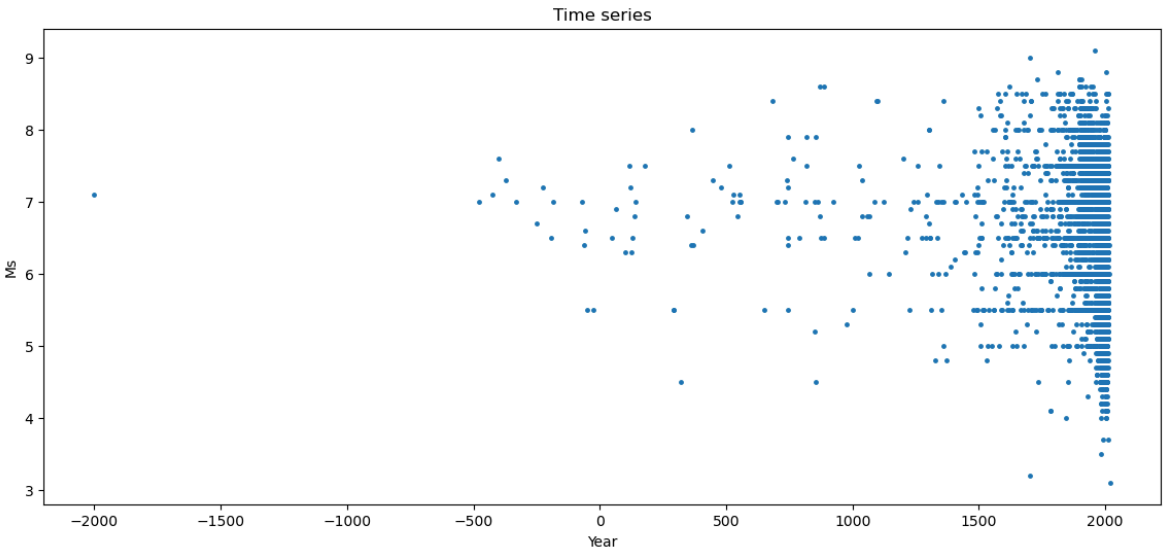
In [1]:
```
#1
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
#%matplotlib inline

#1.1
met_0 = pd.read_csv(r'E:\0_plus_1\home work\python\Sig_Eqs.tsv', sep='\t')
met_1 = met_0.dropna(axis=0, subset =["Total Deaths"]) # 丢弃"Total Deaths"列中有
met_1.head
met_2 = met_1.groupby(['Country'])['Deaths'].sum()#['Deaths'].sum()是统计每个国家
met_3 = met_2.sort_values(ascending=False)#对series排序时，不用写列表名
met_3.head(20)
```

Out[1]:
```
Country
CHINA           2042844.0
TURKEY           995647.0
IRAN             758653.0
ITALY            413079.0
SYRIA            365700.0
HAITI            323476.0
AZERBAIJAN       310119.0
JAPAN            273687.0
ARMENIA          189000.0
PAKISTAN         143742.0
ECUADOR          134445.0
TURKMENISTAN     110412.0
PERU              90369.0
PORTUGAL          82572.0
GREECE            77260.0
IRAQ              70200.0
CHILE             63867.0
INDIA             62412.0
TAIWAN            57143.0
TUNISIA           48013.0
Name: Deaths, dtype: float64
```

In [53]:
```
#1.2
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
met_0 = pd.read_csv(r'E:\0_plus_1\home work\python\Sig_Eqs.tsv', sep='\t')
met_4 = met_0.dropna(axis=0, subset = ["Ms"])
met_time = met_4.loc[(met_4["Ms"] > 3)]
plt.figure(figsize=(14, 6))
plt.scatter(met_time["Year"], met_time["Ms"], s = 6)
plt.title('Time series')
plt.xlabel('Year')
plt.ylabel('Ms')
```

Out[53]:
```
Text(0, 0.5, 'Ms')
```



思考：通过图片我看到的趋势是，在19-20世纪的数据点比较多，而时间越早数据点越少，说明在现代科技的支持下，检测的数据更可靠，也更多。而且19-20世纪的MS大部分分布在4-8.5之间。

In [5]:
```
#1.3 我自己尝试写了之后，询问ai对我写的代码纠错
met_6 = met_0.dropna(axis=0, subset = ["Country", "Location Name", "Year", "Mo",
met_6
met_7 = met_6[["Country", "Location Name", "Year", "Mo", "Dy", "Ms"]]
met_7

met_8 = met_7.loc[(met_7['Year'] > -2150)]
met_8.head()
def CountEq_LargestEq(country):
    met_country = met_8[met_8["Country"] == country]#使用布尔型Series作为索引，从
    total_eqs = len(met_country)
    if total_eqs >0:
        lagest_eqs = met_country.loc[met_country['Ms'].idxmax()]#idmax确定Ms里最
        lagest_date = (lagest_eqs['Year'], lagest_eqs['Mo'], lagest_eqs['Dy'], l
    else:
        lagest_eqs = None
    return total_eqs, lagest_eqs, lagest_date


unique_countries = met_8['Country'].unique()#将重复的国家筛掉，避免重复处理一个国

for country in unique_countries:
    total_eqs, largest_eqs, largest_date = CountEq_LargestEq(country)#多重赋值，
    print(f"Country:{country}, Total_eq:{total_eqs}" )#用 f-string在字符串中插入
    if largest_eqs is not None and largest_date is not None:
        print(f"Largest EQ Date: {largest_date[0]}-{largest_date[1]}-{largest_da
    else:
          print("No EQs found.")
```

```
Country:CHINA, Total_eq:463
Largest EQ Date: 1920.0-12.0-16.0, Location: CHINA:  GANSU PROVINCE, SHANXI PROVI
NCE
Country:TURKEY, Total_eq:124
Largest EQ Date: 1939.0-12.0-26.0, Location: TURKEY:  ERZINCAN
Country:JORDAN, Total_eq:2
Largest EQ Date: 362.0-5.0-24.0, Location: JORDAN:  AL-KARAK
Country:GREECE, Total_eq:103
Largest EQ Date: 365.0-7.0-21.0, Location: GREECE:  CRETE:  KNOSSOS
Country:JAPAN, Total_eq:266
Largest EQ Date: 869.0-7.0-13.0, Location: JAPAN:  SANRIKU
Country:AFGHANISTAN, Total_eq:25
Largest EQ Date: 1909.0-7.0-7.0, Location: AFGHANISTAN:  HINDU-KUSH
Country:IRAN, Total_eq:153
Largest EQ Date: 856.0-12.0-22.0, Location: IRAN:  DAMGHAN, QUMIS
Country:SYRIA, Total_eq:1
Largest EQ Date: 1202.0-5.0-20.0, Location: SYRIA:  SOUTHWESTERN
Country:UKRAINE, Total_eq:7
Largest EQ Date: 1927.0-9.0-11.0, Location: UKRAINE:  CRIMEA:  SEBASTOPOL
Country:NEPAL, Total_eq:9
Largest EQ Date: 1505.0-6.0-6.0, Location: NEPAL-INDIA
Country:SLOVENIA, Total_eq:3
Largest EQ Date: 1511.0-3.0-26.0, Location: BALKANS NW:  SLOVENIA:  IDRIJA,SKOFJA
LOKA
Country:PORTUGAL, Total_eq:4
Largest EQ Date: 1761.0-3.0-30.0, Location: PORTUGAL: LISBON, PORTO
Country:CHILE, Total_eq:110
Largest EQ Date: 1730.0-7.0-8.0, Location: CHILE:  VALPARAISO
Country:FRANCE, Total_eq:4
Largest EQ Date: 1909.0-6.0-11.0, Location: FRANCE:  VERNEGUES,CHARLEVAL,LA ROQUE
D'ANTHERON
Country:PERU, Total_eq:77
Largest EQ Date: 1619.0-2.0-14.0, Location: PERU:  TRUJILLO, PIURA, SANTA
Country:ITALY, Total_eq:62
Largest EQ Date: 1915.0-1.0-13.0, Location: ITALY:  MARSICA, AVEZZANO, ABRUZZI
Country:PHILIPPINES, Total_eq:98
Largest EQ Date: 1897.0-9.0-21.0, Location: PHILIPPINES:  MINDANAO, ZAMBOANGA, SU
LU, ISABELA
Country:SOUTH KOREA, Total_eq:3
Largest EQ Date: 1643.0-7.0-25.0, Location: SEA OF JAPAN
Country:RUSSIA, Total_eq:87
Largest EQ Date: 1952.0-11.0-4.0, Location: RUSSIA:  KAMCHATKA PENINSULA
Country:TAIWAN, Total_eq:81
Largest EQ Date: 1920.0-6.0-5.0, Location: TAIWAN
Country:CROATIA, Total_eq:4
Largest EQ Date: 1667.0-4.0-6.0, Location: BALKANS NW:  CROATIA: DUBROVNIK:  RAGU
SA
Country:NORTH KOREA, Total_eq:1
Largest EQ Date: 1668.0-7.0-31.0, Location: NORTH KOREA:  YELLOW SEA
Country:INDONESIA, Total_eq:244
Largest EQ Date: 2004.0-12.0-26.0, Location: INDONESIA:  SUMATRA:  ACEH:  OFF WES
T COAST
Country:ANTIGUA AND BARBUDA, Total_eq:2
Largest EQ Date: 1690.0-4.0-16.0, Location: ANTIGUA; SAINT KITTS AND NEVIS
Country:USA, Total_eq:143
Largest EQ Date: 1957.0-3.0-9.0, Location: ALASKA
Country:COLOMBIA, Total_eq:42
Largest EQ Date: 1904.0-1.0-20.0, Location: PANAMA-COLOMBIA
Country:ISRAEL, Total_eq:3
Largest EQ Date: 1759.0-10.0-30.0, Location: ISRAEL:  ZEFAT (SAFED)
```

```
Country:CUBA, Total_eq:4
Largest EQ Date: 1992.0-5.0-25.0, Location: CUBA:  PILON, MANZANILLO
Country:VENEZUELA, Total_eq:17
Largest EQ Date: 1900.0-10.0-29.0, Location: VENEZUELA:  MACUTO
Country:PAPUA NEW GUINEA, Total_eq:58
Largest EQ Date: 2000.0-11.0-16.0, Location: PAPUA NEW GUINEA:  NEW IRELAND, DUKE
OF YORK
Country:MEXICO, Total_eq:82
Largest EQ Date: 1787.0-3.0-28.0, Location: MEXICO:  SAN MARCOS, OAXACA
Country:ECUADOR, Total_eq:19
Largest EQ Date: 1906.0-1.0-31.0, Location: ECUADOR:  OFF COAST
Country:INDIA, Total_eq:35
Largest EQ Date: 1897.0-6.0-12.0, Location: INDIA:  ASSAM; BANGLADESH
Country:GUATEMALA, Total_eq:20
Largest EQ Date: 1942.0-8.0-6.0, Location: GUATEMALA:  NEAR S COAST
Country:NORWAY, Total_eq:1
Largest EQ Date: 1819.0-8.0-31.0, Location: NORWAY: RANA REGION: LUROY
Country:ROMANIA, Total_eq:6
Largest EQ Date: 1986.0-8.0-30.0, Location: ROMANIA:  BUCHAREST, KISHINEV-KAGUL
Country:COSTA RICA, Total_eq:22
Largest EQ Date: 1950.0-10.0-5.0, Location: COSTA RICA-NICARAGUA
Country:TRINIDAD AND TOBAGO, Total_eq:5
Largest EQ Date: 1831.0-12.0-3.0, Location: TRINIDAD & ST. CHRISTOPHER
Country:ALBANIA, Total_eq:14
Largest EQ Date: 1893.0-6.0-14.0, Location: ALBANIA: HIMARA, DHERMI, KUC, KUDHES
I, VLORE, KANINA
Country:HAITI, Total_eq:4
Largest EQ Date: 1842.0-5.0-7.0, Location: HAITI:  CAP-HAITIEN
Country:BANGLADESH, Total_eq:9
Largest EQ Date: 1918.0-7.0-8.0, Location: BANGLADESH:  SRIMANGAL
Country:NEW ZEALAND, Total_eq:36
Largest EQ Date: 1855.0-1.0-23.0, Location: NEW ZEALAND:  WELLINGTON,WAIOURU,WANG
ANUI,OTAKI
Country:FRENCH POLYNESIA, Total_eq:1
Largest EQ Date: 1848.0-7.0-12.0, Location: FRENCH POLYNESIA:  TAHITI
Country:HONDURAS, Total_eq:6
Largest EQ Date: 1856.0-8.0-4.0, Location: HONDURAS:  COAST
Country:SOUTH SUDAN, Total_eq:3
Largest EQ Date: 1990.0-5.0-20.0, Location: SOUTH SUDAN:  JUBA, MAYA;  UGANDA: NA
KURA
Country:EL SALVADOR, Total_eq:11
Largest EQ Date: 2001.0-1.0-13.0, Location: EL SALVADOR; GUATEMALA
Country:VANUATU, Total_eq:37
Largest EQ Date: 1910.0-6.0-16.0, Location: VANUATU ISLANDS
Country:IRAQ, Total_eq:2
Largest EQ Date: 1864.0-12.0-2.0, Location: IRAQ:  ZURBATIYAH, BADRAH, TURSAQ, BA
GHDAD
Country:TONGA, Total_eq:13
Largest EQ Date: 1919.0-4.0-30.0, Location: TONGA ISLANDS
Country:AZERBAIJAN, Total_eq:4
Largest EQ Date: 1902.0-2.0-13.0, Location: AZERBAIJAN:  SEMACHA; N IRAN
Country:NEW CALEDONIA, Total_eq:7
Largest EQ Date: 1875.0-3.0-28.0, Location: NEW CALEDONIA:  LOYALTY ISLANDS:  LIF
OU ISLAND
Country:EGYPT, Total_eq:6
Largest EQ Date: 1995.0-11.0-22.0, Location: EGYPT:  NUWAYBI; SAUDI ARABIA; ISRAE
L; JORDAN
Country:PANAMA, Total_eq:17
Largest EQ Date: 1882.0-9.0-7.0, Location: PANAMA: SAN BLAS ARCHIPELAGO
Country:ERITREA, Total_eq:3
```

```
Largest EQ Date: 1915.0-9.0-23.0, Location: ERITREA: ASMARA
Country:SPAIN, Total_eq:2
Largest EQ Date: 1884.0-12.0-25.0, Location: SPAIN:  ARENAS DEL REY, VEGA, ALHAM
A, MALAGA
Country:USA TERRITORY, Total_eq:9
Largest EQ Date: 1902.0-9.0-22.0, Location: GUAM:  AGANA
Country:ARGENTINA, Total_eq:10
Largest EQ Date: 1894.0-10.0-27.0, Location: ARGENTINA:  LA RIOJA, SAN JUAN, MEND
OZA
Country:SOLOMON SEA, Total_eq:2
Largest EQ Date: 1895.0-3.0-6.0, Location: W. SOLOMON SEA
Country:TURKMENISTAN, Total_eq:3
Largest EQ Date: 1895.0-7.0-8.0, Location: TURKMENISTAN:  UZUN-ADA
Country:NICARAGUA, Total_eq:13
Largest EQ Date: 1898.0-4.0-29.0, Location: NICARAGUA:  LEON, CHINANDEGA, MANAGUA
Country:BOLIVIA, Total_eq:4
Largest EQ Date: 1916.0-8.0-25.0, Location: BOLIVIA-NORTHERN CHILE
Country:JAMAICA, Total_eq:2
Largest EQ Date: 1899.0-6.0-14.0, Location: JAMAICA
Country:SOLOMON ISLANDS, Total_eq:43
Largest EQ Date: 1934.0-7.0-18.0, Location: SOLOMON ISLANDS:  SANTA CRUZ ISLANDS
Country:BULGARIA, Total_eq:9
Largest EQ Date: 1904.0-4.0-4.0, Location: BULGARIA:  STRUMA
Country:UZBEKISTAN, Total_eq:6
Largest EQ Date: 1976.0-4.0-8.0, Location: UZBEKISTAN:  GAZLI
Country:MONGOLIA, Total_eq:4
Largest EQ Date: 1905.0-7.0-23.0, Location: MONGOLIA
Country:GEORGIA, Total_eq:7
Largest EQ Date: 1905.0-10.0-21.0, Location: GEORGIA:  CAUCASUS
Country:MARTINIQUE, Total_eq:1
Largest EQ Date: 1906.0-12.0-3.0, Location: MARTINIQUE
Country:TAJIKISTAN, Total_eq:15
Largest EQ Date: 1907.0-10.0-21.0, Location: TAJIKISTAN:   KARATAG
Country:MYANMAR (BURMA), Total_eq:13
Largest EQ Date: 1912.0-5.0-23.0, Location: MYANMAR (BURMA):  MANDALAY, MOGOK, MA
YMYO
Country:FIJI, Total_eq:7
Largest EQ Date: 1919.0-1.0-1.0, Location: FIJI ISLANDS
Country:ALGERIA, Total_eq:25
Largest EQ Date: 1980.0-10.0-10.0, Location: ALGERIA:  NORTHERN
Country:TANZANIA, Total_eq:4
Largest EQ Date: 1910.0-12.0-13.0, Location: TANZANIA: RUKWA
Country:KYRGYZSTAN, Total_eq:10
Largest EQ Date: 1911.0-1.0-3.0, Location: KAZAKHSTAN: ALMA-ATA, TURKESTAN;  AFGH
ANISTAN
Country:MICRONESIA, FED. STATES OF, Total_eq:3
Largest EQ Date: 1911.0-8.0-16.0, Location: MICRONESIA, FED. STATES OF:  CAROLINE
ISLANDS
Country:UGANDA, Total_eq:4
Largest EQ Date: 1966.0-3.0-20.0, Location: UGANDA: KICHWAMBA, BONDIBOGYO;  TANZA
NIA;  DR CONGO
Country:PALAU, Total_eq:1
Largest EQ Date: 1914.0-10.0-23.0, Location: MICRONESIA, FED. STATES OF:  CAROLIN
E ISLANDS
Country:DOMINICAN REPUBLIC, Total_eq:7
Largest EQ Date: 1946.0-8.0-4.0, Location: DOMINICAN REPUBLIC:  NORTHEASTERN COAS
T
Country:KERMADEC ISLANDS (NEW ZEALAND), Total_eq:9
Largest EQ Date: 1986.0-10.0-20.0, Location: KERMADEC ISLANDS:  RAOUL
Country:SAMOA, Total_eq:7
```

```
Largest EQ Date: 1917.0-6.0-26.0, Location: SAMOA ISLANDS
Country:AUSTRALIA, Total_eq:9
Largest EQ Date: 1989.0-5.0-23.0, Location: MACQUARIE ISLAND:  MACQUARIE STATION;
NEW ZEALAND
Country:AZORES (PORTUGAL), Total_eq:7
Largest EQ Date: 1980.0-1.0-1.0, Location: AZORES:   TERCEIRA, ANGRA DO HEROISMO
Country:KENYA, Total_eq:2
Largest EQ Date: 1928.0-1.0-6.0, Location: KENYA: SUBUKIA
Country:CANADA, Total_eq:11
Largest EQ Date: 1949.0-8.0-22.0, Location: CANADA:  QUEEN CHARLOTTE ISLANDS
Country:INDIAN OCEAN, Total_eq:3
Largest EQ Date: 1928.0-3.0-9.0, Location: INDIAN OCEAN:  S
Country:SOUTH GEORGIA AND THE SOUTH SANDWICH ISLANDS, Total_eq:2
Largest EQ Date: 1929.0-6.0-27.0, Location: SOUTH SANDWICH ISLANDS
Country:ARMENIA, Total_eq:2
Largest EQ Date: 1988.0-12.0-7.0, Location: ARMENIA:  LENINAKAN, SPITAK, KIROVAKA
N
Country:UK, Total_eq:2
Largest EQ Date: 1931.0-6.0-7.0, Location: UK:  SCARBOROUGH, GRIMSBY
Country:PAKISTAN, Total_eq:22
Largest EQ Date: 1945.0-11.0-27.0, Location: PAKISTAN:  MAKRAN COAST
Country:GHANA, Total_eq:1
Largest EQ Date: 1939.0-6.0-22.0, Location: GHANA:  ACCRA
Country:YEMEN, Total_eq:2
Largest EQ Date: 1982.0-12.0-13.0, Location: YEMEN:  DHAMAR
Country:CYPRUS, Total_eq:3
Largest EQ Date: 1953.0-9.0-10.0, Location: CYPRUS:  PAPHOS
Country:ATLANTIC OCEAN, Total_eq:2
Largest EQ Date: 1941.0-11.0-25.0, Location: ATLANTIC OCEAN:  NORTHERN
Country:SOUTH AFRICA, Total_eq:5
Largest EQ Date: 1942.0-11.0-10.0, Location: SOUTH AFRICA:  PRINCE EDWARD ISLAND
Country:TUNISIA, Total_eq:1
Largest EQ Date: 1957.0-2.0-20.0, Location: TUNISIA:  SIDI ABID,SIDI TOUIL (LA ME
DJA),CAILLOUX
Country:PACIFIC OCEAN, Total_eq:1
Largest EQ Date: 1958.0-11.0-4.0, Location: EAST PACIFIC RIDGE
Country:MOROCCO, Total_eq:2
Largest EQ Date: 2004.0-2.0-24.0, Location: MOROCCO:  AL HOCEIMA, IMZOURENE, BENI
ABDALLAH
Country:CONGO, Total_eq:5
Largest EQ Date: 2005.0-12.0-5.0, Location: CONGO:  KALEMIE
Country:ETHIOPIA, Total_eq:4
Largest EQ Date: 1961.0-6.0-1.0, Location: ETHIOPIA:  KARAKORE
Country:LIBYA, Total_eq:1
Largest EQ Date: 1963.0-2.0-21.0, Location: LIBYA:  BARCE (AL MARJ)
Country:MACEDONIA, Total_eq:3
Largest EQ Date: 1979.0-5.0-24.0, Location: BALKANS NW:  MACEDONIA:  DEBAR
Country:GUADELOUPE, Total_eq:4
Largest EQ Date: 1969.0-12.0-25.0, Location: GUADELOUPE: GRAND BOURG
Country:KAZAKHSTAN, Total_eq:6
Largest EQ Date: 1978.0-3.0-24.0, Location: KAZAKHSTAN:  ALMA-ATA
Country:ANTARCTICA, Total_eq:3
Largest EQ Date: 1998.0-3.0-25.0, Location: BALLENY ISLANDS
Country:GABON, Total_eq:1
Largest EQ Date: 1974.0-9.0-23.0, Location: GABON
Country:ICELAND, Total_eq:4
Largest EQ Date: 2000.0-6.0-17.0, Location: ICELAND:  VESTMANNAEYJAR, HELLA
Country:MALAYSIA, Total_eq:2
Largest EQ Date: 1976.0-7.0-26.0, Location: MALAYSIA:  SABAH:  LAHAD,DATU,KANAK
Country:SERBIA, Total_eq:6
```

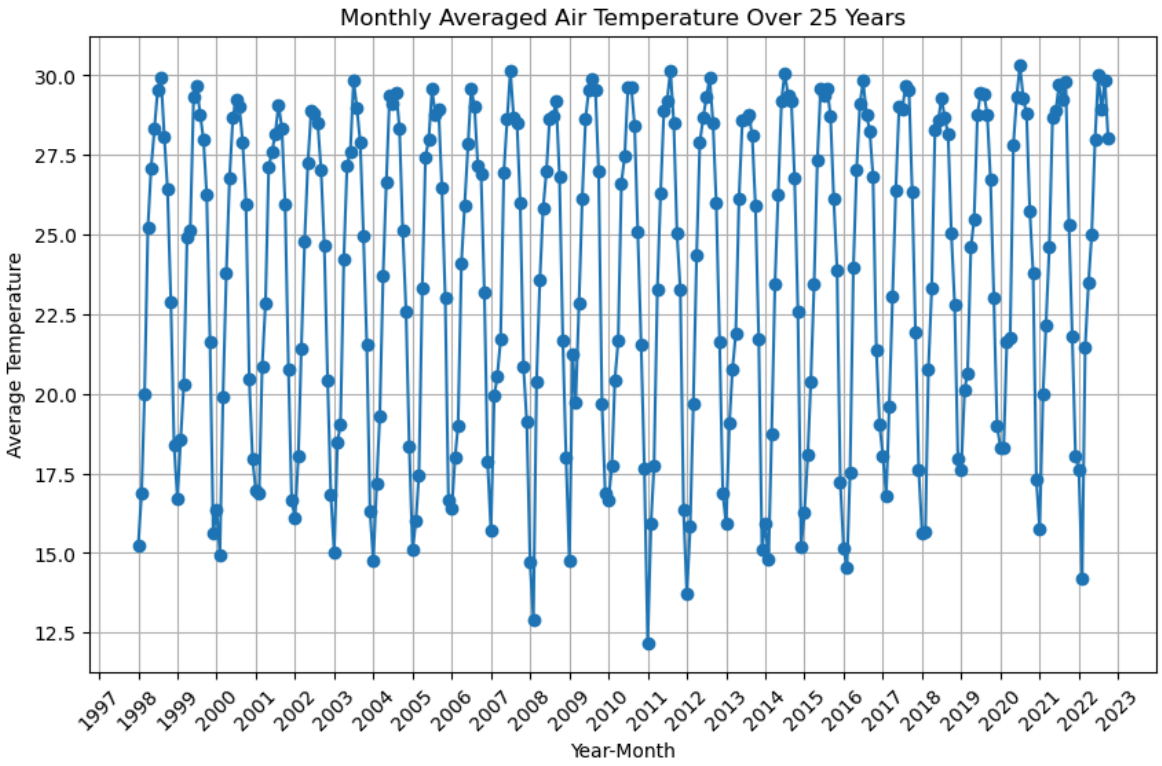
```
Largest EQ Date: 1980.0-5.0-18.0, Location: BALKANS NW:  SERBIA
Country:GERMANY, Total_eq:1
Largest EQ Date: 1978.0-9.0-3.0, Location: GERMANY
Country:MONTENEGRO, Total_eq:2
Largest EQ Date: 1979.0-4.0-15.0, Location: BALKANS NW:  MONTENEGRO
Country:BOSNIA-HERZEGOVINA, Total_eq:4
Largest EQ Date: 1990.0-11.0-27.0, Location: BALKANS NW:  BOSNIA-HERZEGOVINA:  TI
TOGRAD
Country:THAILAND, Total_eq:1
Largest EQ Date: 1983.0-4.0-22.0, Location: THAILAND:  BANGKOK
Country:VIETNAM, Total_eq:1
Largest EQ Date: 1983.0-6.0-24.0, Location: VIETNAM
Country:UK TERRITORY, Total_eq:1
Largest EQ Date: 1983.0-11.0-30.0, Location: INDIAN OCEAN:  CHAGOS ARCHIPELAGO:
DIEGO GARCIA
Country:GUINEA, Total_eq:1
Largest EQ Date: 1983.0-12.0-22.0, Location: GUINEA:  GAOUAL-KOUMBIA
Country:BRAZIL, Total_eq:1
Largest EQ Date: 1986.0-11.0-30.0, Location: BRAZIL:  JOAO CAMARA, NATAL
Country:MALAWI, Total_eq:3
Largest EQ Date: 1989.0-3.0-10.0, Location: MALAWI:  SALIMA, DEDZA, MOHINJI
Country:DJIBOUTI, Total_eq:1
Largest EQ Date: 1989.0-8.0-20.0, Location: DJIBOUTI: GALAFI, YABAKI;  ETHIOPIA
Country:BERING SEA, Total_eq:1
Largest EQ Date: 1991.0-2.0-21.0, Location: BERING SEA
Country:NETHERLANDS, Total_eq:1
Largest EQ Date: 1992.0-4.0-13.0, Location: THE NETHERLANDS: ROERMOND; GERMANY: B
ONN, HEINSBERG
Country:WALLIS AND FUTUNA (FRENCH TERRITORY), Total_eq:1
Largest EQ Date: 1993.0-3.0-12.0, Location: FUTUNA ISLAND
Country:SUDAN, Total_eq:1
Largest EQ Date: 1993.0-8.0-1.0, Location: SUDAN:  KHARTOUM
Country:AUSTRIA, Total_eq:1
Largest EQ Date: 1998.0-4.0-12.0, Location: AUSTRIA:  ARNOLDSTEIN; SLOVENIA:  BOV
EC, KOBARID
Country:LAOS, Total_eq:2
Largest EQ Date: 2007.0-5.0-16.0, Location: LAOS:  BOKEO;  THAILAND:  CHIANG RAI,
CHIAN SAEN
Country:BHUTAN, Total_eq:4
Largest EQ Date: 2009.0-9.0-21.0, Location: BHUTAN:  TASHIGANG
Country:MOZAMBIQUE, Total_eq:1
Largest EQ Date: 2006.0-2.0-22.0, Location: MOZAMBIQUE
Country:RWANDA, Total_eq:1
Largest EQ Date: 2008.0-2.0-14.0, Location: RWANDA:  GISENYI
Country:SAUDI ARABIA, Total_eq:1
Largest EQ Date: 2009.0-5.0-19.0, Location: SAUDI ARABIA: WESTERN
Country:POLAND, Total_eq:1
Largest EQ Date: 2019.0-7.0-1.0, Location: POLAND:  KATOWICE
```

In [55]:

```
#2
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import matplotlib.dates as mdates
df = pd.read_csv(r'E:\0_plus_1\home work\python\homework2\Baoan_Weather_1998_202
                 parse_dates=['DATE'],
                 usecols=['DATE','TMP'])

print(df['DATE'].dtypes)
df['DATE'].head(20)
```

```
#将TMP列中的+去掉
df['TMP'] = df['TMP'].str.replace('+', '')
df['TMP'] = df['TMP'].str.replace(',1', '')
df['TMP'] = df['TMP'].str.replace(',9', '')
df['TMP'] = df['TMP'].str.replace(',5', '')
# 删除TMP列中包含“,2”的数据行
df['TMP'] = df['TMP'].astype(str)
df = df[~df['TMP'].str.contains(',2')]

# 将TMP列中的9999替换为NaN，然后转换为数值型
df['TMP'] = df['TMP'].replace('9999', np.nan)
df['TMP'] = pd.to_numeric(df['TMP'])# errors= 'ignore': 忽略无法转化为数字的值
# 检查转换后的数据类型
print(df['TMP'].dtypes)

# 按照缩放因子，转换tmp值
df['TMP'] = df['TMP'] / 10

# 删除TMP列中NaN的行
df = df.dropna(subset=['TMP'])

# 按月分组并计算每月平均气温
#df['DATE'].dt.to_period('M'): 将每个日期转换为对应的月份。这意味着，无论日期是月
#['TMP'].mean(): 对每个月份的tmp进行求平均
monthly_avg_temp = df.groupby(df['DATE'].dt.to_period('M'))['TMP'].mean()

# 确保索引是正确的日期类型
#转换索引：to_period('M')创建的索引是Period对象，它们表示特定的月份，但不包含具体
#便于绘图：matplotlib在处理日期时，需要日期以Timestamp对象的形式存在，这样才能正确
monthly_avg_temp.index = monthly_avg_temp.index.to_timestamp()

# 绘制图表
plt.figure(figsize=(10, 6))
plt.plot(monthly_avg_temp.index, monthly_avg_temp.values, marker='o')
plt.title('Monthly Averaged Air Temperature Over 25 Years')
plt.xlabel('Year-Month')
plt.ylabel('Average Temperature')
plt.grid(True)

# 设置横坐标格式
ax = plt.gca()
ax.xaxis.set_major_locator(mdates.YearLocator())  # 每年一个主刻度
ax.xaxis.set_major_formatter(mdates.DateFormatter('%Y'))  # 显示年-月
plt.xticks(rotation=45)  # 旋转标签以便更好地显示

plt.show()
```

```
datetime64[ns]
float64
```



思考：在过去25年里的气温趋势基本上都是1-7或8月开始上升，然后9-12月开始下降。
并且最高温度基本上在30度左右，最低温在15-12.5之间

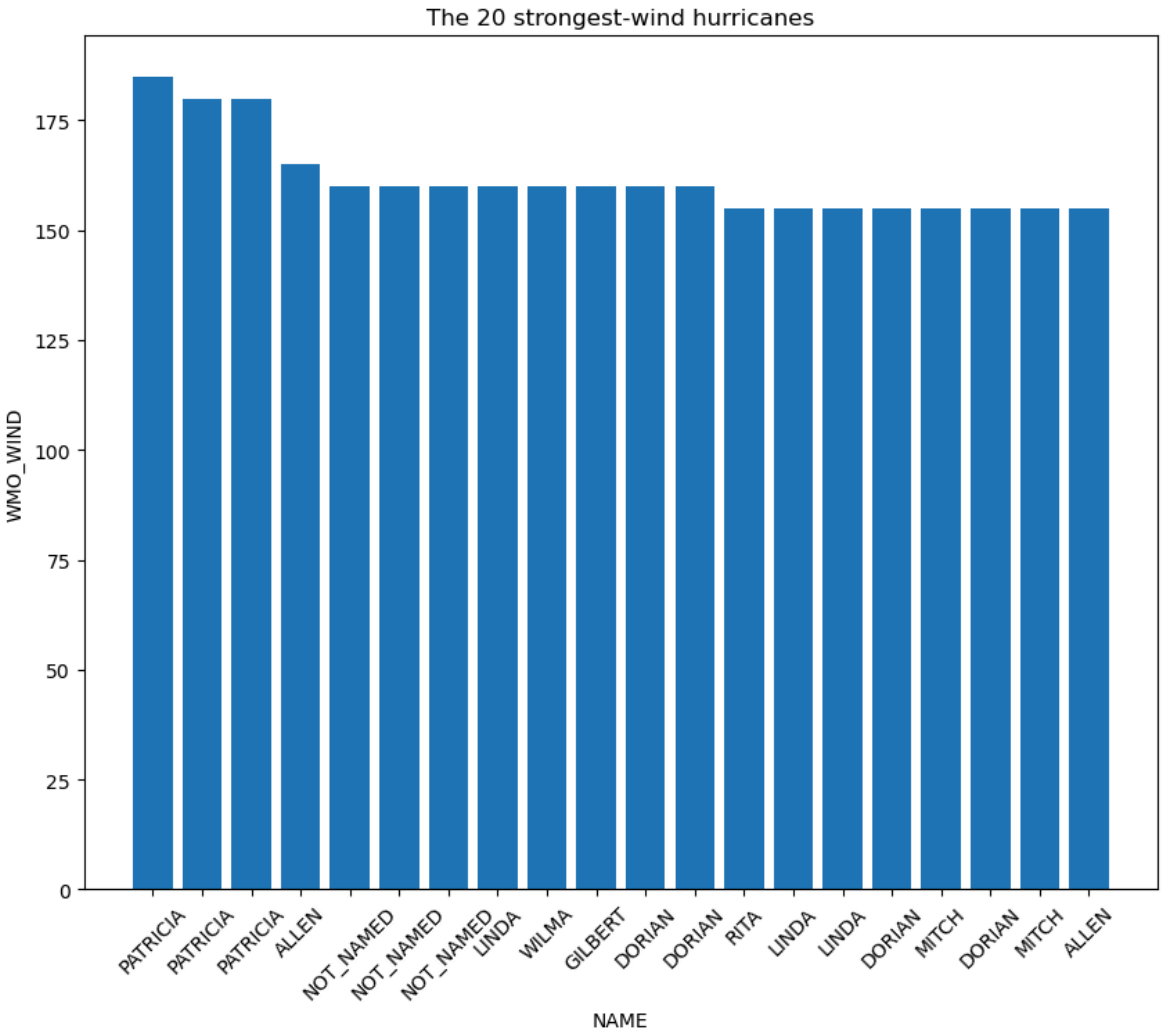
In [59]:
```
#3
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import matplotlib.dates as mdates
df = pd.read_csv('E:/0_plus_1/home work/python/homework2/ibtracs.ALL.list.v04r00
                 skiprows=[1], #跳过文件中的单位行
                parse_dates=['ISO_TIME'],#将ISO_TIME列解析为日期时间格式
                 na_values=[' '],#将空格作为nan
                usecols=['NAME', 'WMO_WIND','ISO_TIME', 'SID', 'BASIN', 'LAT',
                dtype={'WMO_WIND': float})
```

In [15]:
```
#3.1
df = df.dropna(subset =["WMO_WIND"]) # 丢弃缺失值。subset ： 指定只考虑某些列

# 对每个分组按照WMO_WIND降序排序，并找到每组前十个数据
#lamba:小型匿名函数，可以接受任意数量的参数，但只能有一个表达式。lamba 参数1，参数
#apply：对每个分组进行操作
top_10_per_group = df.groupby('SID').apply(lambda x: x.sort_values('WMO_WIND', a

# 重置索引，因为每个分组的head(10)会保留原始的索引
top_10_per_group.reset_index(drop=True, inplace=True)

print(top_10_per_group)
```

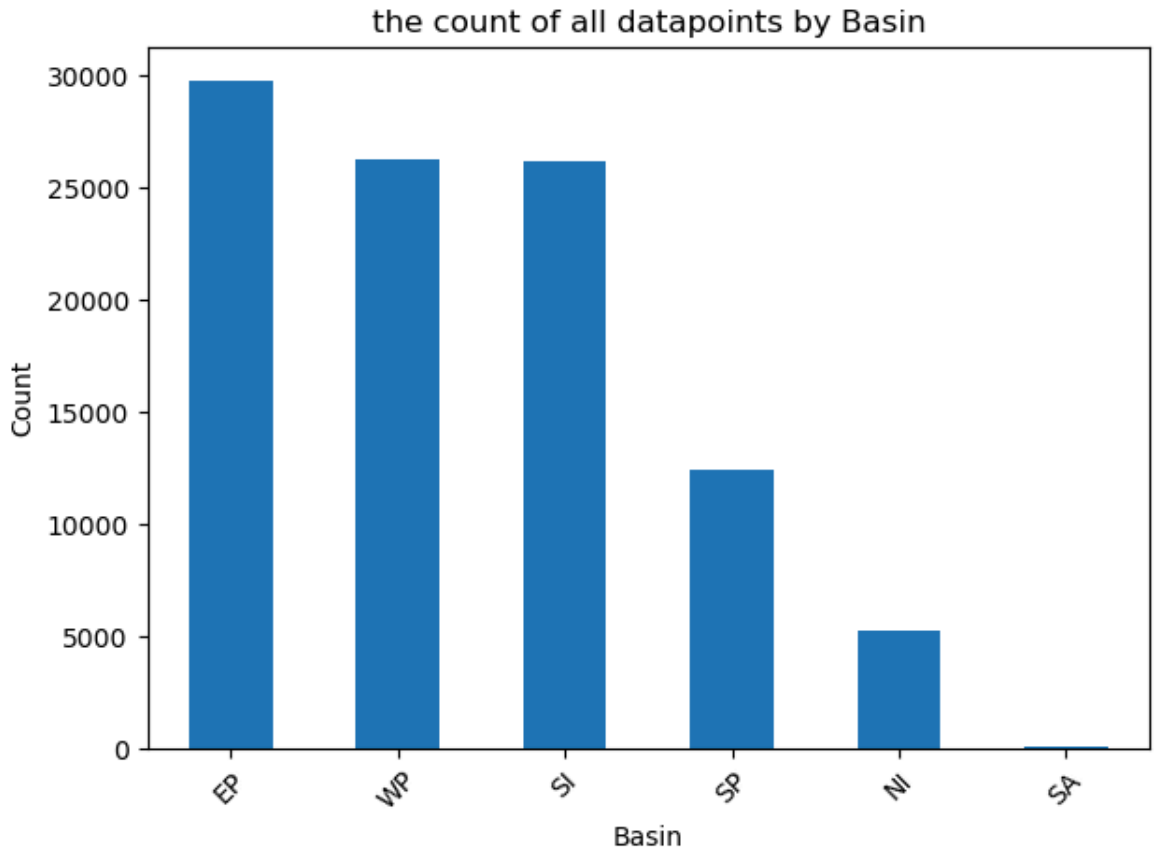
```
                SID BASIN       NAME            ISO_TIME      LAT       LON  \
0      1851175N26270   NaN  NOT_NAMED 1851-06-25 00:00:00  27.5333  -94.2667
1      1851175N26270   NaN  NOT_NAMED 1851-06-25 06:00:00  27.8000  -95.0800
2      1851175N26270   NaN  NOT_NAMED 1851-06-25 12:00:00  27.9000  -95.7333
3      1851175N26270   NaN  NOT_NAMED 1851-06-25 18:00:00  28.0333  -96.2667
4      1851175N26270   NaN  NOT_NAMED 1851-06-25 21:00:00  28.1333  -96.5667
...              ...   ...        ...                 ...      ...       ...
54535  2021311N13248    EP     SANDRA 2021-11-07 06:00:00  13.3000 -112.4000
54536  2021311N13248    EP     SANDRA 2021-11-08 18:00:00  14.9000 -117.3000
54537  2021311N13248    EP     SANDRA 2021-11-09 00:00:00  15.1000 -118.2000
54538  2021311N13248    EP     SANDRA 2021-11-09 06:00:00  15.0000 -119.1000
54539  2021311N13248    EP     SANDRA 2021-11-09 12:00:00  14.7000 -120.1000

       WMO_WIND
0          80.0
1          80.0
2          80.0
3          80.0
4          80.0
...         ...
54535      30.0
54536      30.0
54537      30.0
54538      25.0
54539      25.0

[54540 rows x 7 columns]
C:\Users\DELL\AppData\Local\Temp\ipykernel_48348\1236169277.py:7: DeprecationWarn
ing: DataFrameGroupBy.apply operated on the grouping columns. This behavior is de
precated, and in a future version of pandas the grouping columns will be excluded
from the operation. Either pass `include_groups=False` to exclude the groupings o
r explicitly select the grouping columns after groupby to silence this warning.
  top_10_per_group = df.groupby('SID').apply(lambda x: x.sort_values('WMO_WIND',
ascending=False).head(10))
```

In [17]:

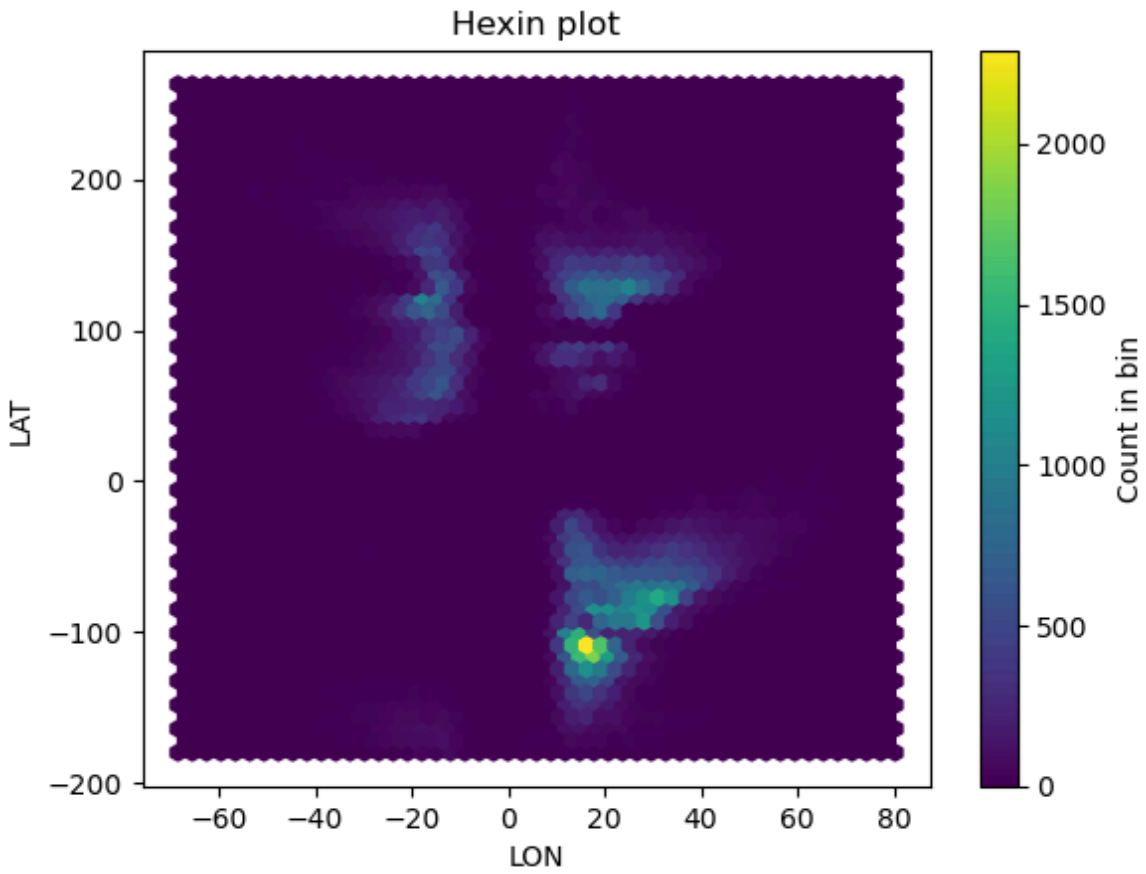
```python
#3.2
df_wind = df.sort_values("WMO_WIND", ascending=False)
df_wind_largest20 = df_wind.head(20)
df_wind_largest20

values = df_wind_largest20['WMO_WIND']

# 获取NAME列的值作为x轴的刻度标签
names = df_wind_largest20['NAME']

# 绘制条形图
plt.figure(figsize=(10, 8))
plt.bar(range(len(values)), values)  # 使用数值索引作为x轴

# 设置x轴的刻度标签为NAME列的值
plt.xticks(range(len(names)), names, rotation=45)  # 旋转标签以便更好地显示

plt.title('The 20 strongest-wind hurricanes')
plt.xlabel('NAME')
plt.ylabel('WMO_WIND')

plt.show()
```



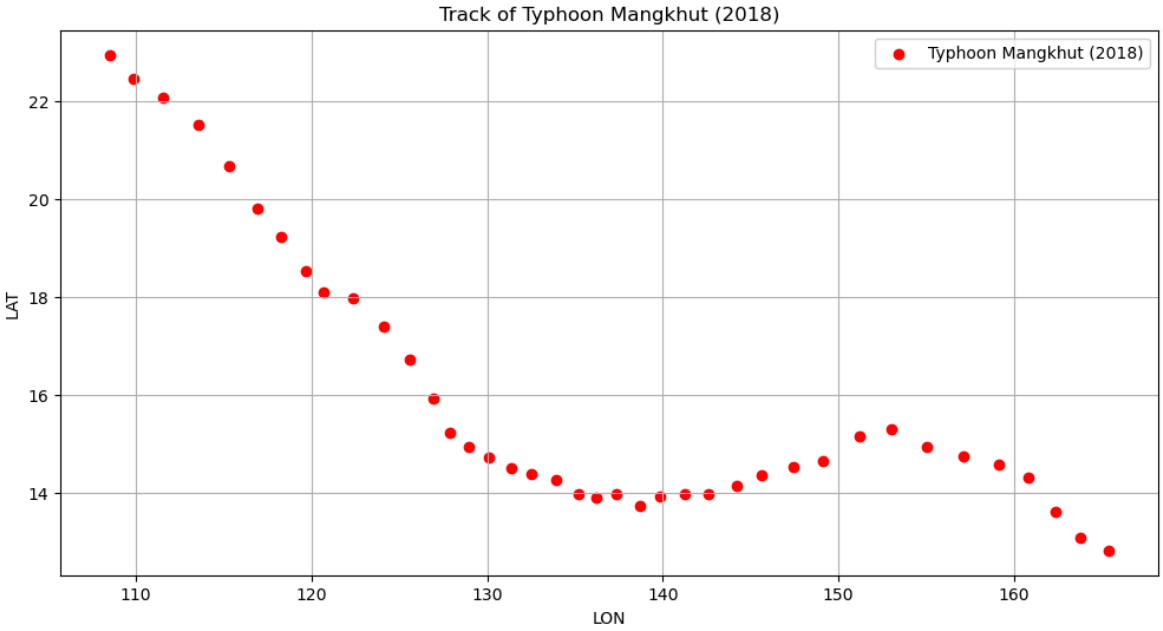
In [19]:
```
#3.3

basin_count = df['BASIN'].value_counts()#对basin列进行计数

basin_count.plot(kind = 'bar')#绘制条形图
plt.xlabel('Basin')
plt.ylabel('Count')
plt.title('the count of all datapoints by Basin')
plt.xticks(rotation = 45)
plt.tight_layout()#调整布局防止标签被截断
plt.show()
```



In [21]:
```
#3.4
#绘制六边形分箱图
plt.hexbin(df['LAT'], df['LON'], gridsize=50, cmap='viridis')#gridsize控制六边形
plt.colorbar(label = 'Count in bin')#添加颜色条
plt.title('Hexin plot')
plt.xlabel('LON')
plt.ylabel('LAT')
plt.show()
```



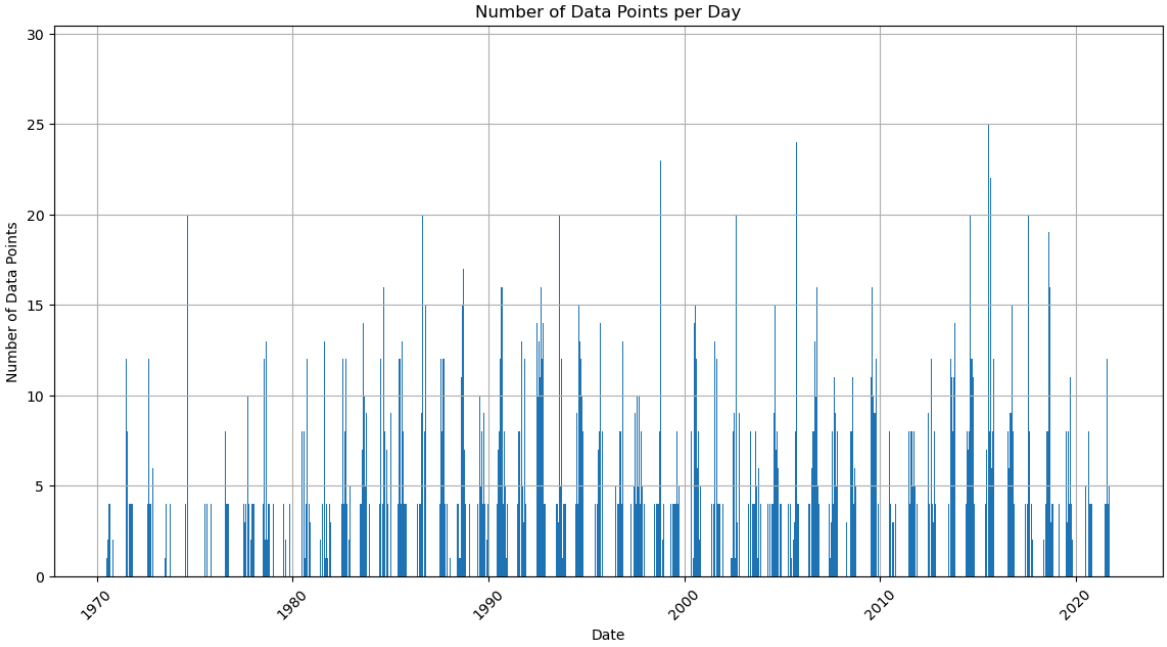
In [25]:
```
#3.5
MANGKHUT_data = df[df['NAME'] == 'MANGKHUT']
MANGKHUT_2018 = MANGKHUT_data[MANGKHUT_data['ISO_TIME'].dt.year == 2018]#dt: 用于
LON = MANGKHUT_2018['LON']
LAT = MANGKHUT_2018['LAT']

plt.figure(figsize=(12, 6))
plt.scatter(LON, LAT, color='red', label='Typhoon Mangkhut (2018)')
plt.xlabel('LON')
plt.ylabel('LAT')
plt.title('Track of Typhoon Mangkhut (2018)')
plt.grid(True)#开启网格线
plt.legend()#添加标签
plt.show()
```



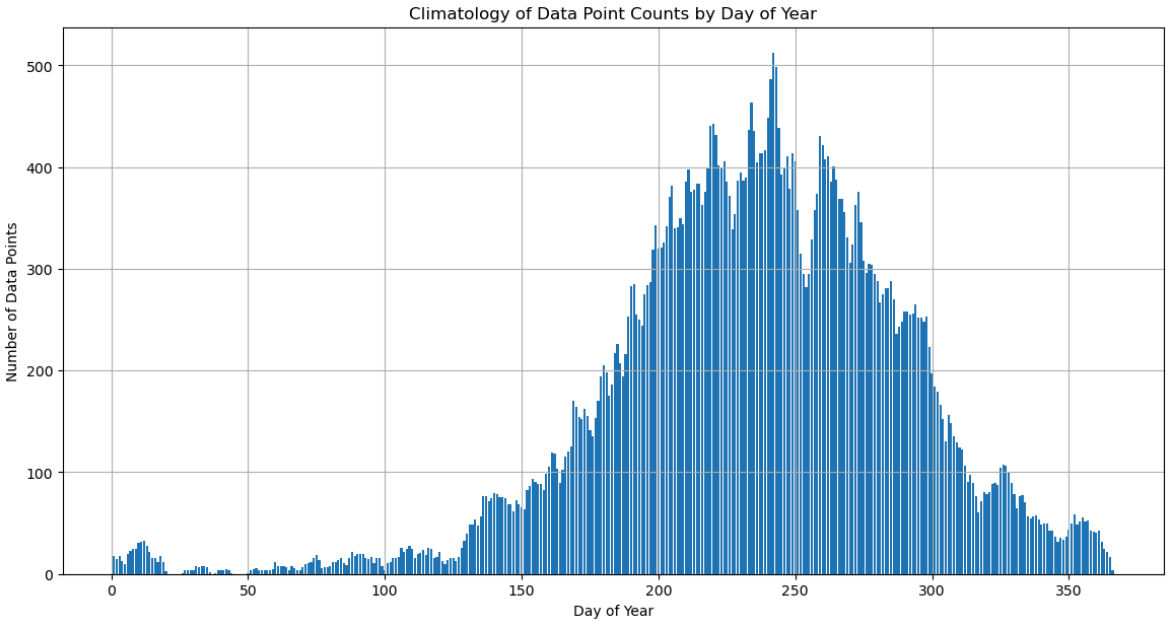
In [61]:
```
#3.6
df_BASIN = df[df['BASIN'].isin(['WP', 'EP'])]
df_BASIN['YEAR'] = df_BASIN['ISO_TIME'].dt.year
df_BASIN = df_BASIN[df_BASIN['YEAR'] >= 1970]
```

```
C:\Users\DELL\AppData\Local\Temp\ipykernel_48348\1014047956.py:3: SettingWithCopy
Warning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stabl
e/user_guide/indexing.html#returning-a-view-versus-a-copy
  df_BASIN['YEAR'] = df_BASIN['ISO_TIME'].dt.year
```

In [29]:
```
#3.7
# 提取日期
df_BASIN['DATE'] = df_BASIN['ISO_TIME'].dt.date

# 计算每天的数据点数量
daily_counts = df_BASIN['DATE'].value_counts().sort_index()#sort_index()将这些日

# 绘制条形图
plt.figure(figsize=(14, 7))
plt.bar(daily_counts.index, daily_counts.values)

plt.xlabel('Date')
plt.ylabel('Number of Data Points')
plt.title('Number of Data Points per Day')
plt.xticks(rotation=45)
plt.grid(True)
plt.show()
```



In [31]:
```
#3.8
#计算每一年的天数。dayofyear：.dt 访问器的一个属性，它返回日期时间对象中存储的那一
df_BASIN['DAY_OF_YEAR'] = df_BASIN['ISO_TIME'].dt.dayofyear

DAY_OF_YEAR_count = df_BASIN['DAY_OF_YEAR'].value_counts().sort_index()

plt.figure(figsize=(14, 7))
plt.bar(DAY_OF_YEAR_count.index, DAY_OF_YEAR_count.values)
plt.xlabel('Day of Year')
plt.ylabel('Number of Data Points')
plt.title('Climatology of Data Point Counts by Day of Year')
plt.grid(True)
plt.show()
```



思考：台风多发生在6-9月

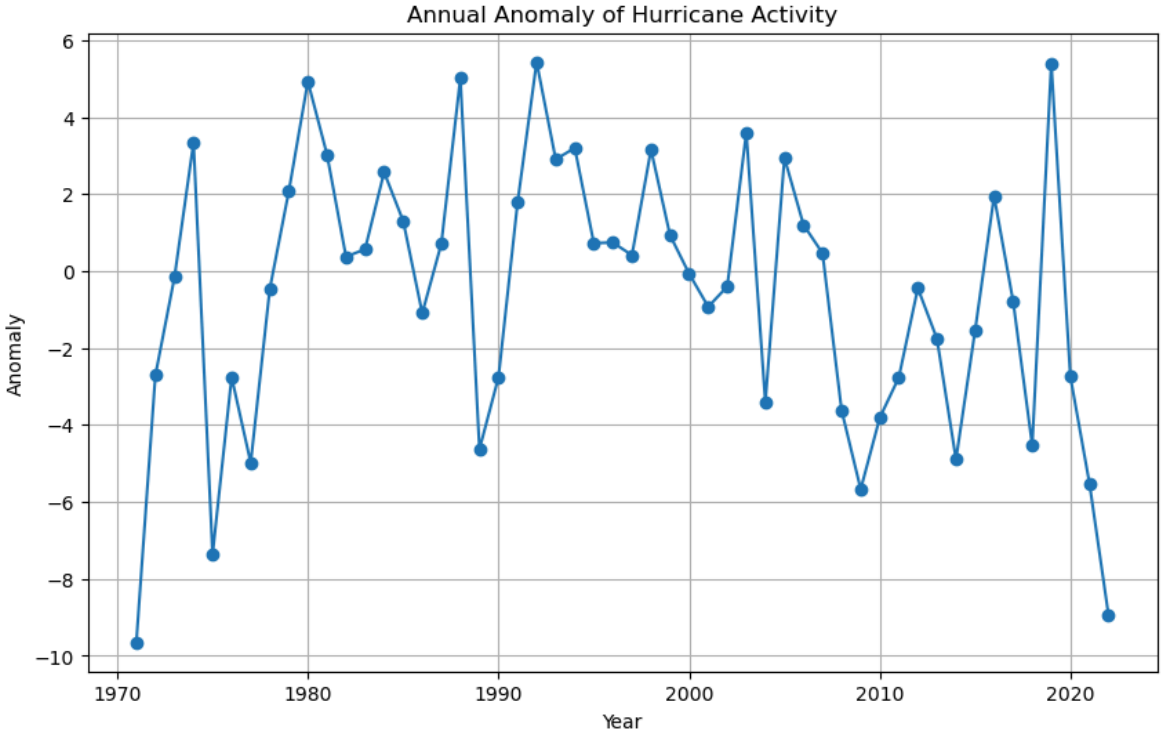
In [33]:
```
#3.9

group_data = df_BASIN.groupby('DAY_OF_YEAR')
print(group_data)
```

```
climatology = df_BASIN.groupby('DAY_OF_YEAR')['WMO_WIND'].transform('mean')#tran

df_BASIN['WMO_WIND_anom'] = df_BASIN['WMO_WIND'] - climatology
df_BASIN.WMO_WIND_anom
```

```
<pandas.core.groupby.generic.DataFrameGroupBy object at 0x000001D1AF97C050>
```

Out[33]:
```
351440    -6.666667
351442    -6.666667
351444    -5.468750
351446    -5.468750
351448    -5.468750
             ...
703055   -23.555556
703057   -28.555556
703059   -28.555556
703061   -28.555556
703063   -31.288660
Name: WMO_WIND_anom, Length: 52023, dtype: float64
```

In [35]:
```
# 3.10
# 将ISO_TIME列设置为索引
df_BASIN_index = df_BASIN.set_index('ISO_TIME', inplace=False)

# 对ANOMALY列进行年分辨率的重采样，并计算每年的平均异常值
anomalies_resampled = df_BASIN_index['WMO_WIND_anom'].resample('YE').mean()#YE:年

# 绘制图表
plt.figure(figsize=(10, 6))
plt.plot(anomalies_resampled.index, anomalies_resampled.values, marker='o')
plt.title('Annual Anomaly of Hurricane Activity')
plt.xlabel('Year')
plt.ylabel('Anomaly')
plt.grid(True)
plt.show()
```

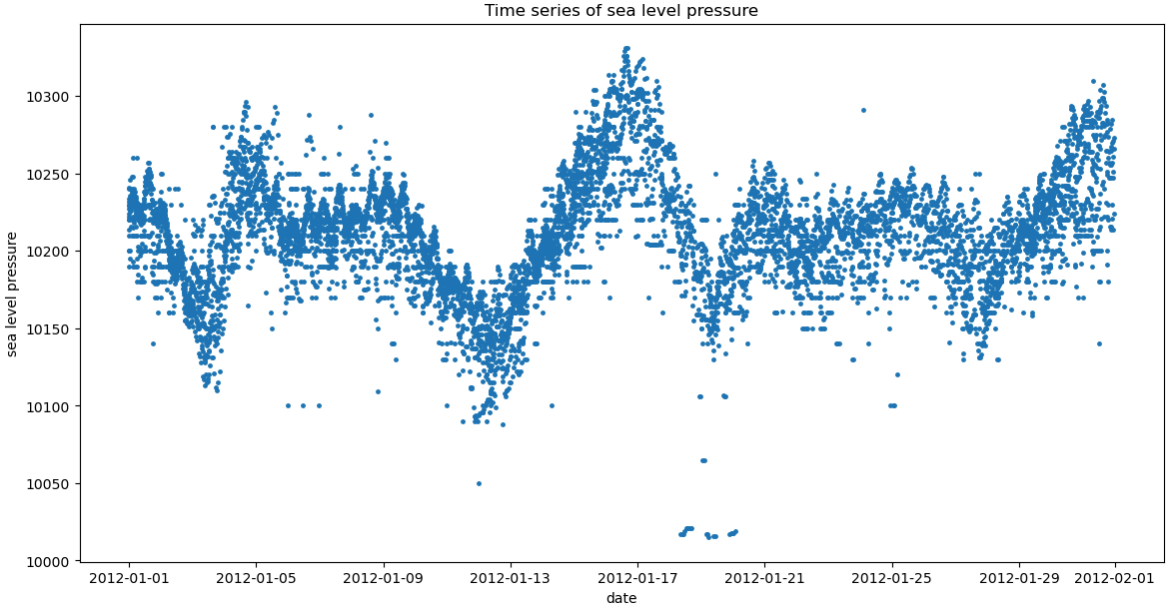


第四题我想对全球10度分箱海洋观测数据表中的海平面压力（SEA_LVL_PRES）在2021.1月这段时间内的变化趋势，以及它和海洋表面温度（SEA_SURF_TEMP）之间的相关性

In [41]:
```
#4
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import matplotlib.dates as mdates
#4.1
df = pd.read_csv(r'E:\0_plus_1\home work\python\homework2\30_-80_20_-70.csv',
                 parse_dates=['DATE'],#将Time of Observation列解析为日期时间格式
                  na_values=[' '],
                 usecols=['LATITUDE', 'LONGITUDE','DATE', 'SEA_LVL_PRES','SEA_SUR
                 dtype={'SEA_LVL_PRES': float, 'SEA_SURF_TEM': float})

df= df.dropna(subset =["SEA_LVL_PRES","SEA_SURF_TEMP"])

print(df)
```

```
                    DATE  LATITUDE  LONGITUDE  SEA_LVL_PRES  SEA_SURF_TEMP
0      2012-01-01 00:00:00     28.90     -78.50       10222.0          236.0
1      2012-01-01 00:00:00     27.50     -71.50       10234.0          254.0
3      2012-01-01 00:00:00     25.50     -79.80       10230.0          244.0
4      2012-01-01 00:00:00     26.00     -79.50       10200.0          263.0
5      2012-01-01 00:00:00     23.70     -74.60       10200.0          280.0
...                    ...       ...        ...           ...            ...
14040  2012-01-31 23:00:00     25.90     -79.80       10247.0          230.0
14041  2012-01-31 23:00:00     21.20     -75.80       10214.0          260.0
14043  2012-01-31 23:20:00     23.25     -73.15       10224.0          252.0
14047  2012-01-31 23:50:00     28.90     -78.50       10273.0          229.0
14048  2012-01-31 23:50:00     27.50     -71.50       10266.0          233.0

[8133 rows x 5 columns]
```

In [43]:
```
#4.2画海平面压力的时间序列图
plt.figure(figsize=(14, 7))
plt.scatter(df['DATE'], df['SEA_LVL_PRES'], s = 6)
plt.title('Time series of sea level pressure')
plt.xlabel('date')
plt.ylabel('sea level pressure')

plt.show()
```



In [49]:
```
#4.3
#查看各列数据的平均值。最小值、最大值等等
df.describe()
```

Out[49]:

	DATE	LATITUDE	LONGITUDE	SEA_LVL_PRES	SEA_SURF_TEM
count	8133	8133.000000	8133.000000	8133.000000	8133.0000
mean	2012-01-15 09:47:45.909258496	26.646286	-74.818847	10209.811386	239.7701
min	2012-01-01 00:00:00	20.000000	-80.000000	10015.000000	156.0000
25%	2012-01-07 15:40:00	25.100000	-78.500000	10188.000000	229.0000
50%	2012-01-14 12:20:00	27.500000	-74.100000	10211.000000	237.0000
75%	2012-01-22 20:40:00	28.900000	-71.600000	10231.000000	250.0000
max	2012-01-31 23:50:00	29.990000	-70.010000	10331.000000	307.0000
std	NaN	2.597157	3.113659	37.957426	16.3014

In [47]:
```
#续4.3

#检查异常值(四分位距法)
Q1 = df['SEA_LVL_PRES'].quantile(0.25)
Q3 = df['SEA_LVL_PRES'].quantile(0.75)
IQR = Q3 - Q1
lower_bound = Q1 - 1.5 * IQR
upper_bound = Q3 + 1.5 * IQR
df_cleaned = df[(df['SEA_LVL_PRES'] >= lower_bound) & (df['SEA_LVL_PRES'] <= upp

print(df_cleaned)

#正态检验（Shapiro-Wilk检验）:数据是否服从正态分布
from scipy.stats import shapiro
stat, p_value = shapiro(df['SEA_LVL_PRES'])
print('SEA_LVL_PRES Shapiro-Wilk Test:', 'Pass' if p_value > 0.05 else 'Fail')

stat, p_value = shapiro(df['SEA_SURF_TEMP'])
print('SEA_SURF_TEMP Shapiro-Wilk Test:', 'Pass' if p_value > 0.05 else 'Fail')
#SEA_LVL_PRES和SEA_SURF_TEMP不服从正态分布


#相关性检验:计算两个变量之间的皮尔森相关系数，检查它们是否存在线性关系。
from scipy.stats import pearsonr
corr, p_value = pearsonr(df['SEA_LVL_PRES'], df['SEA_SURF_TEMP'])
print('Pearson Correlation:', corr)

#SEA_LVL_PRES和SEA_SURF_TEMP负相关（皮尔森系数在-1~0期间为负相关）


#方差齐性检验:使用Levene检验来检查不同组数据的方差是否相等。
sea_level_pressure = df['SEA_LVL_PRES']
```

```
sea_suface_temperature = df['SEA_SURF_TEMP']

from scipy.stats import levene
stat, p_value = levene(sea_level_pressure, sea_suface_temperature)
print('Levene Test:', 'Equal variances' if p_value > 0.05 else 'Unequal variance

#两组数据的方差不齐，可能会对某些统计分析的结果产生影响，尤其是那些假设方差齐性的

#秩和检验（Mann-Whitney U检验）:用于比较两组数据的分布是否不同，适用于非正态数据。
from scipy.stats import mannwhitneyu
stat, p_value = mannwhitneyu(sea_level_pressure, sea_suface_temperature)
print('Mann-Whitney U Test:', 'No significant difference' if p_value > 0.05 else

#两组数据有很大的差异
```

	DATE	LATITUDE	LONGITUDE	SEA_LVL_PRES	SEA_SURF_TEMP
0	2012-01-01 00:00:00	28.90	-78.50	10222.0	236.0
1	2012-01-01 00:00:00	27.50	-71.50	10234.0	254.0
3	2012-01-01 00:00:00	25.50	-79.80	10230.0	244.0
4	2012-01-01 00:00:00	26.00	-79.50	10200.0	263.0
5	2012-01-01 00:00:00	23.70	-74.60	10200.0	280.0
...	...	...	...	...	...
14040	2012-01-31 23:00:00	25.90	-79.80	10247.0	230.0
14041	2012-01-31 23:00:00	21.20	-75.80	10214.0	260.0
14043	2012-01-31 23:20:00	23.25	-73.15	10224.0	252.0
14047	2012-01-31 23:50:00	28.90	-78.50	10273.0	229.0
14048	2012-01-31 23:50:00	27.50	-71.50	10266.0	233.0

[7865 rows x 5 columns]
SEA_LVL_PRES Shapiro-Wilk Test: Fail
SEA_SURF_TEMP Shapiro-Wilk Test: Fail
Pearson Correlation: -0.16723334437647835
Levene Test: Unequal variances
Mann-Whitney U Test: Significant difference

```
C:\Users\DELL\AppData\Local\Temp\ipykernel_48348\1331205771.py:17: UserWarning: s
cipy.stats.shapiro: For N > 5000, computed p-value may not be accurate. Current N
is 8133.
  stat, p_value = shapiro(df['SEA_LVL_PRES'])
C:\Users\DELL\AppData\Local\Temp\ipykernel_48348\1331205771.py:20: UserWarning: s
cipy.stats.shapiro: For N > 5000, computed p-value may not be accurate. Current N
is 8133.
  stat, p_value = shapiro(df['SEA_SURF_TEMP'])
```

思考：综上所述，SEA_LVL_PRES和SEA_SURF_TEMP之间的相关性可能很低