Assignment 2

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1、Answer:

1.1

Top 20 countries and their total number of deaths from earthquakes:

	Country	Deaths
58	CHINA	2075947.0
319	TURKEY	1148745.0
140	IRAN	995410.0
148	ITALY	498418.0
295	SYRIA	369224.0
119	HAITI	323478.0
23	AZERBAIJAN	317219.0
152	JAPAN	278607.0
17	ARMENIA	191890.0
146	ISRAEL	160120.0
233	PAKISTAN	145080.0
82	ECUADOR	135496.0
143	IRAQ	120200.0
323	TURKMENISTAN	117412.0
241	PERU	101461.0
248	PORTUGAL	83547.0
104	GREECE	80482.0
56	CHILE	64270.0
131	INDIA	61960.0
298	TAIWAN	57152.0

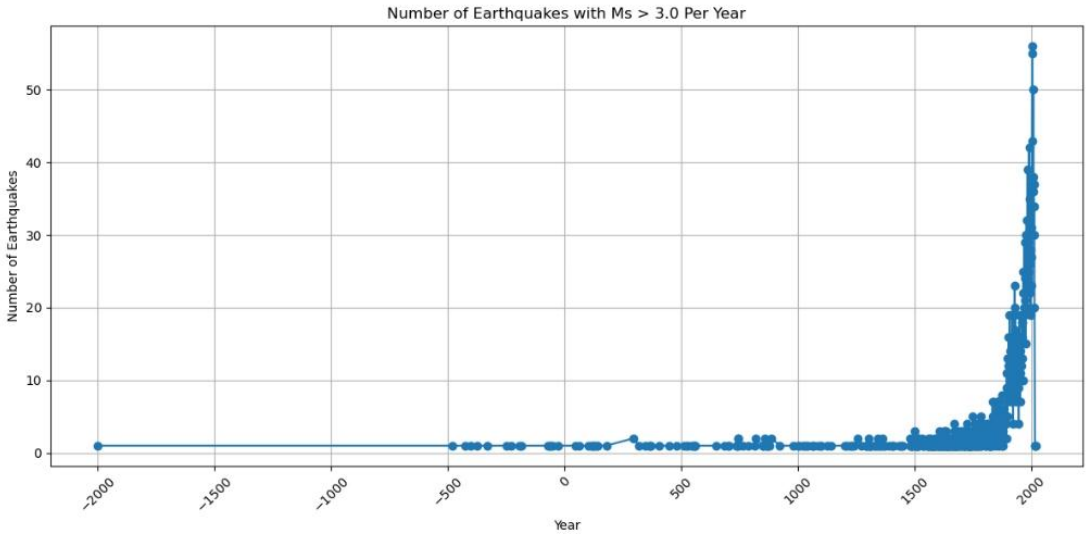
1.2 Observe any trends in the data:

The plot of earthquakes with a magnitude greater than 3.0 per year shows a significant increase in recorded earthquakes over time, especially in recent centuries. Here's a breakdown of the observed trends and possible reasons behind them:

From ancient times until roughly the early 20th century, the number of recorded earthquakes per year remains very low and relatively stable. This suggests either low seismic activity detection or limited documentation.

Starting around the early 1900s, there is a noticeable and steep increase in the number of recorded earthquakes, with a particularly sharp rise post-1950. This trend continues into the 21st century, where the count reaches much higher levels.

The significant increase in recorded earthquakes is more likely due to technological and logistical improvements rather than an actual increase in global seismic activity. The rise in detection sensitivity and global cooperation in seismic monitoring are key drivers of the upward trend observed in the data.



1.3

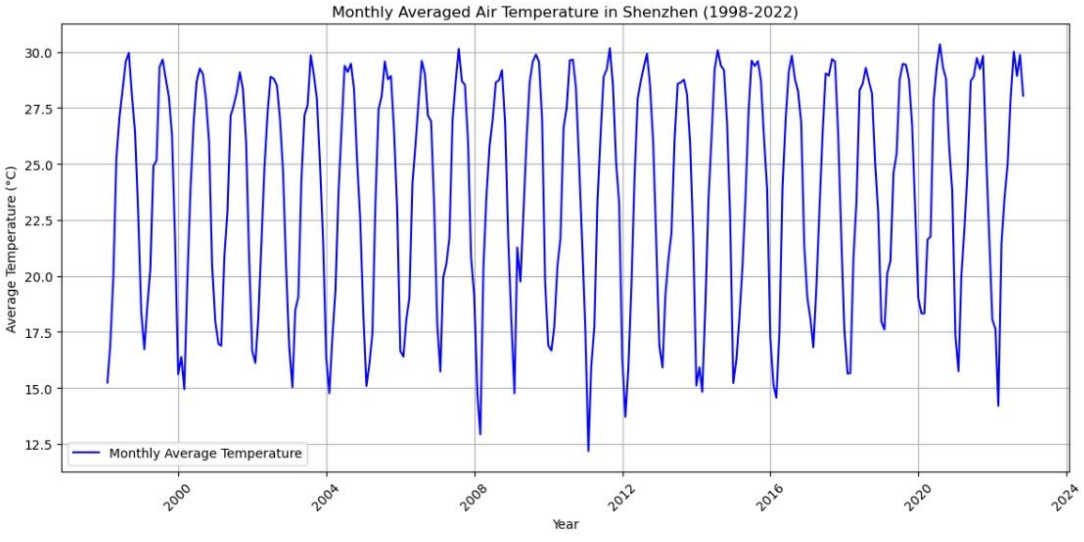
	Total_Earthquakes	Largest_Earthquake_Date	\
CHINA	623	1920.0-12-16	
INDONESIA	395	2004.0-12-26	
IRAN	386	856.0-12-22	
JAPAN	359	869.0-07-13	
ITALY	332	1915.0-01-13	
...	...	...	
TRINIDAD; GRENADA	1	None	
URUGUAY	1	None	
TIMOR SEA	1	1891.0-10-05	
BALKANS	1	None	
NaN	0	None	

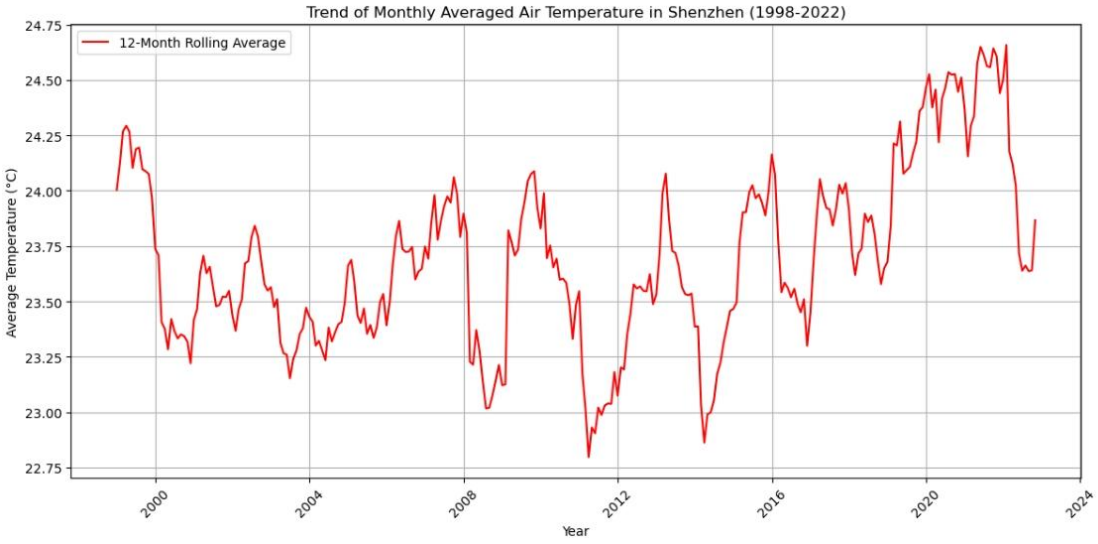
	Largest_Earthquake_Latitude	Largest_Earthquake_Longitude	\
CHINA	36.601	105.317	
INDONESIA	3.295	95.982	
IRAN	36.200	54.300	
JAPAN	38.500	143.800	
ITALY	42.000	13.500	
...	...	...	
TRINIDAD; GRENADA	NaN	NaN	
URUGUAY	NaN	NaN	
TIMOR SEA	-9.000	124.000	
BALKANS	NaN	NaN	
NaN	NaN	NaN	

	Largest_Earthquake_Ms
CHINA	8.6
INDONESIA	8.8
IRAN	7.9
JAPAN	8.6
ITALY	7.5
...	...
TRINIDAD; GRENADA	NaN
URUGUAY	NaN
TIMOR SEA	7.0
BALKANS	NaN
NaN	NaN

[351 rows x 5 columns]

2、Answer:





The data clearly shows an annual cyclical pattern, with temperatures peaking in the summer months (June, July, August) and reaching their lowest points in the winter months (January, February). This is due to the Earth's tilt and orbit, which create the four seasons. Summer months generally have higher temperatures, while winter months have lower temperatures.

There appears to be a gradual upward trend, especially in the summer months. For instance, temperatures in July and August have approached or exceeded 30°C in many years. Winter temperatures also show a slight upward trend, particularly in January and February.

In the summer, there are several months with temperatures above 29°C, especially in the summers of 2003, 2004, 2009, 2014, and 2022, where temperatures reached above 29°C; In the winter, there are several months with temperatures below 15°C, particularly in January 2011 and 2012, where temperatures were below 13°C.

In addition to seasonal variations, there are also fluctuations from year to year. Some years have relatively higher temperatures, while others have lower temperatures. For example, the summers of 2003, 2004, 2009, 2014, and 2022 had higher temperatures, while the winters of 2011 and 2012 were colder.

Overall, the temperatures seem to be increasing gradually, which may be related to global climate change and global warming.

3、Answer:

Please see PS2.jpynb. No need to support other things.

4、Answer:

Report the findings.

From the results of data visualization from 1980 to 2024, only the concentration of CFC-11 increased year by year, showing a linear trend; CFC-12, CFC-13, CH3CCl3, CCl4 and N2O all showed a decreasing trend, and finally reached a certain critical value and then stabilized. However, CH4 and CHCl3 showed a fluctuating trend with seasonal changes.

Second, in this dataset, I observed a significant negative correlation between chlorofluorocarbon (CFCs) and chlorofluorocarbon (HCFCs) substances CFC-11, CFC-12, CFC-113, CH3CCl3, and CCl4, which may mean that their distribution and origin in the atmosphere are somewhat similar. Or their behavior in the environment is influenced by similar factors. In particular, the high negative correlation between CFC-11, CFC-12, CFC-113, and CH3CCl3 may reflect their interrelationship and potential common source in atmospheric chemical processes. On the other hand, CCl4 shows a high positive correlation with these substances, which may indicate that its distribution and origin in the atmosphere is similar to other CFCs and HCFCs.

The positive correlation of N2O and CH4 with CFC-like substances suggests that they may have a common source or interact with each other in some environmental processes, which may be related to global climate change and atmospheric chemical processes. However, the low correlation of CHCl3 with other substances may indicate that its distribution and origin in the environment is different from that of other substances, or that its chemical behavior in the atmosphere is different from that of other substances.

With the exception of CH4, the distribution of all the other variables deviated significantly from the normal distribution, which may have implications for statistical analysis and model building and need to be considered in subsequent data analysis.

These findings suggest that we need to consider the interactions and common sources of these substances when studying atmospheric chemistry and global climate change. Further research could focus on the emission sources of these substances, their atmospheric transport routes, and their chemical reactions in the atmosphere. In addition, considering that CH4 is an important greenhouse gas, its positive correlation with CFCs may have an important impact on the global greenhouse effect, so further study of the interaction mechanism between them is needed. At the same time, more research is needed to understand the independent behavior and influencing factors of

CHCl3, a substance with low correlation. These studies will help us better understand and predict changes in atmospheric composition and their impact on the environment and climate change.