Weather in Ishikawa Prefecture in the Edo Period from the Kakuson diary

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Motivation for research
In the past four years, we have analyzed the weather of Sekiguchi diary, Nijo family diary,Myohoin diary, Moriyatoneri diary and Hirosaki domain diary.
This year, we analyzed the Kakuson diary. The purpose of the research
(1) Create a database in conjunction with these old documents examined in the past year.
(2) The 1816, which was said to be the "year without summer" due to the eruption of the Tambora volcano in Indonesia, and 1836, which was the most severe in Tenpoh famine, were compared. The research method
We classified the weather recorded in the historical diaries to make them closer to the definitions used by the Modern Meteorological Agency.
The data about the weather for 21 years: 7, 148 days has been gathered. Data1
The Kakuson diary calculated the rate of appearance for the entire period of weather and the period of the eruption of theTambora volcano from 1812 to 1816.
During the eruption period of the volcano, it was found that the rate of appearance of sunny weather decreased, and the rate of occurrence of rain increased.
It can also be seen that the incidence of sunny weather decreased further in the Great Tenpoh famine in1836, and the rate of occurrence of rain increased significantly. Data2
Compared to the weather in May and September of 1816 and 1836 in four ancient documents, it is common that the incidence of cloudy in July is high. The difference between 1816 and 1836 is a marked pick-up in the appearance rate of sunny weather in August 1816. Data3
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Looking at the rate of lightning in the four seasons, the rate of lightning in the summer of 1816 has decreased compared to the previous and previous years. On the other hand, autumn was the highest in 1816. Data5
Here, We decided to compare it with Ms. Mika Ichino`s paper by calculating the weather class and the global solar radiation by referring to the paper of her of the National Institute of Informatics. Since the description of the weather of the old document is various, the diary weather class is classified into three categories: sunny, cloudy, rainy weather and snow. This graph is converted from weather information in ancient documents to total solar radiation each year and compared over multiple years.
From this data, both 1816 and 1836 are lower than the average between 1821 and 1850. In other words, throughout two years, the total solar radiation is low, the cold season continues, and there is an impact on crops, etc., and it can be seen that famine has occurred. Discussion
First,as shown in the data 1 and, the appearance rate of sunny weather in 1812-1816 during the eruption activity period of the Tambora volcano was 36.12%, and it was 1.88% lower than the entire period, so daylight hours may have decreased and temperatures were low.
In addition, rom the data 2, in 1816, from summer to winter of Kakuson diary, the appearance rate of rainy

exceeds the one of sunny weather. It is thought that it was a year when the temperature of summer and autumn did not rise. Second, from data3 ,in the Kakuson diary, Hirosaki diary, Sekiguchi diary and Nijou family diary, the appearance rate of sunny in 1816 and 1836 has decreased.
The Tenpoh famine was to have been particularly severe lying in the Tohoku region, but as the latitude rises, the difference in the appearance rate of sunny between 1816 and 1836 is large. Third, comparing the average of 30 years from 1821 to 1850 and the total solar radiation in the summer of 1816 and 1836, the total solar radiation in both years are low.
Therefore, we think that the temperature also decreased. Summary of the study
(1)The appearance rate of sunny during the eruption activity period of Tambora volcano in the Kakuson diary was 36.31%, 1.71% lower than all periods, and the daylight hours may have decreased and the temperature may have decreased.
(2)It is said that the Tenpoh famine was particularly severe in the cold damage in the Tohoku region, but as the latitude rises, the difference in the appearance of sunny in 1816 and 1836 increases.
(3)The total solar radiation volume was lower than the average from 1821 to 1850 in 1816 and 1836. In other words, for the past two years, we can see that the total solar radiation has been low throughout the year, and the cold season has continued. Challenges for the Future
We will make data of the Sabae domain diarty and restore the weather information by using it. After that , we will analyze it in the wider period.

Keywords: Kakuson diary, Tenpoh famine, ancient document, total solar radiation volume