```python
# import pandas
import pandas as pd
# import numpy
import numpy as np
# import matplotlib
from matplotlib import pyplot as plt
```

```python
# 读取tsv文件，以制表符为分隔，命名为Sig_Eqs
Sig_Eqs = pd.read_csv(r"D:\ESE5023\data\earthquakes-2025-11-05_21-08-05_+0800.tsv", sep='\t')
```

```python
# 数据预览
Sig_Eqs.head()
```

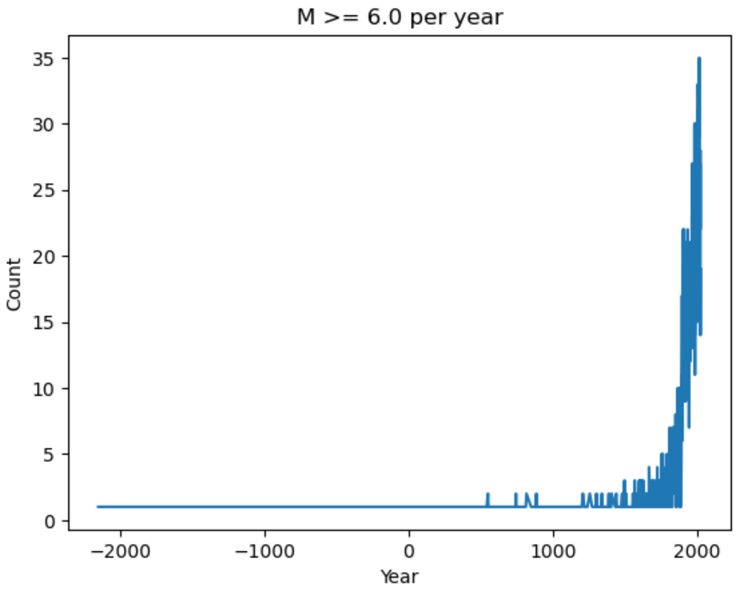
	Search Parameters	Id	Year	Mo	Dy	Hr	Mn	Sec	Tsu	Vol	...	Total Missing	Total Missing Description	Total Injuries
0	[]	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN
1	NaN	1.0	-2150.0	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN
2	NaN	2.0	-2000.0	NaN	NaN	NaN	NaN	NaN	1.0	NaN	...	NaN	NaN	NaN
3	NaN	3.0	-2000.0	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN
4	NaN	5877.0	-1610.0	NaN	NaN	NaN	NaN	NaN	3.0	1351.0	...	NaN	NaN	NaN

5 rows × 49 columns

```python
# 1.1各国总死亡人数，打印前10
country_deaths = Sig_Eqs.groupby("Country")["Deaths"].sum()
top10 = country_deaths.sort_values(ascending=False).head(10)
print(top10)
```

```
Country
CHINA         2139210.0
TURKEY        1199742.0
IRAN          1014453.0
ITALY          498219.0
SYRIA          419226.0
HAITI          323484.0
AZERBAIJAN     319251.0
JAPAN          242445.0
ARMENIA        191890.0
PAKISTAN       145083.0
Name: Deaths, dtype: float64
```

```python
# 1.2计算每年全球震级大于6的地震总数，并绘制时间序列图
# 震级 >= 6.0
big = Sig_Eqs[Sig_Eqs["Mag"] >= 6.0]
# 按年份计数
year_counts = big.groupby("Year").size()
year_counts = year_counts.reset_index(name="Count")
# 绘图
plt.figure()
plt.plot(year_counts["Year"], year_counts["Count"])
plt.title("M >= 6.0 per year")
plt.xlabel("Year")
plt.ylabel("Count")
plt.show()
year_counts.head()
print("趋势分析：1. 公元前无数据，可能是由于历史记录不完整；2. 随时间推移，地震记录数量逐渐增多；3. 地震活动本身可能没有显著增加，但监测能力提升使得更多地震被记录")
```



```
趋势分析：1. 公元前无数据，可能是由于历史记录不完整；2. 随时间推移，地震记录数量逐渐增多；3. 地震活动本身可能没有显著增加，但监测能力提升使得更多地震被记录
```

```python
# 1.3编写函数CountEq_LargestEq
import datetime as dt
import pandas as pd
def CountEq_LargestEq(country):
    sub = Sig_Eqs[Sig_Eqs["Country"] == country]
    total = len(sub)
    # 该国没有任何有效震级
    if not sub["Mag"].notna().any():
        return total, None
    idx = sub["Mag"].dropna().idxmax()
    row = sub.loc[idx]
    y = int(row["Year"])
    m = int(row["Mo"]) if pd.notna(row.get("Mo")) else 1
    d = int(row["Dy"]) if pd.notna(row.get("Dy")) else 1
    # 年份<=0（公元前），用字符串返回；否则用 datetime.date
    if y <= 0:
        bce_year = abs(y) + 1   # 无0年，所以+1
        date_of_largest = f"{bce_year} BCE-{m:02d}-{d:02d}"
    else:
        date_of_largest = dt.date(y, m, d)
    return total, date_of_largest
# 测试
CountEq_LargestEq("CHINA")
```

```
(623, datetime.date(1668, 7, 25))
```

```python
# 1.3 应用于每个国家并按降序报告
results = []
for c in Sig_Eqs["Country"].dropna().unique():
    total, date_ = CountEq_LargestEq(c)
    results.append([c, total, date_])
out = pd.DataFrame(results, columns=["Country", "Total_Earthquakes", "Date_of_Largest_Eq"])
out = out.sort_values("Total_Earthquakes", ascending=False).reset_index(drop=True)
# 由于数据太多，只打印前15行
out.head(15)

```

	Country	Total_Earthquakes	Date_of_Largest_Eq
0	CHINA	623	1668-07-25
1	JAPAN	424	2011-03-11
2	INDONESIA	421	2004-12-26

	Country	Total_Earthquakes	Date_of_Largest_Eq
3	IRAN	388	0856-12-22
4	TURKEY	358	1939-12-26
5	ITALY	333	1915-01-13
6	GREECE	289	0365-07-21
7	USA	280	1964-03-28
8	PHILIPPINES	230	1897-09-21
9	MEXICO	214	1787-03-28
10	CHILE	200	1960-05-22
11	PERU	194	1716-02-06
12	RUSSIA	158	1952-11-04
13	PAPUA NEW GUINEA	107	1919-05-06
14	INDIA	102	1950-08-15

```python
# 2.深圳风速变化趋势
data = pd.read_csv(r"D:\ESE5023\data\2281305.csv")
# 数据预览
data.head()
```

	STATION	DATE	SOURCE	REPORT_TYPE	CALL_SIGN	QUALITY_CONTROL	AA1	AA2	AA3	AJ1	...	OD1
0	59493099999	2010-01-02T00:00:00	4	SY-MT	ZGSZ	V020	06,0000,2,1	24,0000,2,1	NaN	NaN	...	NaN
1	59493099999	2010-01-02T01:00:00	4	FM-15	ZGSZ	V020	NaN	NaN	NaN	NaN	...	NaN
2	59493099999	2010-01-02T02:00:00	4	FM-15	ZGSZ	V020	NaN	NaN	NaN	NaN	...	NaN
3	59493099999	2010-01-02T03:00:00	4	SY-MT	ZGSZ	V020	NaN	NaN	NaN	NaN	...	NaN
4	59493099999	2010-01-02T04:00:00	4	FM-15	ZGSZ	V020	NaN	NaN	NaN	NaN	...	NaN

5 rows × 43 columns

```python
# 解析风速
def parse_wind_speed(wnd_str):
    try:
        parts = str(wnd_str).split(',')
        if len(parts) >= 4:
            return float(parts[3]) / 10
    except:
        return None
    return None
data["WindSpeed"] = data["WND"].apply(parse_wind_speed)

```

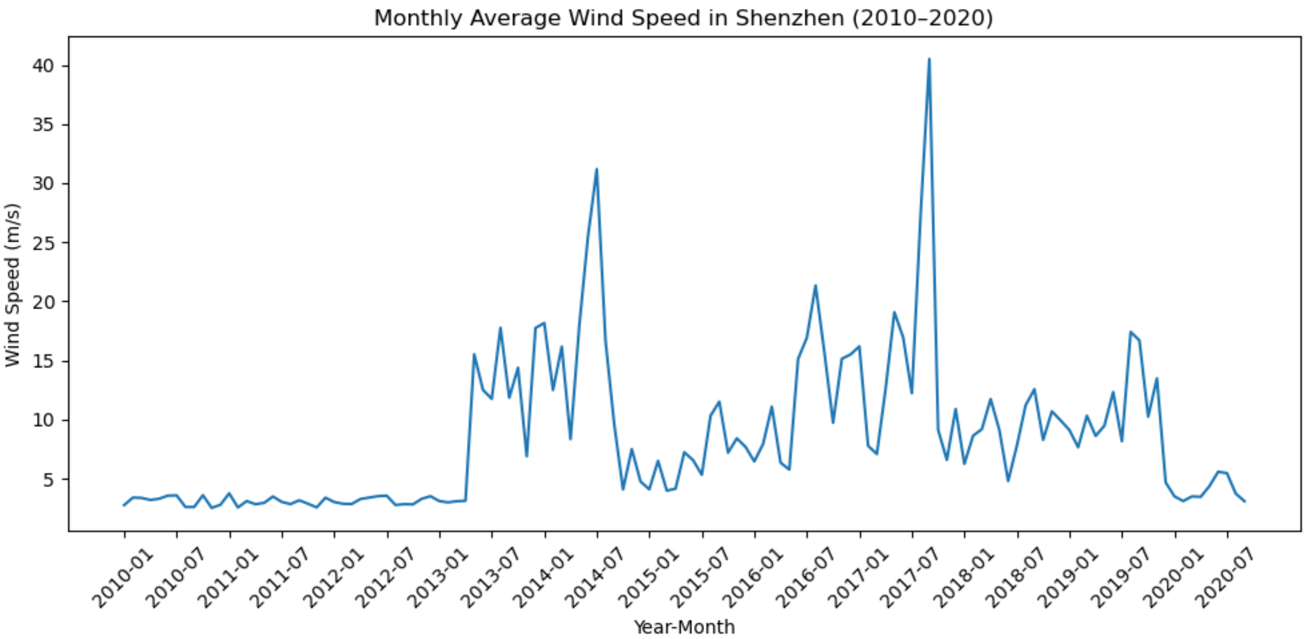
```python
# 时间处理与筛选
data["Date"] = pd.to_datetime(data["DATE"], errors="coerce")
data = data[(data["Date"].dt.year >= 2010) & (data["Date"].dt.year <= 2020)]

# 按年月求平均
data["YearMonth"] = data["Date"].dt.to_period("M")
monthly = data.groupby("YearMonth")["WindSpeed"].mean().reset_index()

# 画图
plt.figure(figsize=(10,5))
plt.plot(monthly["YearMonth"].astype(str), monthly["WindSpeed"])
plt.title("Monthly Average Wind Speed in Shenzhen (2010–2020)")
plt.xlabel("Year-Month")
plt.ylabel("Wind Speed (m/s)")
# 每6个月显示一个刻度
plt.xticks(ticks=range(0, len(monthly), 6),
           labels=monthly["YearMonth"].astype(str)[::6],
           rotation=45)
plt.tight_layout()
plt.show()

# 趋势分析
print("趋势分析：从 2010 年到 2020 年，深圳宝安机场的月平均风速总体上呈现出较大的年际波动，但没有显著的长期上升或下降趋势。风速的峰值多出现在台风季节，说明短期极端天气对平均风速的影响较大。")

```



```
趋势分析：从 2010 年到 2020 年，深圳宝安机场的月平均风速总体上呈现出较大的年际波动，但没有显著的长期上升或下降趋势。风速的峰值多出现在台风季节，说明短期极端天气对平均风速的影响较大。
```

```python
# 3. 选取纽约国际机场综合地表数据进行分析
# 读入 CSV 文件
df = pd.read_csv(r"D:\ESE5023\data\72528014733.csv")
df.head()
```

	STATION	DATE	SOURCE	LATITUDE	LONGITUDE	ELEVATION	NAME	REPORT_TYPE	CALL_SIGN	QUALITY_CONTR
0	72528014733	2014-01-01T00:00:00	4	42.93997	-78.73615	218.2	BUFFALO NIAGARA INTERNATIONAL, NY US	FM-12	99999	V020
1	72528014733	2014-01-01T00:54:00	7	42.93997	-78.73615	218.2	BUFFALO NIAGARA INTERNATIONAL, NY US	FM-15	KBUF	V030

	STATION	DATE	SOURCE	LATITUDE	LONGITUDE	ELEVATION	NAME	REPORT_TYPE	CALL_SIGN	QUALITY_CONTR
2	72528014733	2014-01-01T01:54:00	7	42.93997	-78.73615	218.2	BUFFALO NIAGARA INTERNATIONAL, NY US	FM-15	KBUF	V030
3	72528014733	2014-01-01T02:54:00	7	42.93997	-78.73615	218.2	BUFFALO NIAGARA INTERNATIONAL, NY US	FM-15	KBUF	V030
4	72528014733	2014-01-01T03:00:00	4	42.93997	-78.73615	218.2	BUFFALO NIAGARA INTERNATIONAL, NY US	FM-12	99999	V020

5 rows × 110 columns

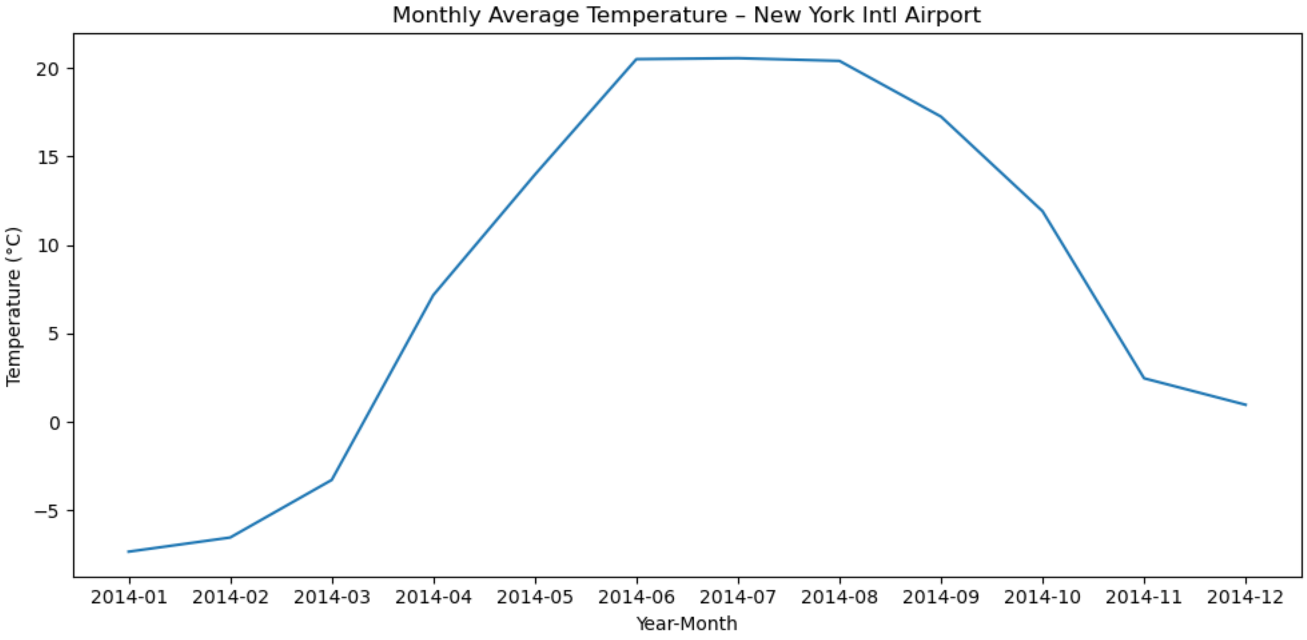
```
# 气温分析
def parse_tmp(tmp):
    try:
        val = float(str(tmp).split(',')[0])
        if val < 9999:
            return val / 10   # 单位 0.1 °C
    except:
        return None

df["Temperature"] = df["TMP"].apply(parse_tmp)
df["Date"] = pd.to_datetime(df["DATE"], errors="coerce")
df = df.dropna(subset=["Temperature", "Date"])

# 按月平均
df["YearMonth"] = df["Date"].dt.to_period("M")
monthly = df.groupby("YearMonth")["Temperature"].mean().reset_index()

# 绘图
plt.figure(figsize=(10,5))
plt.plot(monthly["YearMonth"].astype(str), monthly["Temperature"])
plt.title("Monthly Average Temperature - New York Intl Airport")
plt.xlabel("Year-Month")
plt.ylabel("Temperature (°C)")
plt.tight_layout()
plt.show()

```

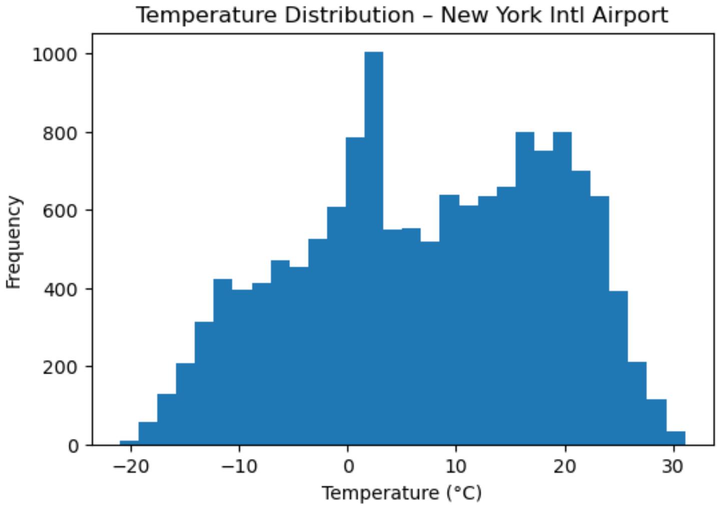


```
# 五项统计指标
```

```python
temp = df["Temperature"]
print("1.记录数量:", len(temp))
print("2.平均气温 (°C):", round(temp.mean(), 2))
print("3.最高气温 (°C):", temp.max())
print("4.最低气温 (°C):", temp.min())
print("5.标准差 (°C):", round(temp.std(), 2))

plt.figure(figsize=(6,4))
plt.hist(temp, bins=30)
plt.title("Temperature Distribution – New York Intl Airport")
plt.xlabel("Temperature (°C)")
plt.ylabel("Frequency")
plt.show()
print("现象描述：冬季气温集中在 0 °C 以下，夏季集中在 15–25 °C 之间，平均气温7.38℃，整体气候偏凉，符合纽约温带海洋性气候特征")
```

```
1.记录数量: 14377
2.平均气温 (°C): 7.38
3.最高气温 (°C): 31.1
4.最低气温 (°C): -21.0
5.标准差 (°C): 11.63
```



```
现象描述：冬季气温集中在 0 °C 以下，夏季集中在 15–25 °C 之间，平均气温7.38℃，整体气候偏凉，符合纽约温带海洋性气候特征
```