

Discusses wind direction, wind speed, solar illuminance, and the influence on different orientations of the old house



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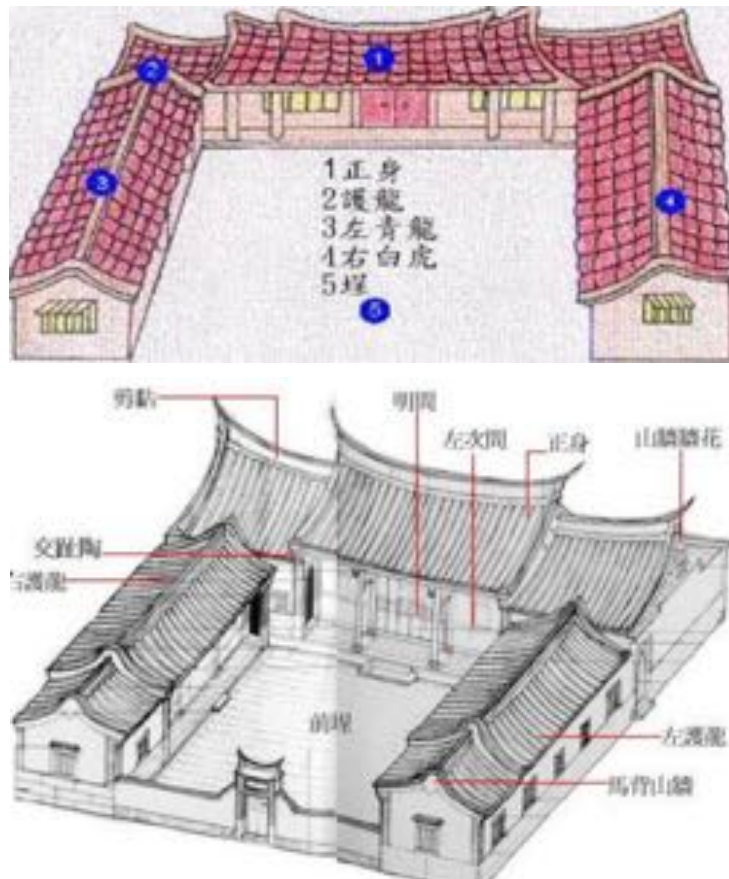
summary:

This study is based on the surrounding environment (meteorological factors: elevation angle, relative humidity, temperature, wind speed) of Kinmen's unique architecture, Hokkien style old house, and discusses the numerical relationship between them and makes rough conclusions. The following will be divided into: Introduction to the location of Kinmen, overview of the surroundings of the ancient house of this study, overview of the ancient house of southern Fujian, research motivation, research purpose, research instruments, research methods and procedures, research discussion and research conclusions

Overview of ancient houses: Min, abbreviated as Fujian Province, Kinmen is located in southern Fujian, and southern Fujian-style ancient houses are one of the characteristics of Kinmen Description of the structure of the ancient house:

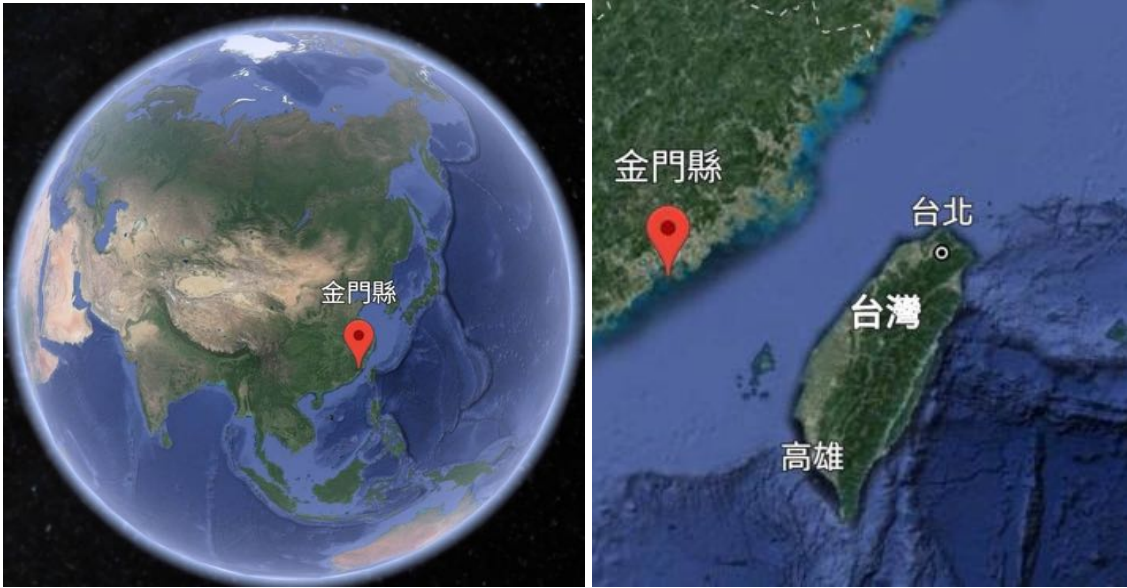
Cheng: Also known as courtyard and patio, it is an open space enclosed in front of or within a house

Dragon Guard: Known as "Giatau" in Kinmen, it is located on the left and right of the main body, and is perpendicular to the main body. Room: Located on both sides of the main body or in the dragon protection room, mainly used as a living or sleeping room.



old house sketch

The location of Kinmen county



The following picture shows the location of the old house in Kinmen:



The location of the red dot is the old house

the surrounding and introduction of the old house and the location of the old house:

Take photos of each parts of the old house:



Picture in front of the and old house



Picture of the back of the old house



Picture of the alley on the left side of the old house



Picture of the alley on the right side of the old house



Photographed in the grass behind the old house



Taken on the left side of the old house



Taken from the right window of the old house



Photo of the house on the right behind the old house



The right window behind the old house



Left window behind the old house



RESEARCH MOTIVATION :

When I was a child, I often heard the elders in the family say that when there was no tin house in front of our house (Gucuo: sitting north facing south), there was almost no wind in winter (northeast monsoon), and later because of the tin house, the wind blew into the home, so I wanted to find out the correlation between the four by exploring the wind speed, humidity, temperature and elevation angle of the surrounding environment of the ancient house

RESEARCH PURPOSES :

Understand the influence of wind direction, wind speed, solar illumination, and on different directions of the house (1) Observe the relationship between elevation angle value and relative humidity by recording the two (2) Discuss the relationship between each other by measuring the wind speed of windows in different directions

RESEARCH EQUIPMENT :

Wind speed and thermometer, moisture meter Wind speed and thermometer (the brown box on the right is the wind speed value (m/s), the green box is the temperature (°C))



Moisture meter software: HygroMeter (the bottom left picture is the app picture, the bottom right is the interface of the app measurement value)



RESEARCH METHODS AND STEP :

(1) Measure the wind direction and wind speed of the windows in different directions of the building at noon (2) Measure the illuminance, wind direction and wind speed outside the windows of different directions (3) Measure the temperature of the room where each window is located (4) Check the day on the website Sun

elevation and azimuth at noon, record data (5) measure again at 6 o'clock in the evening, repeat the above steps

RESEARCH DISCUSSION

(1) Elevation angle (vertical axis unit: S) Source of elevation angle value: Central Meteorological Station

As can be seen from the figure below, the noon elevation angle gradually decreases to gradually increases, which is related to the winter solstice sun shining on the southern hemisphere at 23.5 degrees. The elevation angle is the same on December 10 as on December 25, which lasts for 16 days

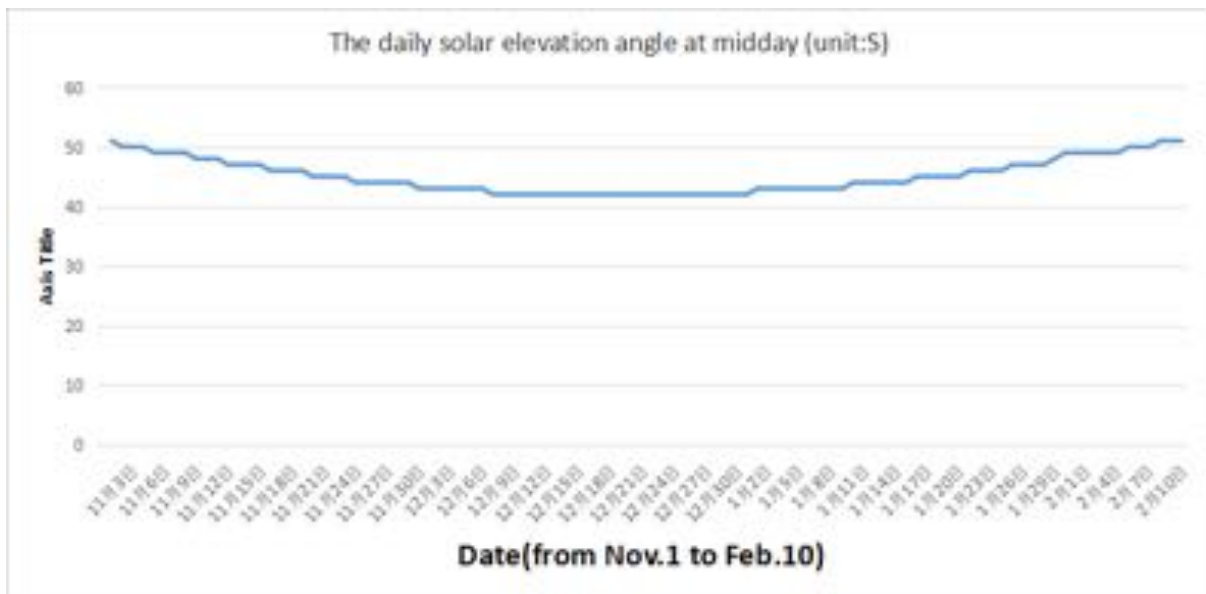


FIGURE1

(2)TEMPERATURE

The overall trend is slightly decreasing, but it can still be found that the temperature change is first decreased, then increased, then decreased, and increased again, with December and January temperatures being lower than November and the size of the standard deviation of temperature was January (3.35) > December (2.75) > November (2.25), which is consistent with the characteristics of Kinmen's spring temperature and warmth

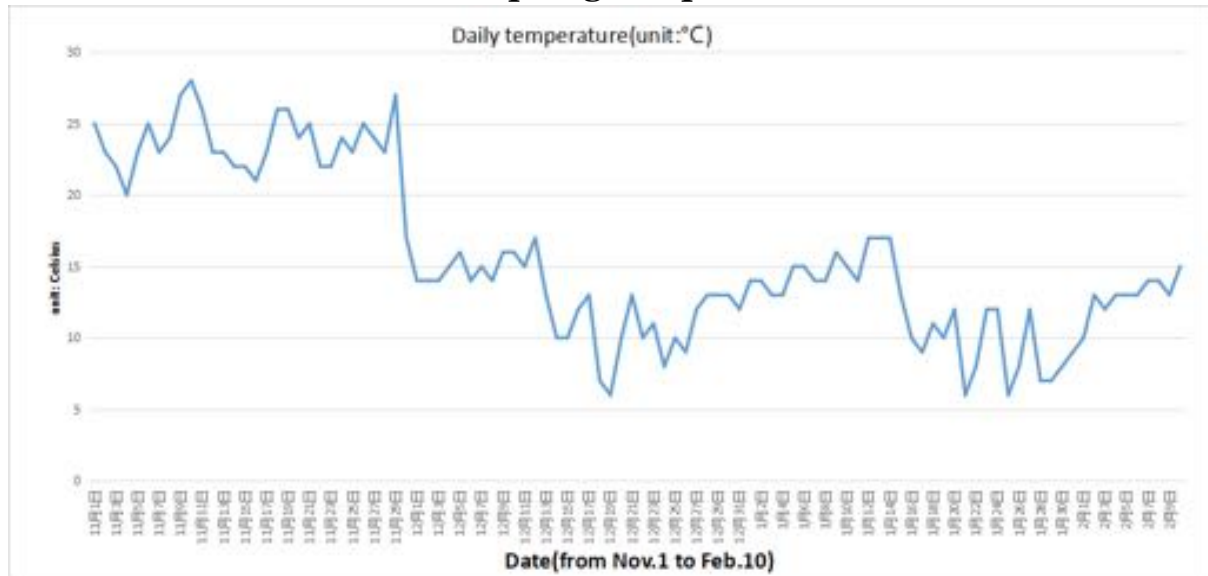


FIGURE2

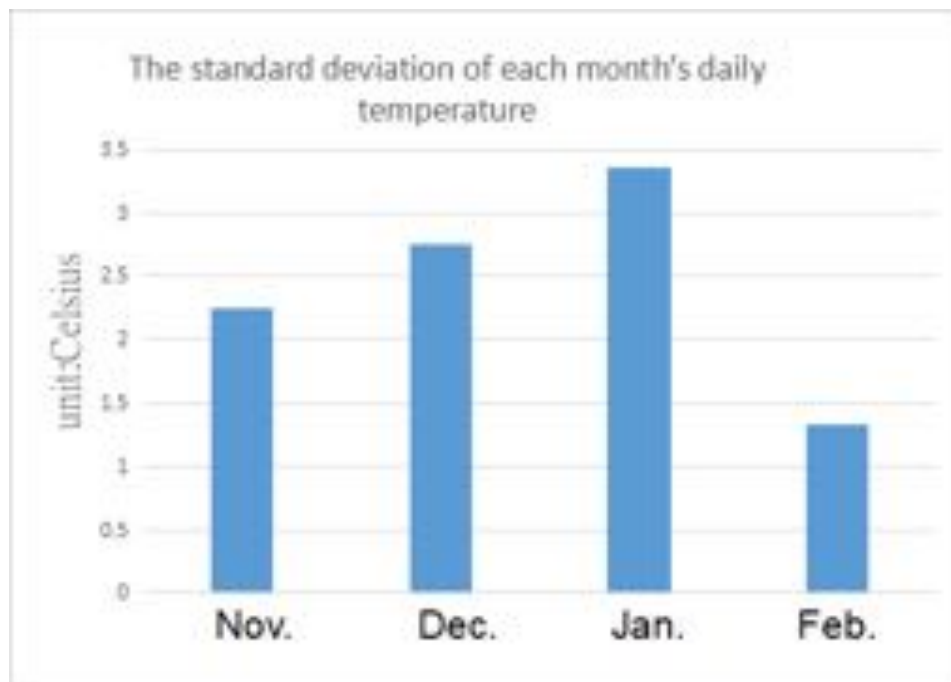


FIGURE3

(3)RELATIVE HUMIDITY

Relative humidity estimate of how the body feels about the weather on a particular day It can be seen from the figure that the humidity change is quite irregular, but it can be inferred that the humidity change will rise or fall irregularly, and the change is obvious. Among them, it can be found that the standard deviation of the relative humidity value is small when the elevation angle at noon becomes smaller (lowest point: 12/10~1/30) (as shown in Figure 5)

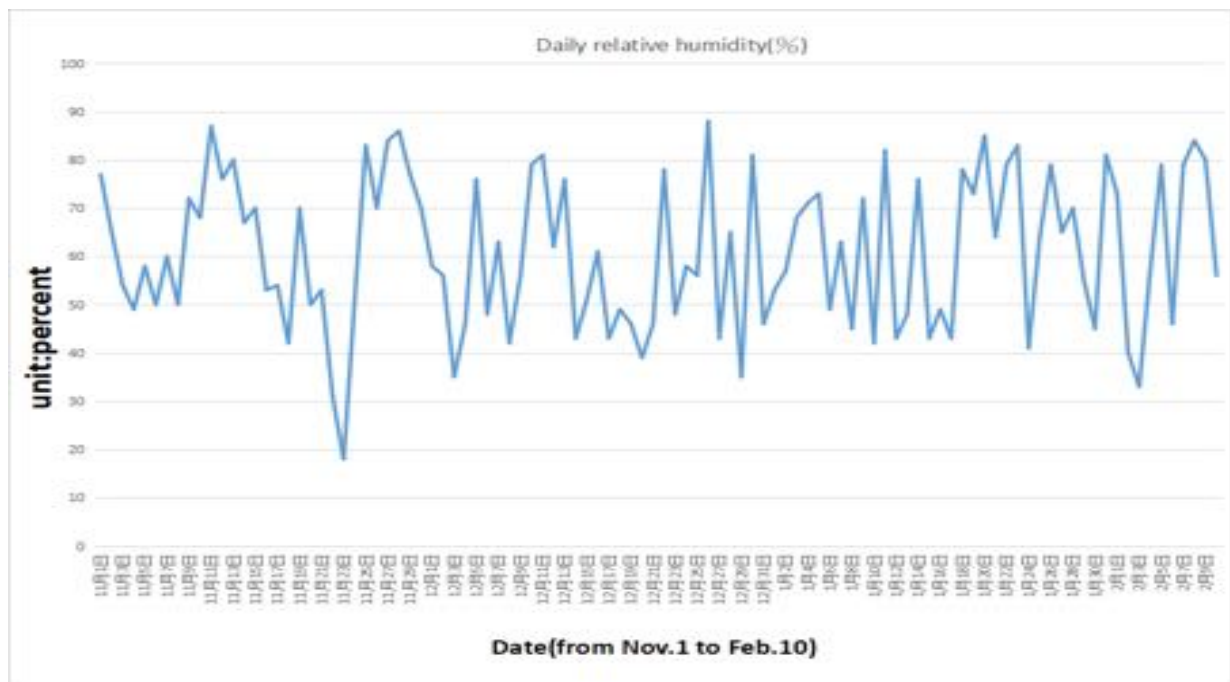


FIGURE4

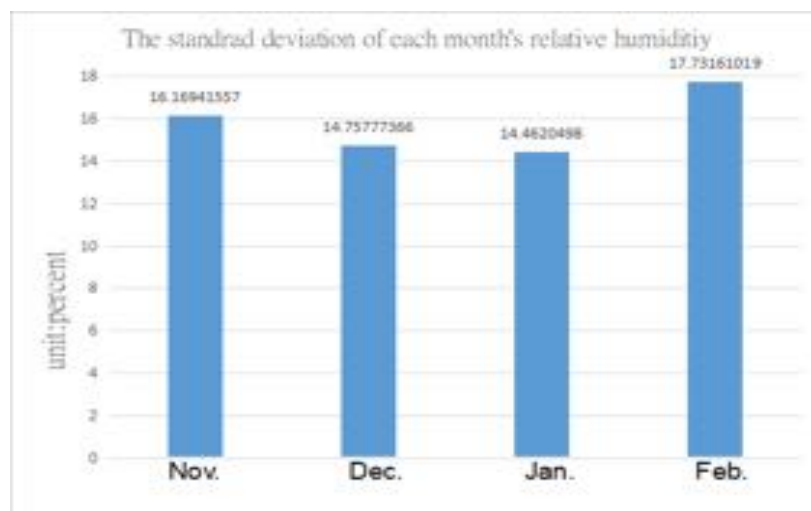
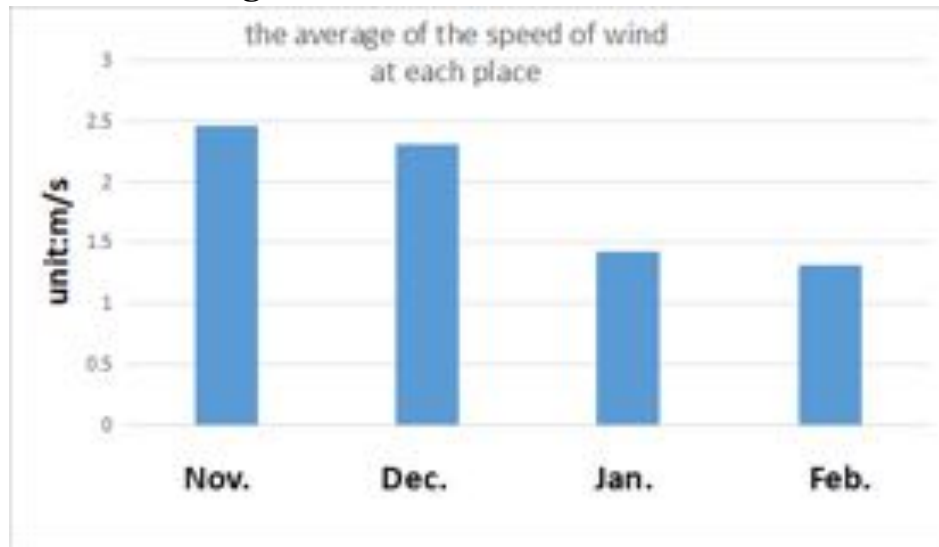
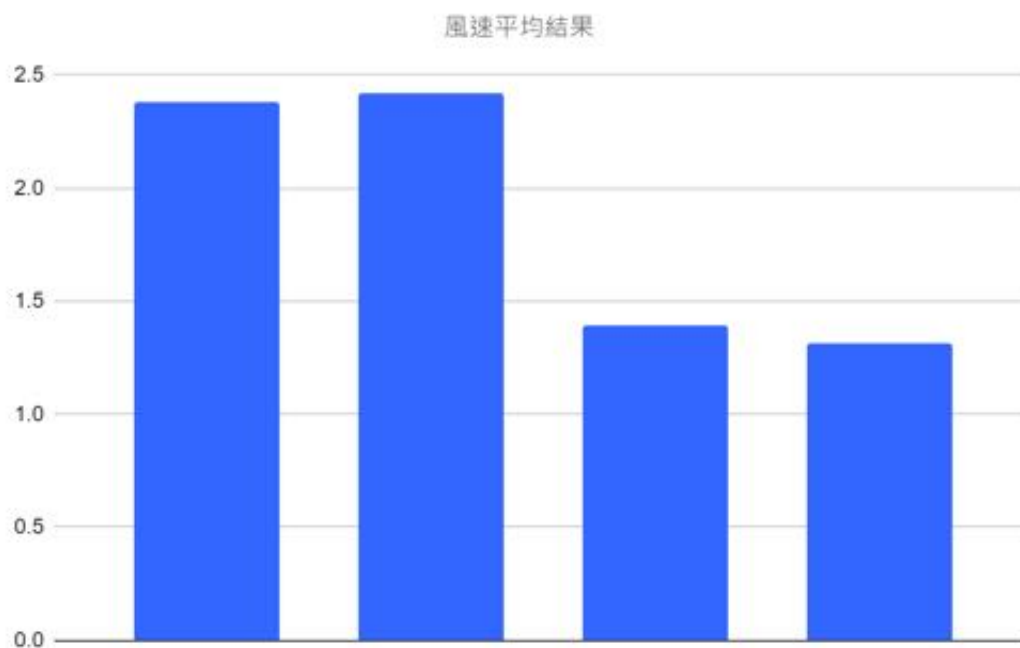


FIGURE5

(4)Average wind speed: (Figure 6) and (Figure 7) Results (columnar data from left to right, respectively, behind the house. Left rear. Left. Average wind speed measured in the window on the right)

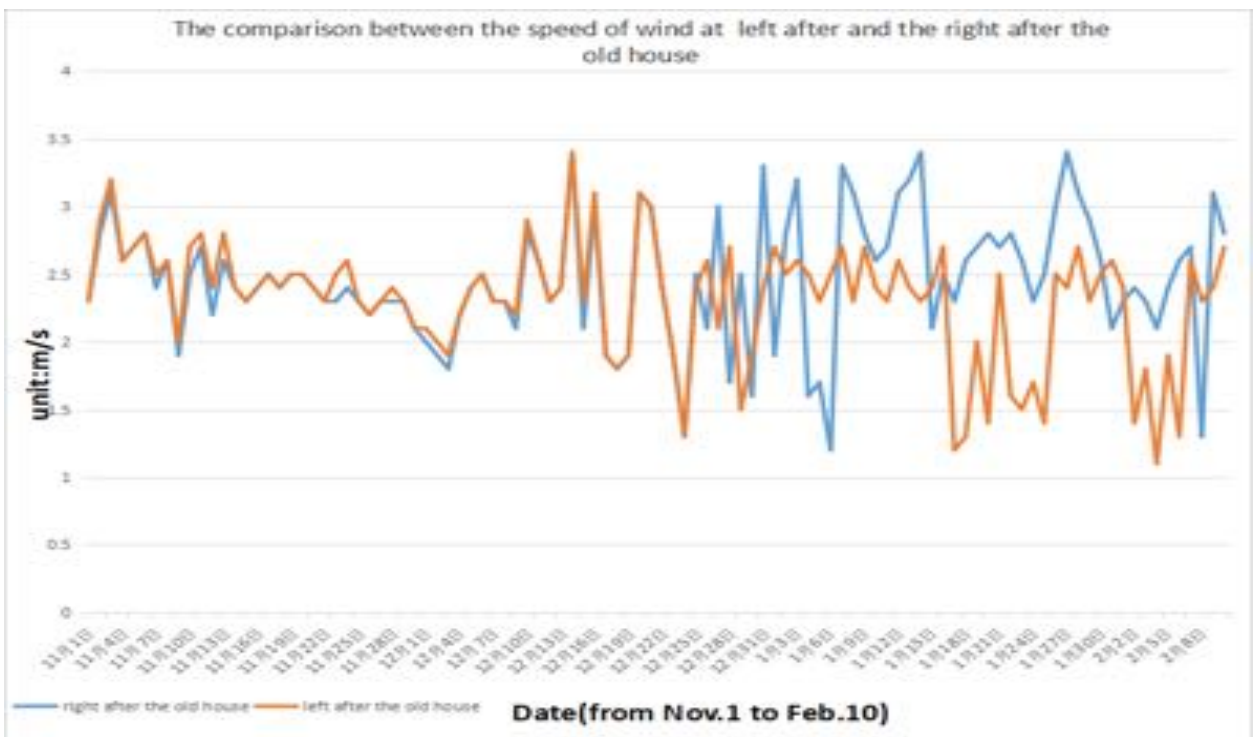


(FIGURE6)Average wind speed results from November to February



(FIGURE7)Average results of wind speed from November to December 25

It can be seen from the figure that after one month, the average wind speed results are compared everywhere, but it is rear left > rear right. Judging from the numerical standard deviation, the standard deviation of the wind speed at the rear right is greater than the standard deviation of the rear left (Figure 12). It is speculated that it may be because there is a residential building behind the right, and it is difficult for the wind to blow to other places, which may cause the wind to blow here. , or the wind is blocked by the houses and blows in the opposite direction from the houses to the ancient houses.



FIGURES

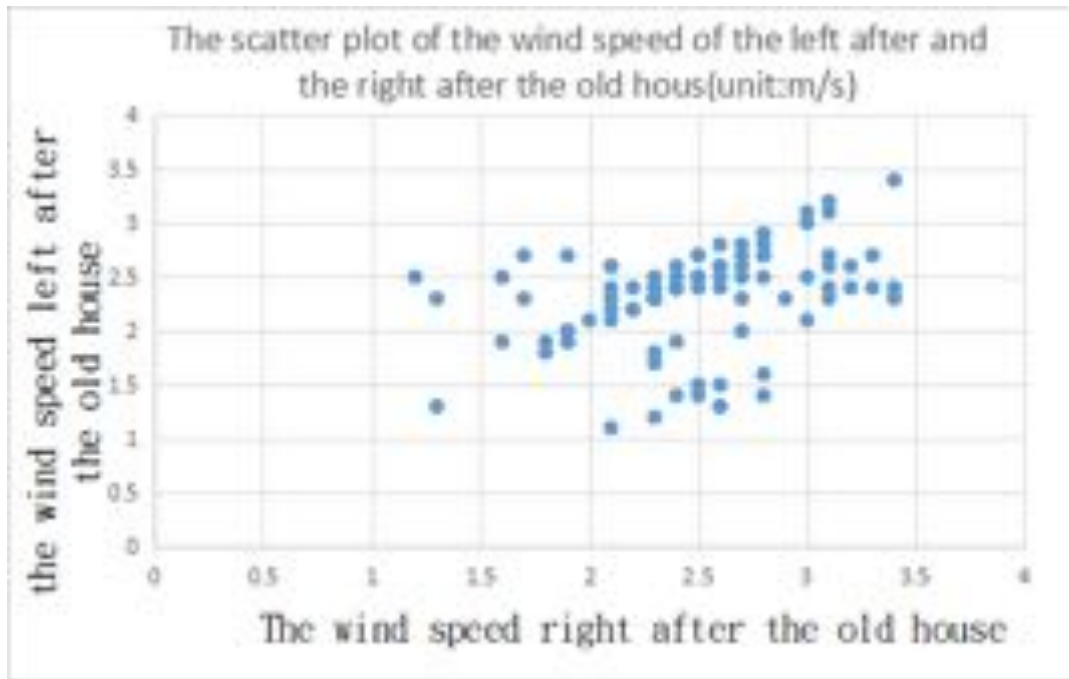


FIGURE9

(1) Generally speaking, the wind speed at the rear left and rear right should be similar (Figure 8), but the correlation coefficient value is 0.36 (Figure 9), which is not very ideal. (2) Since December 26, the wind speed behind the old house The difference in wind speed between the left and the rear right in the same day is larger than before

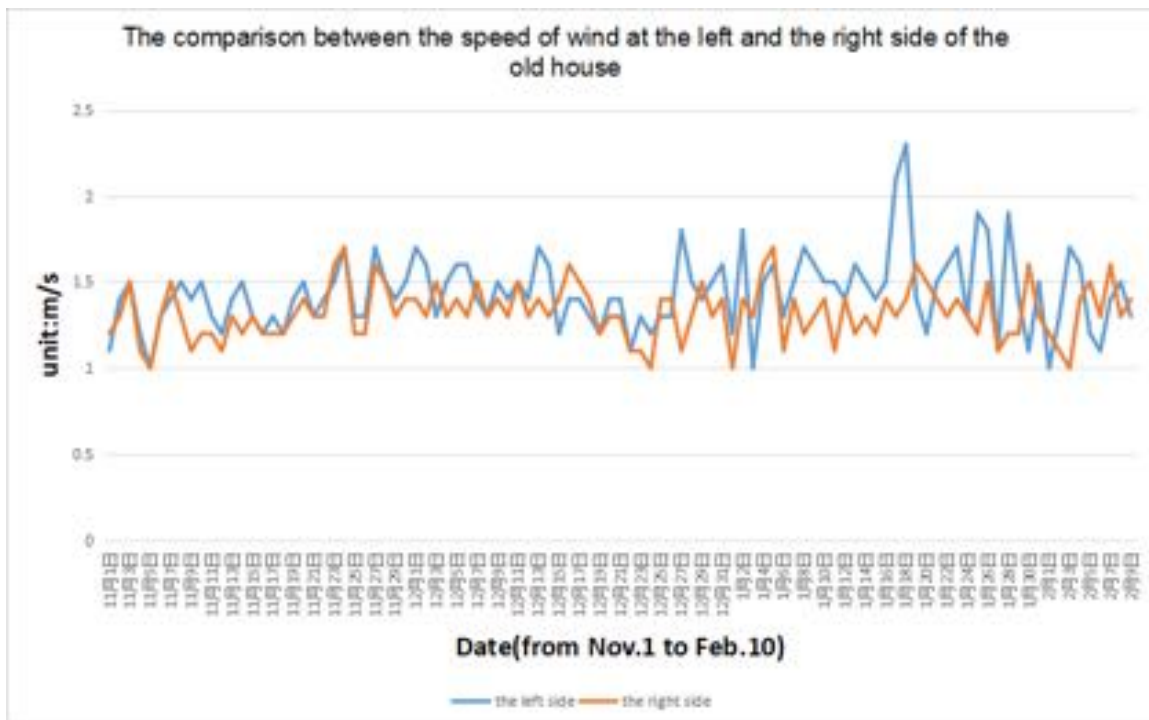


FIGURE10

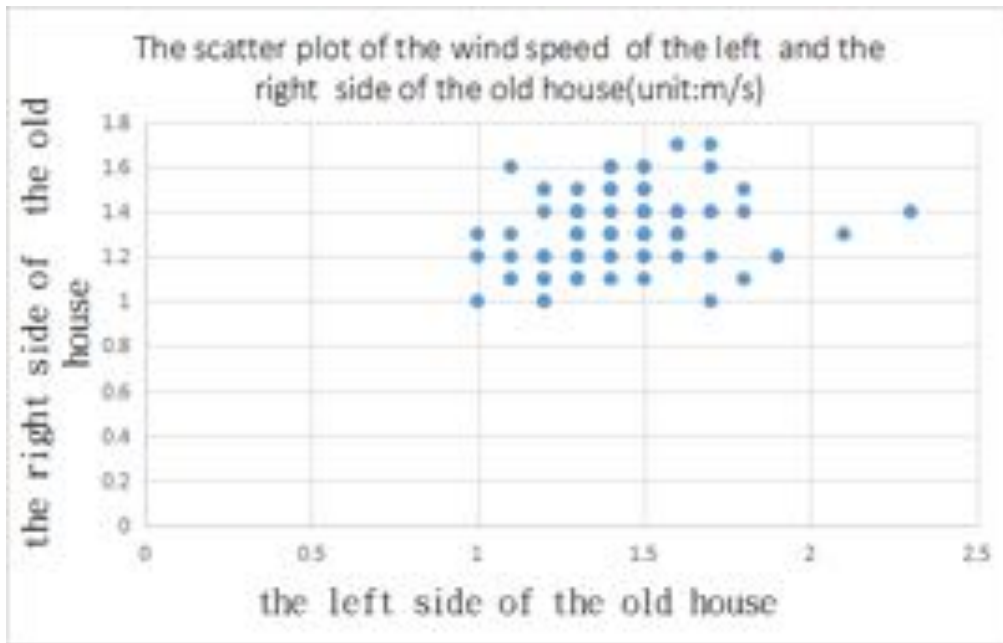


FIGURE11

Generally speaking, the correlation coefficient of wind speed between the left side and the right side is 0.23 (Figure 11 is the scatter diagram of the two), and it is lower than the correlation coefficient between the rear left side and the rear right side. Two residential houses, Figure 10 is the scatter diagram of the two)

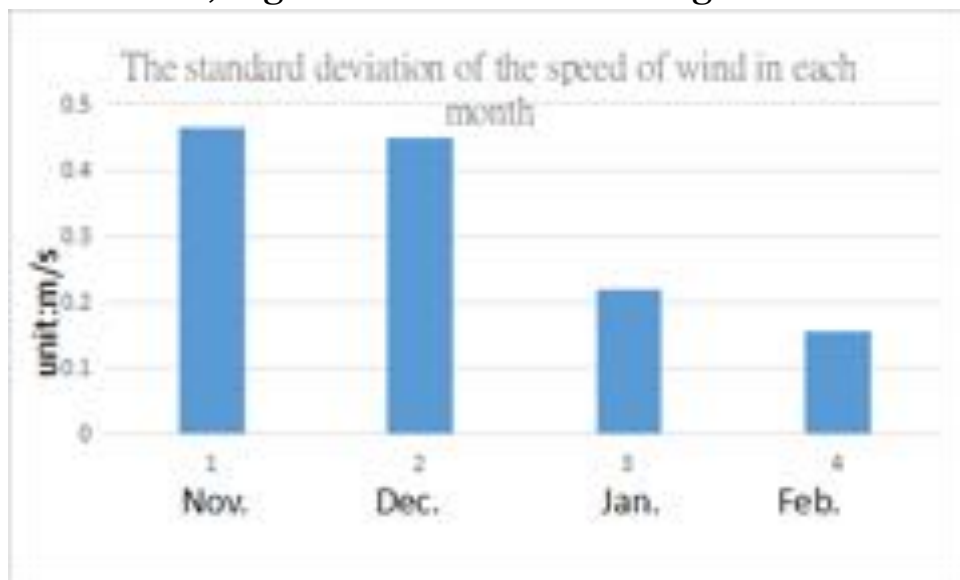


FIGURE12

conclusion:

(1) The lower the temperature, the lower the elevation angle, the smaller the change in relative humidity, and the greater the change in wind speed

(2) Because the wind speed changes greatly when the temperature is low, especially at the rear of the ancient house (rear left and rear right), but The correlation coefficient of the wind speed between the left side and the right side of the ancient house is larger than that between the left side of the ancient house and the right side of the ancient house. On the contrary, it is lower than the wind speed correlation between the left and right of the ancient house

(3) When the elevation angle decreases and then rises, the temperature drops instead; the minimum value of the elevation angle appears around the winter solstice, which is not directly related to the temperatures

Resources:

<https://pansci.asia/archives/115405>

泛科學一張圖看懂相對濕度怎麼算—《知識大圖解》