

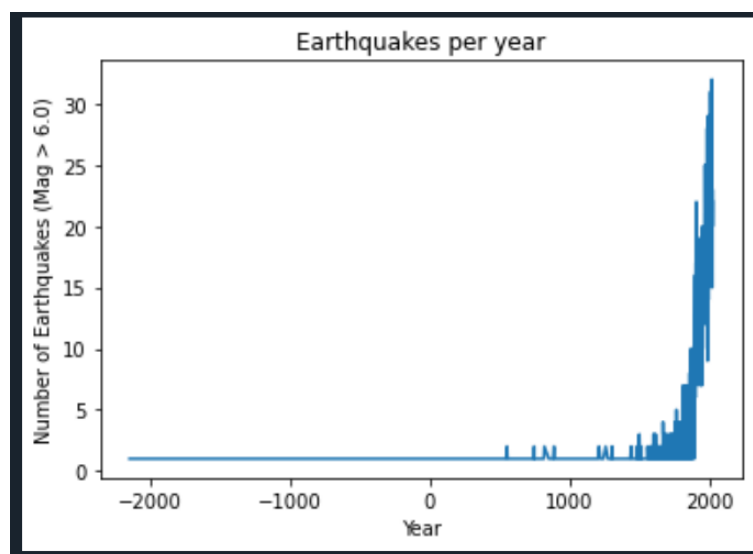
Problem1

1.1 The printed results are as follows:

Country	
CHINA	2075045.0
TURKEY	1188881.0
IRAN	1011449.0
ITALY	498478.0
SYRIA	439224.0
HAITI	323478.0
AZERBAIJAN	317219.0
JAPAN	279085.0
ARMENIA	191890.0
PAKISTAN	145083.0

It can be seen that China has the largest number of deaths in the earthquake, 2075045, followed by Türkiye, 1188881.

1.2 The diagram drawn is as follows:



The number of earthquakes with a magnitude greater than 6 is gradually increasing, possibly due to human activities (such as environmental damage) causing more intense crustal movement on the Earth.

1.3 The results of the number of earthquakes and the year of the largest earthquake in each country are printed as follows:

Country: CHINA, Total Earthquakes: 620, Largest Earthquake Date: 1668.0

Country: JAPAN, Total Earthquakes: 414, Largest Earthquake Date: 2011.0

Country: INDONESIA, Total Earthquakes: 411, Largest Earthquake Date: 2004.0
Country: IRAN, Total Earthquakes: 384, Largest Earthquake Date: 856.0
Country: TURKEY, Total Earthquakes: 335, Largest Earthquake Date: 1939.0
Country: ITALY, Total Earthquakes: 331, Largest Earthquake Date: 1915.0
Country: USA, Total Earthquakes: 276, Largest Earthquake Date: 1964.0
Country: GREECE, Total Earthquakes: 270, Largest Earthquake Date: 365.0
Country: PHILIPPINES, Total Earthquakes: 224, Largest Earthquake Date: 1897.0
Country: MEXICO, Total Earthquakes: 209, Largest Earthquake Date: 1899.0
Country: CHILE, Total Earthquakes: 198, Largest Earthquake Date: 1960.0
Country: PERU, Total Earthquakes: 190, Largest Earthquake Date: 1716.0
Country: RUSSIA, Total Earthquakes: 152, Largest Earthquake Date: 1952.0
Country: PAPUA NEW GUINEA, Total Earthquakes: 101, Largest Earthquake Date: 1919.0
Country: INDIA, Total Earthquakes: 100, Largest Earthquake Date: 1950.0
Country: TAIWAN, Total Earthquakes: 100, Largest Earthquake Date: 1920.0
Country: COLOMBIA, Total Earthquakes: 80, Largest Earthquake Date: 1826.0
Country: NEW ZEALAND, Total Earthquakes: 71, Largest Earthquake Date: 1826.0
Country: ECUADOR, Total Earthquakes: 68, Largest Earthquake Date: 1906.0
Country: AFGHANISTAN, Total Earthquakes: 66, Largest Earthquake Date: 1909.0
Country: VENEZUELA, Total Earthquakes: 66, Largest Earthquake Date: 1894.0
Country: SOLOMON ISLANDS, Total Earthquakes: 62, Largest Earthquake Date: 1977.0
Country: ALGERIA, Total Earthquakes: 57, Largest Earthquake Date: 1980.0
Country: ALBANIA, Total Earthquakes: 56, Largest Earthquake Date: 1893.0
Country: VANUATU, Total Earthquakes: 54, Largest Earthquake Date: 1913.0
Country: PAKISTAN, Total Earthquakes: 53, Largest Earthquake Date: 1945.0
Country: CROATIA, Total Earthquakes: 53, Largest Earthquake Date: 1667.0
Country: FRANCE, Total Earthquakes: 43, Largest Earthquake Date: 1817.0
Country: USA TERRITORY, Total Earthquakes: 40, Largest Earthquake Date: 1902.0
Country: GUATEMALA, Total Earthquakes: 39, Largest Earthquake Date: 1942.0
Country: NICARAGUA, Total Earthquakes: 39, Largest Earthquake Date: 1898.0
Country: EL SALVADOR, Total Earthquakes: 38, Largest Earthquake Date: 1915.0
Country: COSTA RICA, Total Earthquakes: 36, Largest Earthquake Date: 1950.0
Country: SPAIN, Total Earthquakes: 34, Largest Earthquake Date: 881.0
Country: MYANMAR (BURMA), Total Earthquakes: 34, Largest Earthquake Date: 1912.0
Country: SYRIA, Total Earthquakes: 33, Largest Earthquake Date: 1202.0
Country: SWITZERLAND, Total Earthquakes: 31, Largest Earthquake Date: 1601.0
Country: PORTUGAL, Total Earthquakes: 28, Largest Earthquake Date: -60.0
Country: AZORES (PORTUGAL), Total Earthquakes: 27, Largest Earthquake Date: 1968.0
Country: TAJIKISTAN, Total Earthquakes: 27, Largest Earthquake Date: 1907.0
Country: NEW CALEDONIA, Total Earthquakes: 25, Largest Earthquake Date: 1875.0
Country: ISRAEL, Total Earthquakes: 24, Largest Earthquake Date: -31.0

Country: IRAQ, Total Earthquakes: 24, Largest Earthquake Date: 1864.0
Country: TONGA, Total Earthquakes: 24, Largest Earthquake Date: 1919.0
Country: AUSTRALIA, Total Earthquakes: 24, Largest Earthquake Date: 1989.0
Country: PANAMA, Total Earthquakes: 23, Largest Earthquake Date: 1882.0
Country: SLOVENIA, Total Earthquakes: 22, Largest Earthquake Date: 1511.0
Country: SOUTH KOREA, Total Earthquakes: 21, Largest Earthquake Date: 1643.0
Country: MOROCCO, Total Earthquakes: 21, Largest Earthquake Date: 2023.0
Country: ARGENTINA, Total Earthquakes: 21, Largest Earthquake Date: 1944.0
Country: KERMADEC ISLANDS (NEW ZEALAND), Total Earthquakes: 21, Largest Earthquake Date: 1986.0
Country: CANADA, Total Earthquakes: 20, Largest Earthquake Date: 1949.0
Country: HAITI, Total Earthquakes: 20, Largest Earthquake Date: 1842.0
Country: NEPAL, Total Earthquakes: 19, Largest Earthquake Date: 1505.0
Country: JAMAICA, Total Earthquakes: 19, Largest Earthquake Date: 1899.0
Country: FIJI, Total Earthquakes: 19, Largest Earthquake Date: 1919.0
Country: BULGARIA, Total Earthquakes: 18, Largest Earthquake Date: 1904.0
Country: DOMINICAN REPUBLIC, Total Earthquakes: 18, Largest Earthquake Date: 1946.0
Country: ICELAND, Total Earthquakes: 17, Largest Earthquake Date: 1912.0
Country: BANGLADESH, Total Earthquakes: 17, Largest Earthquake Date: 1918.0
Country: AZERBAIJAN, Total Earthquakes: 16, Largest Earthquake Date: 1667.0
Country: EGYPT, Total Earthquakes: 15, Largest Earthquake Date: 1995.0
Country: GEORGIA, Total Earthquakes: 15, Largest Earthquake Date: 1905.0
Country: SERBIA, Total Earthquakes: 15, Largest Earthquake Date: 1922.0
Country: ROMANIA, Total Earthquakes: 15, Largest Earthquake Date: 1977.0
Country: LEBANON, Total Earthquakes: 14, Largest Earthquake Date: 551.0
Country: KYRGYZSTAN, Total Earthquakes: 14, Largest Earthquake Date: 1946.0
Country: UK, Total Earthquakes: 14, Largest Earthquake Date: 1580.0
Country: UZBEKISTAN, Total Earthquakes: 14, Largest Earthquake Date: 1976.0
Country: CUBA, Total Earthquakes: 14, Largest Earthquake Date: 2020.0
Country: SOUTH AFRICA, Total Earthquakes: 14, Largest Earthquake Date: 1942.0
Country: ARMENIA, Total Earthquakes: 13, Largest Earthquake Date: 1988.0
Country: HONDURAS, Total Earthquakes: 13, Largest Earthquake Date: 1856.0
Country: UKRAINE, Total Earthquakes: 12, Largest Earthquake Date: 103.0
Country: MACEDONIA, Total Earthquakes: 12, Largest Earthquake Date: 1979.0
Country: TURKMENISTAN, Total Earthquakes: 11, Largest Earthquake Date: 1895.0
Country: BOSNIA-HERZEGOVINA, Total Earthquakes: 11, Largest Earthquake Date: 1969.0
Country: KAZAKHSTAN, Total Earthquakes: 10, Largest Earthquake Date: 1889.0
Country: YEMEN, Total Earthquakes: 10, Largest Earthquake Date: 1982.0
Country: MONTENEGRO, Total Earthquakes: 10, Largest Earthquake Date: 1979.0
Country: MARTINIQUE, Total Earthquakes: 10, Largest Earthquake Date: 1906.0
Country: TUNISIA, Total Earthquakes: 9, Largest Earthquake Date: 1957.0
Country: GERMANY, Total Earthquakes: 9, Largest Earthquake Date: 1978.0

Country: ETHIOPIA, Total Earthquakes: 9, Largest Earthquake Date: 1906.0
Country: GUADELOUPE, Total Earthquakes: 9, Largest Earthquake Date: 1843.0
Country: TRINIDAD AND TOBAGO, Total Earthquakes: 8, Largest Earthquake Date: 1888.0
Country: TANZANIA, Total Earthquakes: 8, Largest Earthquake Date: 1910.0
Country: SAMOA, Total Earthquakes: 8, Largest Earthquake Date: 1917.0
Country: BRAZIL, Total Earthquakes: 8, Largest Earthquake Date: 1963.0
Country: CYPRUS, Total Earthquakes: 7, Largest Earthquake Date: 1953.0
Country: AUSTRIA, Total Earthquakes: 7, Largest Earthquake Date: 1590.0
Country: CONGO, Total Earthquakes: 7, Largest Earthquake Date: 1992.0
Country: SOUTH GEORGIA AND THE SOUTH SANDWICH ISLANDS, Total Earthquakes: 7, Largest Earthquake Date: 1929.0
Country: POLAND, Total Earthquakes: 7, Largest Earthquake Date: 2004.0
Country: NORTH KOREA, Total Earthquakes: 6, Largest Earthquake Date: 1518.0
Country: ERITREA, Total Earthquakes: 6, Largest Earthquake Date: 1875.0
Country: ATLANTIC OCEAN, Total Earthquakes: 6, Largest Earthquake Date: 1941.0
Country: BOLIVIA, Total Earthquakes: 6, Largest Earthquake Date: 1994.0
Country: MONGOLIA, Total Earthquakes: 6, Largest Earthquake Date: 1905.0
Country: JORDAN, Total Earthquakes: 5, Largest Earthquake Date: -2150.0
Country: GHANA, Total Earthquakes: 5, Largest Earthquake Date: 1862.0
Country: HUNGARY, Total Earthquakes: 5, Largest Earthquake Date: 1834.0
Country: VIETNAM, Total Earthquakes: 5, Largest Earthquake Date: 1935.0
Country: ANTARCTICA, Total Earthquakes: 5, Largest Earthquake Date: 1998.0
Country: RWANDA, Total Earthquakes: 5, Largest Earthquake Date: 2015.0
Country: BHUTAN, Total Earthquakes: 5, Largest Earthquake Date: 2009.0
Country: THAILAND, Total Earthquakes: 4, Largest Earthquake Date: 2014.0
Country: MICRONESIA, FED. STATES OF, Total Earthquakes: 4, Largest Earthquake Date: 1911.0
Country: UGANDA, Total Earthquakes: 4, Largest Earthquake Date: 1912.0
Country: MALAWI, Total Earthquakes: 4, Largest Earthquake Date: 1989.0
Country: SLOVAKIA, Total Earthquakes: 3, Largest Earthquake Date: 2004.0
Country: ANTIGUA AND BARBUDA, Total Earthquakes: 3, Largest Earthquake Date: 1690.0
Country: SOUTH SUDAN, Total Earthquakes: 3, Largest Earthquake Date: 1990.0
Country: KENYA, Total Earthquakes: 3, Largest Earthquake Date: 1928.0
Country: INDIAN OCEAN, Total Earthquakes: 3, Largest Earthquake Date: 1928.0
Country: MALAYSIA, Total Earthquakes: 3, Largest Earthquake Date: 1976.0
Country: NETHERLANDS, Total Earthquakes: 3, Largest Earthquake Date: 1992.0
Country: SAUDI ARABIA, Total Earthquakes: 3, Largest Earthquake Date: 2009.0
Country: MOZAMBIQUE, Total Earthquakes: 3, Largest Earthquake Date: 2006.0
Country: FRENCH GUIANA, Total Earthquakes: 2, Largest Earthquake Date: 1885.0
Country: SAINT LUCIA, Total Earthquakes: 2, Largest Earthquake Date: Data not available
Country: TOGO, Total Earthquakes: 2, Largest Earthquake Date: 1788.0

Country: CANARY ISLANDS, Total Earthquakes: 2, Largest Earthquake Date: Data not available

Country: UK TERRITORY, Total Earthquakes: 2, Largest Earthquake Date: 1983.0

Country: COTE D'IVOIRE, Total Earthquakes: 2, Largest Earthquake Date: 1879.0

Country: SOLOMON SEA, Total Earthquakes: 2, Largest Earthquake Date: 1895.0

Country: CAMEROON, Total Earthquakes: 2, Largest Earthquake Date: 1945.0

Country: PACIFIC OCEAN, Total Earthquakes: 2, Largest Earthquake Date: 1932.0

Country: LAOS, Total Earthquakes: 2, Largest Earthquake Date: 2007.0

Country: IRELAND, Total Earthquakes: 1, Largest Earthquake Date: Data not available

Country: SIERRA LEONE, Total Earthquakes: 1, Largest Earthquake Date: 1795.0

Country: NORWAY, Total Earthquakes: 1, Largest Earthquake Date: 1819.0

Country: GRENADA, Total Earthquakes: 1, Largest Earthquake Date: Data not available

Country: BARBADOS, Total Earthquakes: 1, Largest Earthquake Date: Data not available

Country: SAINT VINCENT AND THE GRENADINES, Total Earthquakes: 1, Largest Earthquake Date: Data not available

Country: FRENCH POLYNESIA, Total Earthquakes: 1, Largest Earthquake Date: 1848.0

Country: BRITISH VIRGIN ISLANDS, Total Earthquakes: 1, Largest Earthquake Date: Data not available

Country: SRI LANKA, Total Earthquakes: 1, Largest Earthquake Date: Data not available

Country: URUGUAY, Total Earthquakes: 1, Largest Earthquake Date: Data not available

Country: MONTSERRAT, Total Earthquakes: 1, Largest Earthquake Date: Data not available

Country: KIRIBATI, Total Earthquakes: 1, Largest Earthquake Date: 1905.0

Country: PALAU, Total Earthquakes: 1, Largest Earthquake Date: 1914.0

Country: CENTRAL AFRICAN REPUBLIC, Total Earthquakes: 1, Largest Earthquake Date: 1921.0

Country: LIBYA, Total Earthquakes: 1, Largest Earthquake Date: 1963.0

Country: GABON, Total Earthquakes: 1, Largest Earthquake Date: 1974.0

Country: BELGIUM, Total Earthquakes: 1, Largest Earthquake Date: 1983.0

Country: GUINEA, Total Earthquakes: 1, Largest Earthquake Date: 1983.0

Country: DJIBOUTI, Total Earthquakes: 1, Largest Earthquake Date: 1989.0

Country: BERING SEA, Total Earthquakes: 1, Largest Earthquake Date: 1991.0

Country: WALLIS AND FUTUNA (FRENCH TERRITORY), Total Earthquakes: 1, Largest Earthquake Date: 1993.0

Country: SUDAN, Total Earthquakes: 1, Largest Earthquake Date: 1993.0

Country: BURUNDI, Total Earthquakes: 1, Largest Earthquake Date: 2004.0

Country: CZECH REPUBLIC, Total Earthquakes: 1, Largest Earthquake Date: 2008.0

Country: MADAGASCAR, Total Earthquakes: 1, Largest Earthquake Date: 2017.0

Country: ZAMBIA, Total Earthquakes: 1, Largest Earthquake Date: 2017.0

Country: COMOROS, Total Earthquakes: 1, Largest Earthquake Date: 2018.0

Country: nan, Total Earthquakes: 0, Largest Earthquake Date: No data available

According to the results, China has the highest number of earthquakes, with 620 of them, with the largest occurring in 1668 AD. Secondly, Japan experienced a total of 414 earthquakes, with the largest occurring in 2011. The Comoros has the least number of earthquakes, with only one earthquake occurring in 2018.

Problem2

Operate on the 'WND' column by first separating the string with commas and extracting the fourth part, then converting it to a floating point number to obtain wind speed data.

`current_year = pd.Timestamp.now().year` retrieves the current year for subsequent data filtering.

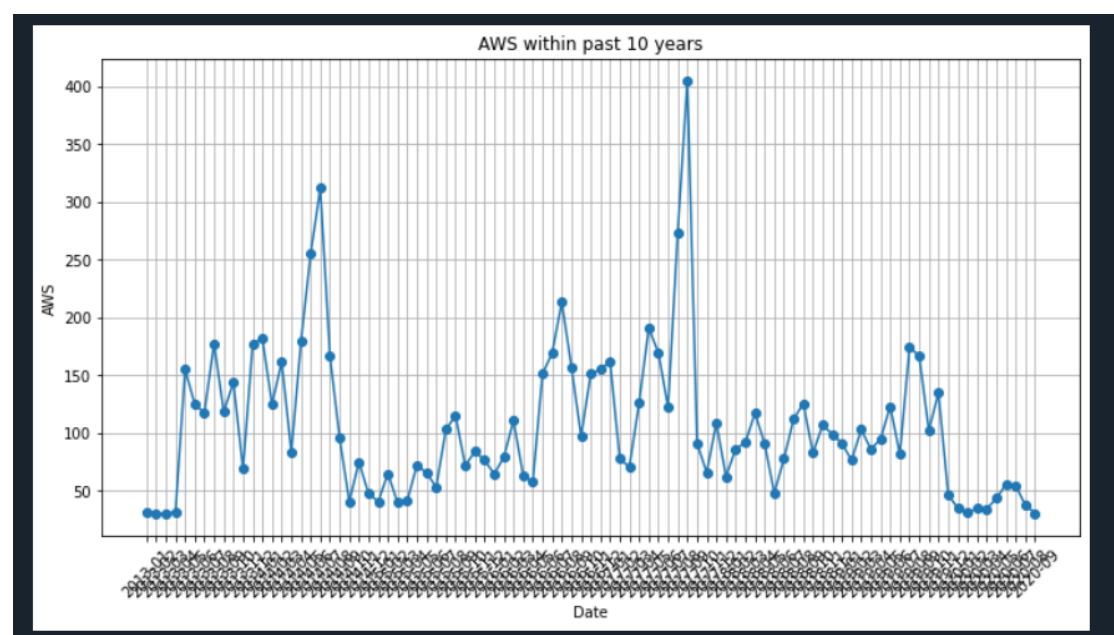
`data_last_10_years = data[data['Year'] >= current_year - 10]` filter out the data for the last 10 years based on the current year.

`result = data_last_10_years.groupby(['Year', 'Month'])['WND'].mean().reset_index()` groups data from the past 10 years and calculates the average wind speed for each year and month.

`result['Year-Month'] = result['Year'].astype(str) + '-' + result['Month'].astype(str).str.zfill(2)` create a new column called 'Year Month', combining the year and month into a string shaped like 'YYYY-MM', with the month portion filled with zeros.

`result = result.sort_values('Year-Month')` sorts the data based on the values in the 'Year Month' column to ensure correct chronological order.

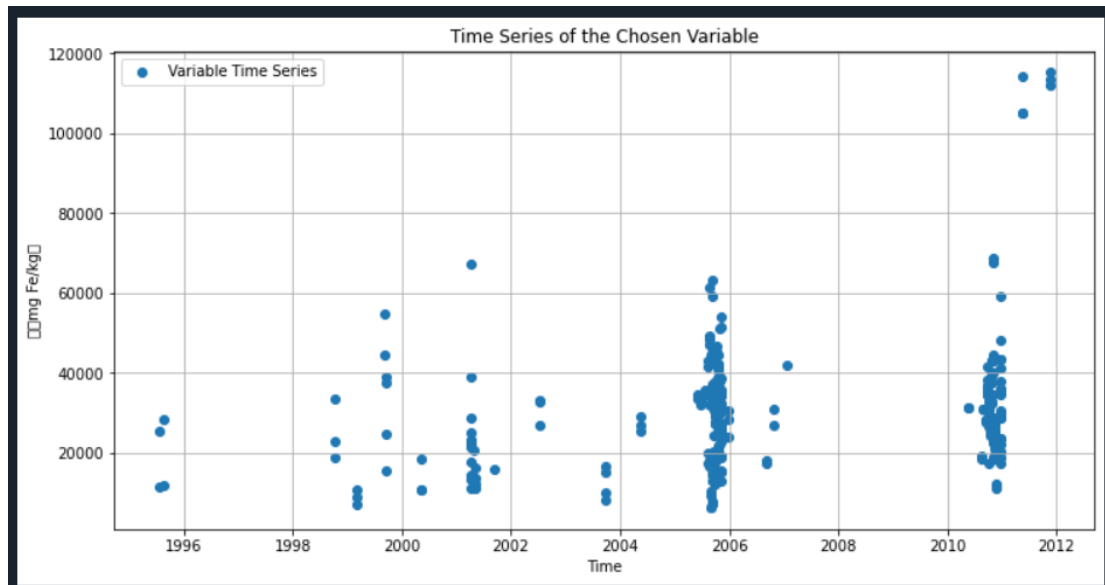
`result = result[['Year-Month', 'WND']].reset_index(drop=True)` select the 'Year Month' and 'WND' columns from the resulting DataFrame and reset the index to obtain the final data. (Jiao Mingming explained to me the idea of extracting wind speed in question 2, which was very helpful to me.)



From the results, there has been no significant trend in the monthly average wind speed over the past 10 years.

Problem3

The data I selected is the 1995-2011 China Land Ecosystem Soil Environmental Element Content Dataset.



By plotting a scatter plot of the iron content in soil over time, it can be observed that there is a certain upward trend in soil iron content. Calculate the maximum, minimum, average, median, and standard deviation of iron content, and the results are:

```
Max Value: 115205.0
Min Value: 6287.0
Mean Value: 30708.88811188811
Median Value: 29275.0
Standard Deviation: 16401.43428905882
```

It can be seen that the highest soil iron content from 1995 to 2011 was 115205 (mg Fe/kg), and the minimum value was 6287 (mg Fe/kg), with a significant difference. This may not be caused by natural reasons, but may be due to human activities. The average value is 30708.8 (mg Fe/kg), with a median of 29275 (mg Fe/kg), which is very close. The standard deviation is 16401.4 (mg Fe/kg), which once again reflects the significant changes in soil iron content in different years. Nevertheless, the soil iron content still shows an upward trend.