Saskylakh, RU
City [1137] = Ushuaia, AR
City [1138] = Tasiilaq, GL
Missing field/result for nizhneyansk, ru... skipping.
```

```
City [1140] = Castro, CL
City [1141] = East London, ZA
City [1142] = Yulara, AU
City [1143] = Ancud, CL
City [1144] = Adrar, DZ
Missing field/result for mataura, pf... skipping.
City [1146] = La Victoria, VE
City [1147] = Busselton, AU
City [1148] = Bluff, NZ
City [1149] = Ambatofinandrahana, MG
City [1150] = Tibiri, NE
City [1151] = Hermanus, ZA
City [1152] = Fallon, US
City [1153] = Hilo, US
City [1154] = Grand Gaube, MU
City [1155] = Dwarka, IN
City [1156] = Geraldton, AU
City [1157] = Yellowknife, CA
City [1158] = Kavaratti, IN
City [1159] = Pisco, PE
City [1160] = Kodiak, US
Missing field/result for olafsvik, is... skipping.
City [1162] = Sao Filipe, CV
Missing field/result for mataura, pf... skipping.
City [1164] = Umm Lajj, SA
City [1165] = Prince Rupert, CA
City [1166] = Dikson, RU
City [1167] = Zanesville, US
City [1168] = Ushuaia, AR
City [1169] = Ponta do Sol, CV
City [1170] = Cape Town, ZA
City [1171] = Shahr-e Kord, IR
City [1172] = Ushuaia, AR
City [1173] = Punta Arenas, CL
City [1174] = Jizan, SA
City [1175] = Punta Arenas, CL
City [1176] = Melilla, ES
City [1177] = Kon Tum, VN
City [1178] = Lompoc, US
City [1179] = Hermanus, ZA
City [1180] = Geraldton, AU
City [1181] = Karpathos, GR
City [1182] = Kapaa, US
City [1183] = Adrar, DZ
City [1184] = Rodrigues Alves, BR
City [1185] = Ushuaia, AR
Missing field/result for sentyabrskiy, ru... skipping.
City [1187] = Port Alfred, ZA
City [1188] = Ancud, CL
City [1189] = Tessalit, ML
City [1190] = Saskylakh, RU
Missing field/result for taolanaro, mg... skipping.
City [1192] = Fortuna, US
Missing field/result for marcona, pe... skipping.
City [1194] = Innisfail, AU
City [1195] = Kununurra, AU
City [1196] = Ushuaia, AR
```

```
City [1197] = Weston-super-Mare, GB
City [1198] = Nkowakowa, ZA
City [1199] = Kapaa, US
City [1200] = Ushuaia, AR
City [1201] = Vila Franca do Campo, PT
City [1202] = Souillac, MU
City [1203] = Narsaq, GL
City [1204] = Kapaa, US
City [1205] = Pangkalanbuun, ID
City [1206] = New Norfolk, AU
City [1207] = Provideniya, RU
Missing field/result for illoqqortoormiut, gl... skipping.
City [1209] = Cape Town, ZA
City [1210] = Torbay, CA
City [1211] = Busselton, AU
City [1212] = Almeirim, BR
City [1213] = Bluff, NZ
City [1214] = Aschaffenburg, DE
City [1215] = Yellowknife, CA
City [1216] = Fortuna, US
Missing field/result for mys shmidta, ru... skipping.
City [1218] = Bilma, NE
City [1219] = Port Alfred, ZA
City [1220] = Punta Arenas, CL
Missing field/result for taolanaro, mg... skipping.
City [1222] = Nikolayevskaya, RU
City [1223] = Port Alfred, ZA
City [1224] = Kodiak, US
City [1225] = Rikitea, PF
City [1226] = Rio Grande, BR
City [1227] = Ushuaia, AR
City [1228] = Port Alfred, ZA
City [1229] = Rikitea, PF
City [1230] = Aklavik, CA
City [1231] = Deputatskiy, RU
City [1232] = Busselton, AU
City [1233] = Lunsar, SL
Missing field/result for armacao dos buzios, br... skipping.
City [1235] = Yellowknife, CA
City [1236] = Cap Malheureux, MU
City [1237] = Tuktoyaktuk, CA
City [1238] = Misratah, LY
City [1239] = Cape Town, ZA
City [1240] = Longyearbyen, SJ
City [1241] = Deputatskiy, RU
City [1242] = Fort Nelson, CA
City [1243] = Faanui, PF
City [1244] = Portel, BR
Missing field/result for mataura, pf... skipping.
City [1246] = Rikitea, PF
City [1247] = Vaitape, PF
City [1248] = Nizwa, OM
City [1249] = Bethel, US
City [1250] = Bonthe, SL
City [1251] = Tuktoyaktuk, CA
City [1252] = Bayshore Gardens, US
City [1253] = Utmanzai, PK
```

```
City [1254] = Nemuro, JP
City [1255] = Kodiak, US
City [1256] = Cape Town, ZA
City [1257] = Ostrovnoy, RU
City [1258] = Rocha, UY
City [1259] = Port Blair, IN
City [1260] = Qaanaaq, GL
Missing field/result for illela, ne... skipping.
City [1262] = Jamestown, SH
City [1263] = Bilibino, RU
City [1264] = Ushuaia, AR
City [1265] = Puerto Ayora, EC
City [1266] = Port Alfred, ZA
City [1267] = Carnarvon, AU
Missing field/result for bengkulu, id... skipping.
City [1269] = Kapaa, US
City [1270] = Poltavka, RU
City [1271] = Kenai, US
City [1272] = Launceston, AU
City [1273] = Jamestown, SH
City [1274] = Barrow, US
Missing field/result for tsihombe, mg... skipping.
City [1276] = Puerto Ayora, EC
City [1277] = Avarua, CK
Missing field/result for barentsburg, sj... skipping.
City [1279] = Roma, AU
City [1280] = Emerald, AU
City [1281] = Bredasdorp, ZA
City [1282] = Karratha, AU
City [1283] = Trail, CA
Missing field/result for alotau, pg... skipping.
City [1285] = Busselton, AU
City [1286] = Jamestown, SH
City [1287] = Iqaluit, CA
City [1288] = Port Alfred, ZA
City [1289] = Kodiak, US
City [1290] = Manzanillo, MX
Missing field/result for belushya guba, ru... skipping.
City [1292] = Nicoya, CR
City [1293] = Teahupoo, PF
City [1294] = Iqaluit, CA
City [1295] = Marinette, US
City [1296] = Fort-Shevchenko, KZ
City [1297] = Busselton, AU
City [1298] = Narsaq, GL
City [1299] = Lavrentiya, RU
City [1300] = East London, ZA
City [1301] = Hobart, AU
City [1302] = Castro, CL
City [1303] = Hami, CN
City [1304] = Sao Joao da Barra, BR
City [1305] = La Joya, MX
City [1306] = Meulaboh, ID
City [1307] = Tasiilaq, GL
City [1308] = Havdrup, DK
City [1309] = Popondetta, PG
Missing field/result for luan, cn... skipping.
```

```
City [1311] = Bluff, NZ
City [1312] = Lebu, CL
City [1313] = Rikitea, PF
Missing field/result for samusu, ws... skipping.
City [1315] = Roebourne, AU
Missing field/result for taolanaro, mg... skipping.
Missing field/result for laguna, br... skipping.
City [1318] = Takayama, JP
City [1319] = Vanavara, RU
City [1320] = Rikitea, PF
City [1321] = Busselton, AU
City [1322] = Atagay, RU
City [1323] = Ushuaia, AR
City [1324] = Busselton, AU
City [1325] = Te Anau, NZ
City [1326] = Uribia, CO
City [1327] = Kronshtadt, RU
City [1328] = New Norfolk, AU
City [1329] = Mlonggo, ID
City [1330] = Georgetown, SH
City [1331] = Kapaa, US
City [1332] = Altamirano, MX
City [1333] = Neyshabur, IR
Missing field/result for airai, pw... skipping.
City [1335] = Adrar, DZ
City [1336] = Kapaa, US
City [1337] = Iquique, CL
Missing field/result for bara, sd... skipping.
Missing field/result for mataura, pf... skipping.
City [1340] = Port Hardy, CA
Missing field/result for norre aaby, dk... skipping.
City [1342] = Port Alfred, ZA
City [1343] = Rikitea, PF
City [1344] = Hervey Bay, AU
City [1345] = Bluff, NZ
Missing field/result for mataura, pf... skipping.
City [1347] = Kerema, PG
City [1348] = Bluff, NZ
City [1349] = Olga, RU
City [1350] = Bethel, US
City [1351] = Churapcha, RU
City [1352] = Khatanga, RU
City [1353] = Nieuw Amsterdam, SR
Missing field/result for tsihombe, mg... skipping.
City [1355] = Jamestown, SH
Missing field/result for el alto, pe... skipping.
City [1357] = Ushuaia, AR
City [1358] = Yakeshi, CN
City [1359] = Iqaluit, CA
City [1360] = Lorengau, PG
City [1361] = Punta Arenas, CL
City [1362] = Port Lincoln, AU
Missing field/result for taolanaro, mg... skipping.
City [1364] = Warrnambool, AU
City [1365] = Mount Isa, AU
City [1366] = Hilo, US
City [1367] = Busselton, AU
```

```
            Missing field/result for saint anthony, ca... skipping.
            City [1369] = Rikitea, PF
            City [1370] = Geraldton, AU
            City [1371] = Meulaboh, ID
            City [1372] = Hofn, IS
            City [1373] = Port Elizabeth, ZA
            City [1374] = Yellowknife, CA
            City [1375] = Cape Town, ZA
            Missing field/result for mys shmidta, ru... skipping.
            Missing field/result for belushya guba, ru... skipping.
            Missing field/result for bereda, so... skipping.
            City [1379] = Nhulunbuy, AU
            City [1380] = Acapulco, MX
            City [1381] = Punta Arenas, CL
            City [1382] = Cape Town, ZA
            City [1383] = Hermanus, ZA
            Missing field/result for taolanaro, mg... skipping.
            City [1385] = Bima, ID
            City [1386] = Torbay, CA
            City [1387] = Mindelo, CV
            City [1388] = Oranjemund, NA
            City [1389] = Vaini, TO
            Missing field/result for barentsburg, sj... skipping.
            Missing field/result for mataura, pf... skipping.
            City [1392] = Tocopilla, CL
            City [1393] = Souillac, MU
            City [1394] = Albany, AU
            City [1395] = Kapaa, US
            City [1396] = Barrow, US
            City [1397] = Hobart, AU
            Missing field/result for bargal, so... skipping.
            City [1399] = Cayenne, GF
            City [1400] = Praia da Vitoria, PT
            City [1401] = Puro, PH
            City [1402] = Namwala, ZM
            City [1403] = Busselton, AU
            City [1404] = Itarema, BR
            City [1405] = Burgeo, CA
            Missing field/result for belushya guba, ru... skipping.
            City [1407] = Ushuaia, AR
            City [1408] = Rikitea, PF
            City [1409] = Upernavik, GL
            Missing field/result for illoqqortoormiut, gl... skipping.
            City [1411] = Nikolskoye, RU
            City [1412] = Bambous Virieux, MU
            City [1413] = Westport, IE
            City [1414] = Albany, AU
            City [1415] = Chuy, UY
            City [1416] = Yellowknife, CA
            City [1417] = Barrow, US
            City [1418] = Trinidad, BO
            City [1419] = Sa Kaeo, TH
            City [1420] = Ribeira Grande, PT
            City [1421] = Esperance, AU
            Missing field/result for taolanaro, mg... skipping.
            City [1423] = Port Alfred, ZA
            City [1424] = Kapaa, US
```

```
City [1425] = Kaitangata, NZ
City [1426] = Maniitsoq, GL
City [1427] = Ushuaia, AR
City [1428] = Severo-Kurilsk, RU
City [1429] = Marsh Harbour, BS
Missing field/result for illoqqortoormiut, gl... skipping.
Missing field/result for ybytimi, py... skipping.
City [1432] = Tyubuk, RU
City [1433] = Rikitea, PF
City [1434] = Kashi, CN
City [1435] = Riyadh, SA
City [1436] = Huttwil, CH
City [1437] = Lagoa, PT
Missing field/result for vaitupu, wf... skipping.
City [1439] = Hasaki, JP
City [1440] = Avarua, CK
City [1441] = Busselton, AU
City [1442] = Tuatapere, NZ
City [1443] = Roma, AU
City [1444] = Atuona, PF
City [1445] = Kahului, US
City [1446] = Morehead, PG
City [1447] = Saskylakh, RU
City [1448] = Butaritari, KI
Missing field/result for amderma, ru... skipping.
Missing field/result for barentsburg, sj... skipping.
City [1451] = Semnan, IR
City [1452] = Port-Gentil, GA
City [1453] = Grimshaw, CA
Missing field/result for linguere, sn... skipping.
Missing field/result for tabiauea, ki... skipping.
Missing field/result for vaitupu, wf... skipping.
Missing field/result for acarau, br... skipping.
City [1458] = Norman Wells, CA
City [1459] = Cherskiy, RU
City [1460] = Qaanaaq, GL
Missing field/result for illoqqortoormiut, gl... skipping.
City [1462] = Qaanaaq, GL
City [1463] = Saint-Philippe, RE
City [1464] = Punta Arenas, CL
City [1465] = Hermanus, ZA
City [1466] = Tura, RU
City [1467] = Rikitea, PF
City [1468] = Cape Town, ZA
City [1469] = Birao, CF
City [1470] = San Cristobal, EC
City [1471] = Hermanus, ZA
City [1472] = Qaanaaq, GL
City [1473] = Vancouver, CA
City [1474] = Srednekolymsk, RU
City [1475] = Yellowknife, CA
City [1476] = Puerto Ayora, EC
City [1477] = New Norfolk, AU
City [1478] = Tipitapa, NI
City [1479] = Bredasdorp, ZA
City [1480] = Aswan, EG
City [1481] = Bredasdorp, ZA
```

```
City [1482] = Aklavik, CA
City [1483] = Cape Town, ZA
Missing field/result for mataura, pf... skipping.
City [1485] = Rikitea, PF
City [1486] = Ponta do Sol, CV
City [1487] = Souillac, MU
City [1488] = Carnarvon, AU
City [1489] = Huangzhai, CN
City [1490] = Bredasdorp, ZA
City [1491] = Punta Arenas, CL
Missing field/result for taolanaro, mg... skipping.
Missing field/result for mataura, pf... skipping.
City [1494] = Boca do Acre, BR
City [1495] = Rikitea, PF
City [1496] = Port Alfred, ZA
City [1497] = Rikitea, PF
City [1498] = Najran, SA
City [1499] = Saint-Philippe, RE
```

In [8]:
```python
# drop any rows with invalid data
weather = weather.dropna(axis=0, how='any', thresh=1, inplace=False)
weather
```

Out[8]:

	City	Cloudiness	Country	Humidity	Lat	Lon	Temp	Wind Speed	Latitude Random	Lo
0	Sioux Lookout	40.0	CA	48.0	50.10	-91.92	60.80	9.17	56.313708	-90
1	Arraial do Cabo	100.0	BR	97.0	-22.97	-42.02	71.01	8.38	-34.083396	-36
2	Mar del Plata	46.0	AR	44.0	-46.43	-67.52	52.30	24.70	-50.476492	-46
3	Assiniboia	100.0	CA	93.0	49.63	-105.99	32.23	13.28	49.007427	-106
4	Tamandare	10.0	BR	74.0	-8.28	-70.75	74.25	1.81	-8.841016	-33
...	...	...	...	...	...	...	...	...	...	
1495	Rikitea	100.0	PF	82.0	-23.12	-134.97	67.35	12.88	-64.295652	-131
1496	Port Alfred	15.0	ZA	92.0	-33.59	26.89	61.00	4.00	-73.351927	37
1497	Rikitea	100.0	PF	82.0	-23.12	-134.97	67.35	12.88	-21.903924	-118
1498	Najran	40.0	SA	40.0	17.54	44.22	71.60	6.76	20.283084	44
1499	Saint-Philippe	0.0	RE	56.0	-21.36	55.77	69.10	5.82	-54.075155	69

1305 rows × 10 columns

In [22]:
```python
# drop duplicate rows
weatherNoDupes = weather.drop_duplicates(subset=["City", "Country", "Lat", "Lon"], keep="first")
weatherNoDupes
```

Out[22]:

	City	Cloudiness	Country	Humidity	Lat	Lon	Temp	Wind Speed	Latitude Random	L
0	Sioux Lookout	40.0	CA	48.0	50.10	-91.92	60.80	9.17	56.313708	-90
1	Arraial do Cabo	100.0	BR	97.0	-22.97	-42.02	71.01	8.38	-34.083396	-36
2	Mar del Plata	46.0	AR	44.0	-46.43	-67.52	52.30	24.70	-50.476492	-46
3	Assiniboia	100.0	CA	93.0	49.63	-105.99	32.23	13.28	49.007427	-106
4	Tamandare	10.0	BR	74.0	-8.28	-70.75	74.25	1.81	-8.841016	-33
...	...	...	...	...	...	...	...	...	...	
1478	Tipitapa	40.0	NI	88.0	12.20	-86.10	78.80	6.51	12.204125	-85
1480	Aswan	0.0	EG	30.0	24.09	32.90	84.20	6.93	23.750908	31
1489	Huangzhai	98.0	CN	72.0	23.86	112.01	73.45	1.20	33.349069	114
1494	Boca do Acre	34.0	BR	63.0	-8.76	-67.39	76.66	1.10	-9.344440	-67
1498	Najran	40.0	SA	40.0	17.54	44.22	71.60	6.76	20.283084	44

537 rows × 12 columns

In [31]:
```
weatherNoDupes = pd.DataFrame(weatherNoDupes)
weatherNoDupes
```

Out[31]:

	City	Cloudiness	Country	Humidity	Lat	Lon	Temp	Wind Speed	Latitude Random	Lo l
0	Sioux Lookout	40.0	CA	48.0	50.10	-91.92	60.80	9.17	56.313708	-90
1	Arraial do Cabo	100.0	BR	97.0	-22.97	-42.02	71.01	8.38	-34.083396	-36
2	Mar del Plata	46.0	AR	44.0	-46.43	-67.52	52.30	24.70	-50.476492	-46
3	Assiniboia	100.0	CA	93.0	49.63	-105.99	32.23	13.28	49.007427	-106
4	Tamandare	10.0	BR	74.0	-8.28	-70.75	74.25	1.81	-8.841016	-33
...	...	...	...	...	...	...	...	...	...	
1478	Tipitapa	40.0	NI	88.0	12.20	-86.10	78.80	6.51	12.204125	-85
1480	Aswan	0.0	EG	30.0	24.09	32.90	84.20	6.93	23.750908	31
1489	Huangzhai	98.0	CN	72.0	23.86	112.01	73.45	1.20	33.349069	114
1494	Boca do Acre	34.0	BR	63.0	-8.76	-67.39	76.66	1.10	-9.344440	-67
1498	Najran	40.0	SA	40.0	17.54	44.22	71.60	6.76	20.283084	44

537 rows × 12 columns

In [32]:
```python
# calculate the difference between the found city lat, lon and the original ra
ndom lat, Lon
weatherNoDupes["Lat Diff"] = weatherNoDupes["Latitude Random"] - weatherNoDupe
s["Lat"]
weatherNoDupes["Lon Diff"] = weatherNoDupes["Longitude Random"] - weatherNoDup
es["Lon"]
weatherNoDupes
```

Out[32]:

	City	Cloudiness	Country	Humidity	Lat	Lon	Temp	Wind Speed	Latitude Random	Lc l
0	Sioux Lookout	40.0	CA	48.0	50.10	-91.92	60.80	9.17	56.313708	-90
1	Arraial do Cabo	100.0	BR	97.0	-22.97	-42.02	71.01	8.38	-34.083396	-36
2	Mar del Plata	46.0	AR	44.0	-46.43	-67.52	52.30	24.70	-50.476492	-46
3	Assiniboia	100.0	CA	93.0	49.63	-105.99	32.23	13.28	49.007427	-106
4	Tamandare	10.0	BR	74.0	-8.28	-70.75	74.25	1.81	-8.841016	-33
...	...	...	...	...	...	...	...	...	...	
1478	Tipitapa	40.0	NI	88.0	12.20	-86.10	78.80	6.51	12.204125	-85
1480	Aswan	0.0	EG	30.0	24.09	32.90	84.20	6.93	23.750908	31
1489	Huangzhai	98.0	CN	72.0	23.86	112.01	73.45	1.20	33.349069	114
1494	Boca do Acre	34.0	BR	63.0	-8.76	-67.39	76.66	1.10	-9.344440	-67
1498	Najran	40.0	SA	40.0	17.54	44.22	71.60	6.76	20.283084	44

537 rows × 12 columns

Comparison of Random Latitude, Longitude to the matched City Lat, Lon

In [10]:
```python
# Grab the date
tupleTime = time.localtime() # get struct_time
timeString = time.strftime("%m/%d/%Y", tupleTime)
timeString
```
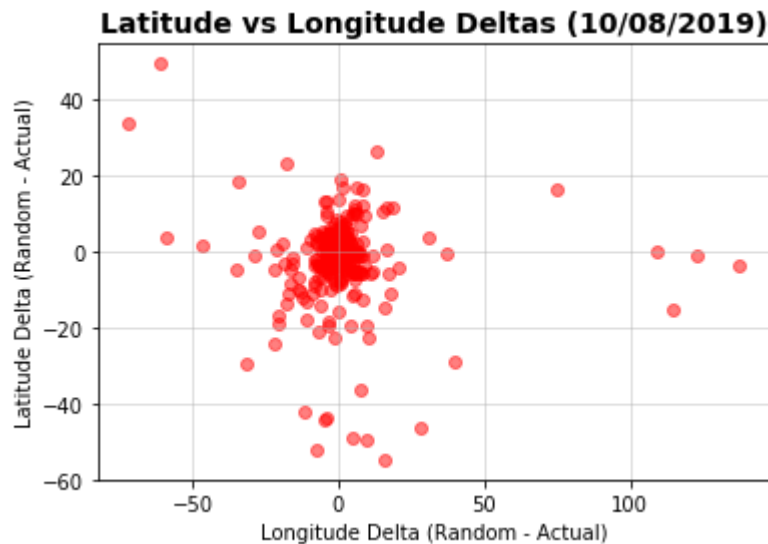
Out[10]: '10/08/2019'

First, look at the differences.

Notice that some deltas can be very large. Therefore the citipy api has a large distance it searches for matches.

In [70]:
```python
# Plot Latitude vs Longitude - (Random - Actual)
plt.scatter(weatherNoDupes["Lon Diff"], weatherNoDupes["Lat Diff"], c="r", alp
ha=0.5)
plt.title(f'Latitude vs Longitude Deltas ({timeString})', size=14, weight='bol
d')
plt.xlabel('Longitude Delta (Random - Actual)')
plt.ylabel('Latitude Delta (Random - Actual)')
plt.grid(alpha=0.5)

# Save the image
plt.savefig("../Images/LonLat_Diff.png")
plt.show()
```
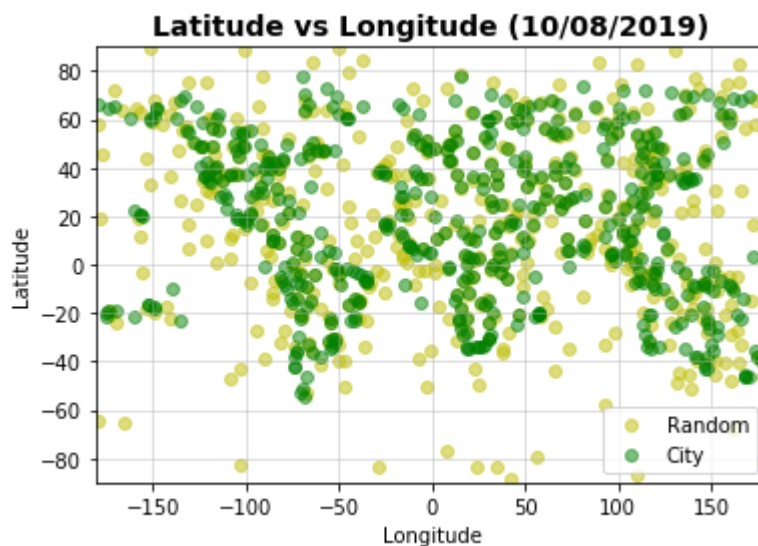

Second, look at both sets of locations plotted together.

Very few cities were found near the poles and there are clearly points in the ocean and other places with no cities.

```
In [69]:   # Plot Latitude vs Longitude - Random vs Actual
           #plt.figure(figsize=(8,8))
           plt.scatter(weatherNoDupes["Longitude Random"], weatherNoDupes["Latitude Rando
           m"], c="y", alpha=0.5, label="Random")
           plt.scatter(weatherNoDupes["Lon"], weatherNoDupes["Lat"], c="g", alpha=0.5, la
           bel="City")
           plt.title(f'Latitude vs Longitude ({timeString})', size=14, weight='bold')
           plt.xlabel('Longitude')
           plt.ylabel('Latitude')
           plt.xlim(lng_range)
           plt.ylim(lat_range)
           plt.legend(loc="best")
           plt.grid(alpha=0.5)

           # Save the image
           plt.savefig("../Images/LatvsLon_RandomvsActual.png")
           plt.show()
```


Convert Raw Data to DataFrame

- Export the city data into a .csv.
- Display the DataFrame

```
In [35]:   # Save the data to a csv file
           weatherNoDupes.to_csv(path_or_buf=output_data_file, index=False)
```

```
In [36]: # Display the dataframe length
         weatherNoDupes.count()
```

```
Out[36]: City                 537
         Cloudiness           537
         Country              537
         Humidity             537
         Lat                  537
         Lon                  537
         Temp                 537
         Wind Speed           537
         Latitude Random      537
         Longitude Random     537
         Lat Diff             537
         Lon Diff             537
         dtype: int64
```

```
In [37]: # Display the data frame
         weatherNoDupes
```

Out[37]:

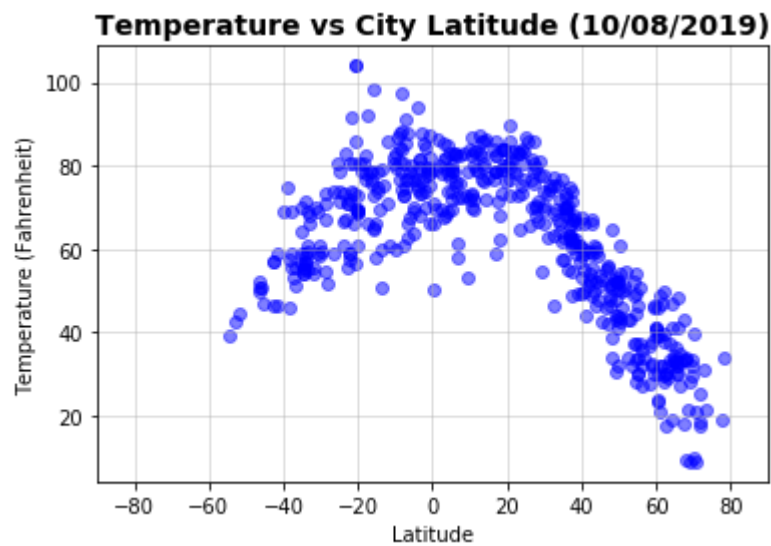|	City	Cloudiness	Country	Humidity	Lat	Lon	Temp	Wind Speed	Latitude Random	L
0	Sioux Lookout	40.0	CA	48.0	50.10	-91.92	60.80	9.17	56.313708	-90
1	Arraial do Cabo	100.0	BR	97.0	-22.97	-42.02	71.01	8.38	-34.083396	-36
2	Mar del Plata	46.0	AR	44.0	-46.43	-67.52	52.30	24.70	-50.476492	-46
3	Assiniboia	100.0	CA	93.0	49.63	-105.99	32.23	13.28	49.007427	-106
4	Tamandare	10.0	BR	74.0	-8.28	-70.75	74.25	1.81	-8.841016	-33
...	...	...	...	...	...	...	...	...	...	
1478	Tipitapa	40.0	NI	88.0	12.20	-86.10	78.80	6.51	12.204125	-85
1480	Aswan	0.0	EG	30.0	24.09	32.90	84.20	6.93	23.750908	31
1489	Huangzhai	98.0	CN	72.0	23.86	112.01	73.45	1.20	33.349069	114
1494	Boca do Acre	34.0	BR	63.0	-8.76	-67.39	76.66	1.10	-9.344440	-67
1498	Najran	40.0	SA	40.0	17.54	44.22	71.60	6.76	20.283084	44

537 rows × 12 columns

Plotting the Data

- Use proper labeling of the plots using plot titles (including date of analysis) and axes labels.
- Save the plotted figures as .pngs.

Latitude vs. Temperature Plot

```
In [61]:  # Plot Latitude vs Temperature
          plt.scatter(weatherNoDupes["Lat"], weatherNoDupes["Temp"], c="b", alpha=0.5)
          plt.title(f'Temperature vs City Latitude ({timeString})', size=14, weight='bol
          d')
          plt.xlabel('Latitude')
          plt.ylabel('Temperature (Fahrenheit)')
          plt.xlim(lat_range)
          plt.grid(alpha=0.5)

          # Save the image
          plt.savefig("../Images/LatvsTemperature.png")
          plt.show()
```
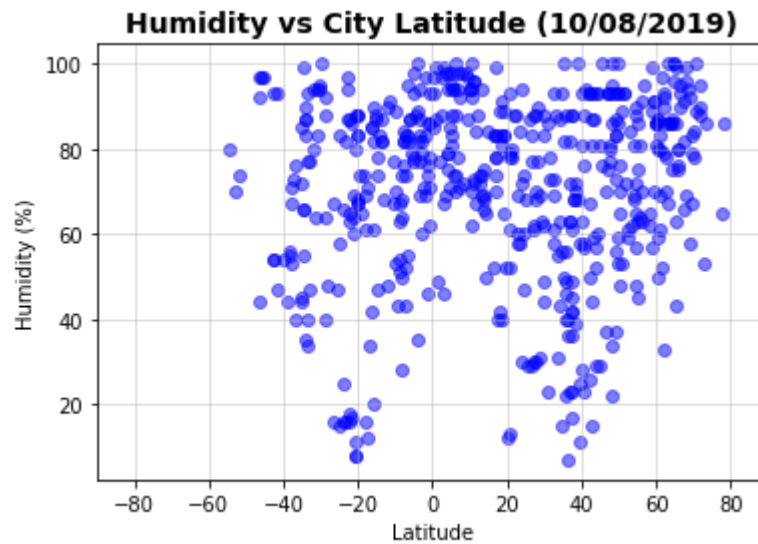

Temperature vs City Latitude (10/08/2019)

Latitude vs. Humidity Plot

In [62]:
```python
# Plot Latitude vs Humidity
plt.scatter(weatherNoDupes["Lat"], weatherNoDupes["Humidity"], c="b", alpha=0.
5)
plt.title(f'Humidity vs City Latitude ({timeString})', size=14, weight='bold')
plt.xlabel('Latitude')
plt.ylabel('Humidity (%)')
plt.xlim(lat_range)
plt.grid(alpha=0.5)

# Save the image
plt.savefig("../Images/LatvsHumidity.png")
plt.show()
```
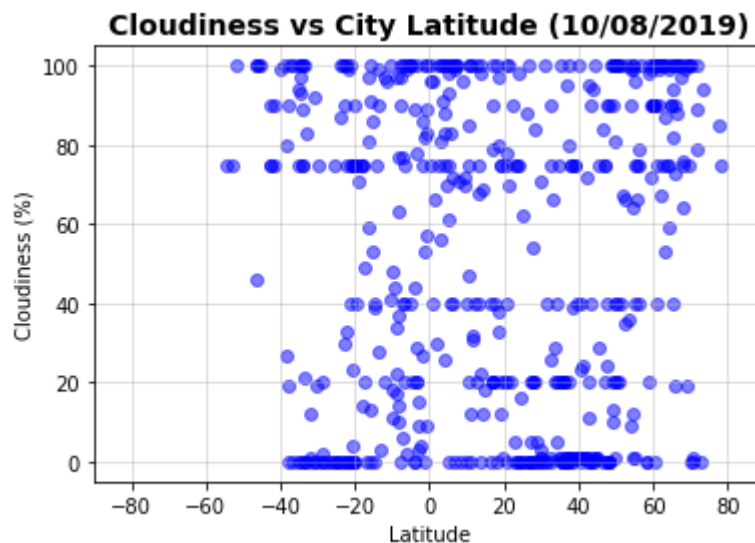
Humidity vs City Latitude (10/08/2019)

Latitude vs. Cloudiness Plot

In [63]:
```python
# Plot Latitude vs Cloudiness
plt.scatter(weatherNoDupes["Lat"], weatherNoDupes["Cloudiness"], c="b", alpha=
0.5)
plt.title(f'Cloudiness vs City Latitude ({timeString})', size=14, weight='bol
d')
plt.xlabel('Latitude')
plt.ylabel('Cloudiness (%)')
plt.xlim(lat_range)
plt.grid(alpha=0.5)

# Save the image
plt.savefig("../Images/LatvsCloudiness.png")
plt.show()
```
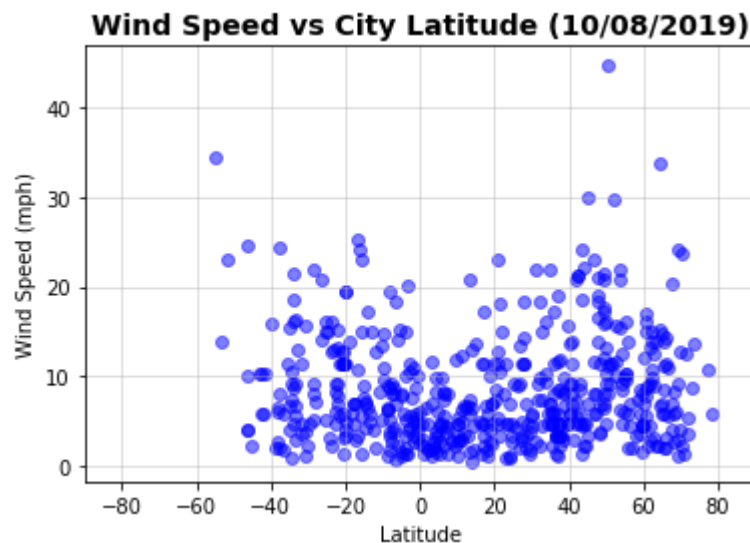
Cloudiness vs City Latitude (10/08/2019)

Latitude vs. Wind Speed Plot

In [64]:
```python
# Plot Latitude vs Wind Speed
plt.scatter(weatherNoDupes["Lat"], weatherNoDupes["Wind Speed"], c="b", alpha=
0.5)
plt.title(f'Wind Speed vs City Latitude ({timeString})', size=14, weight='bol
d')
plt.xlabel('Latitude')
plt.ylabel('Wind Speed (mph)')
plt.xlim(lat_range)
plt.grid(alpha=0.5)

# Save the image
plt.savefig("../Images/LatvsWindSpeed.png")
plt.show()
```
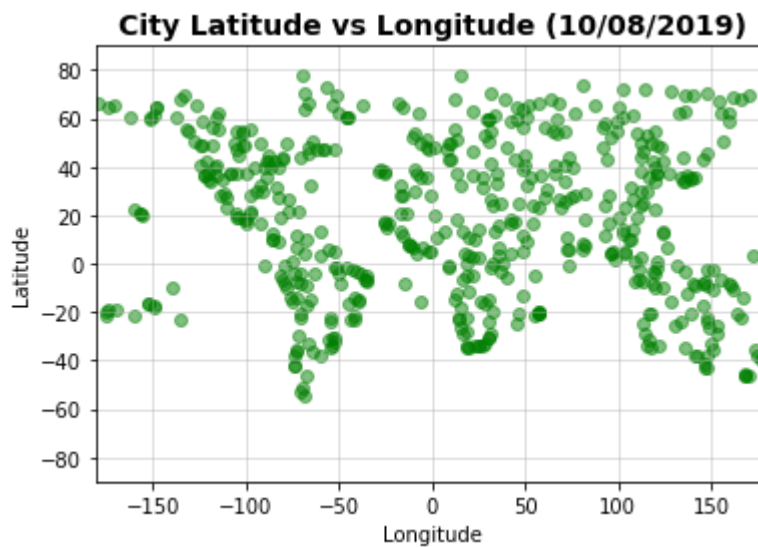
Wind Speed vs City Latitude (10/08/2019)

Longitude vs Latitude

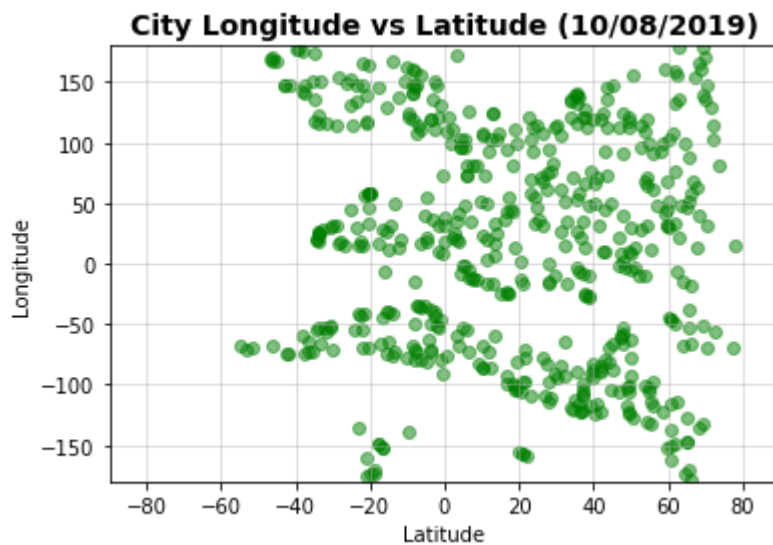Checking for relatively even distribution of resulting cities.

In [67]:
```python
# Plot Latitude vs Longitude
plt.scatter(weatherNoDupes["Lon"], weatherNoDupes["Lat"], c="g", alpha=0.5)
plt.title(f'City Latitude vs Longitude ({timeString})', size=14, weight='bold'
)
plt.xlabel('Longitude')
plt.ylabel('Latitude')
plt.xlim(lng_range)
plt.ylim(lat_range)
plt.grid(alpha=0.5)

# Save the image
plt.savefig("../Images/LatvsLonDisbursement_Final.png")
plt.show()
```


City Latitude vs Longitude (10/08/2019)

In [68]:
```python
# Plot Longitude vs Latitude
plt.scatter(weatherNoDupes["Lat"], weatherNoDupes["Lon"], c="g", alpha=0.5)
plt.title(f'City Longitude vs Latitude ({timeString})', size=14, weight='bold'
)
plt.xlabel('Latitude')
plt.ylabel('Longitude')
plt.xlim(lat_range)
plt.ylim(lng_range)
plt.grid(alpha=0.5)

# Save the image
plt.savefig("../Images/LonvsLatDisbursement_Final.png")
plt.show()
```


City Longitude vs Latitude (10/08/2019)

Observations, tests and conclusions...

citipy observations

- citipy only considers cities with at least 500 in their population. This has a potential for eliminating cities that might be closer to the North Pole or South Pole, resuling in fewer data points at the latitude extremes.
- citipy is a limited interface that only returns city and country code, but often there is more than one city in a country with the same name, which could result in multiple responses when calling the open weather map api.
  - While I assumed the first response was the best, this could be improved upon by comparing each result to the original latitude and longitude to select the correct city. I did not pursue this approach, however.
- Looking at the differences plot where some deltas are > 100 and the plot with city locations overlaid on their original random locations it is clear that citipy has a large search region when attempting to find the nearest city.

Test: Called Open Weather API with random locations rather than cities

- Based on multiple cities within the same country sharing a name, I tried using the latitude and longitude directly when calling the open weather map api. I expected to get a higher percetage of successful results, but instead I received fewer. Because our Latitude and Longitude are randomly generated they are not necessarily in an area that reports on weather. The usage of the citipy api improves the probably of finding a result in the open weather map api. While there is some loss in data in both approaches, the random locations had a much higher drop out rate.
- Because using random locations directly produced poor results and because it takes a long time to call some apis, I removed that code from this jupyter notebook, but I left some of the other things I tried in here anyway. #### Conclusion While coverage starts out better when calling the Open Weather API, the lack of locations in weather reporting ciites results in far fewer data points. This is a poor approach. A better approach would be to obtain a list of all cities reporting weather through Open Weather API and randomly select their locations.

Coverage

- Plotting original random locations vs city locations shows very few identified cities near the North and especially the South Pole.
- In an attempt to force data points near the poles I found a city near each pole and added it's location to my random locations. However, only one of them was found in citipy. I removed them for the purpose of completing the homework. Here are the locations:

  ```
  Add Northernmost city > 500 Reykjavík, Iceland and Southernmost city > 500 Us
  huaia, Argentina
  lats = np.append(lats, [64.128288, -54.7999992])
  lngs = np.append(lngs, [-21.827774, -68.3000031])
  ```

- Despite having a lot of coverage for random locations near the poles, no cities were found above 80 or below -60.

Graph Notes

- Yellow was used for plotting the randomly generated locations
- Red was used to plot the deltas
- Blue was used to plot the weather metrics
- Green was used to plot the found city locations

Homework Observations

1) Generally, it is warmer closer to the equator, but the equator is not the peak, it is currently skewed toward the higher latitudes. This is potentially because of the season being early fall in the northern hemisphere vs early spring in the southern hemisphere.

2) It appears that some cloudiness may be bucketed while other cities report a continuous value. This is evidenced by a high occurance of values at certain intervals.

3) Wind speed appears to be more variable as you move away from the equator - although like temperature it is not centered on the equator it is offset to the north potentially due to the season (early fall).

In [ ]: