The Relation Between PM2.5 And Fog

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Our Final Team Photo

Abstract

Continuous observations from everyday life revealed that the 2020 data were then analyzed using data from weather stations. First comparing visibility with relative humidity, and using it to compared with PM2.5 data, it is concluded that the higher the relative humidity, the lower the visibility and the higher the relative humidity, the higher the PM2.5, plus weekday observation and literature discussion can be known, purple warning does not mean fog, but there is a large probability of fog will be purple warning. This is because the machine is unable to split the difference between water particles and PM2.5.

Research Motive

When the fog starts, both transportation and traffic are greatly affected. And in this small island where we grew up, it is a foggy place, especially in March-May, when spring comes, you can often hear that a flight is cancelled because visibility is too low, and people driving on the road are worried about their own safety and reduce the chance of going out, and in this case, the PM2.5 should have been reduced as expected.

Introduction to the Observation Environment

Kinmen is located near the Strait of China, but Kinmen belongs to Taiwan. Kinmenese moisture is very easy to circulate, by its most obvious in spring. The rise in temperature, in conjunction with the southeastern monsoon, results in saturation of the moisture vapor contained in the air near the ground, coupled with the sea around the sea and no tall barriers, it is very easy to achieve fog conditions.

Research Purpose

1. Explore the relation between visibility and PM2.5.

2. Whether water gas has an effect on the detection of PM2.5 instruments.

Research Method

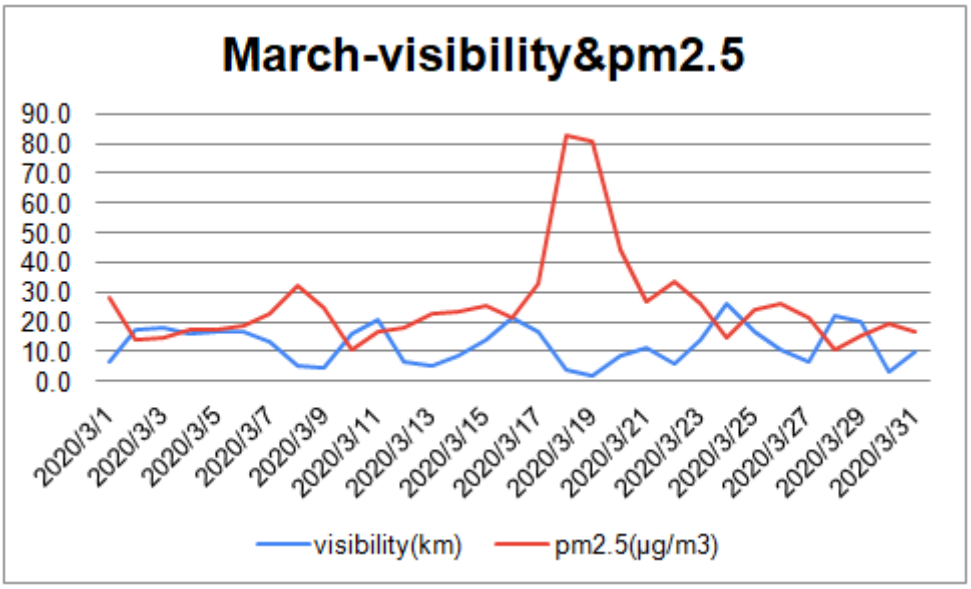
https://www.parenting.com.tw/article/5077004?fbclid=IwAR2XnrZgm0tYUVrOZsLYC8cCU1b4IjWSfG2aK-UfAsew7Ev5pydnRd1daU8(Photo Source)

Let's first compare the relative humidity with visibility. Visibility is low in foggy conditions because moisture blocks a large area of view. In this case, the frequency of residents going out is also relatively reduced, the frequency of the decline also indirectly affected carbon dioxide and emissions. Without these carbon dioxide and emissions, Kinmenese PM2.5 should theoretically fall, but Kinmenese PM2.5 doesn't fall, but rises as humidity increases.Therefore, we query, collect and compile the data of PM2.5 and relative humidity through the weather observatory, and we collate and draw a line chart to make a comparison. We found that they rose at the same time, but did PM2.5 affect the relative humidity or did the increase in relative humidity cause PM2.5 to rise?

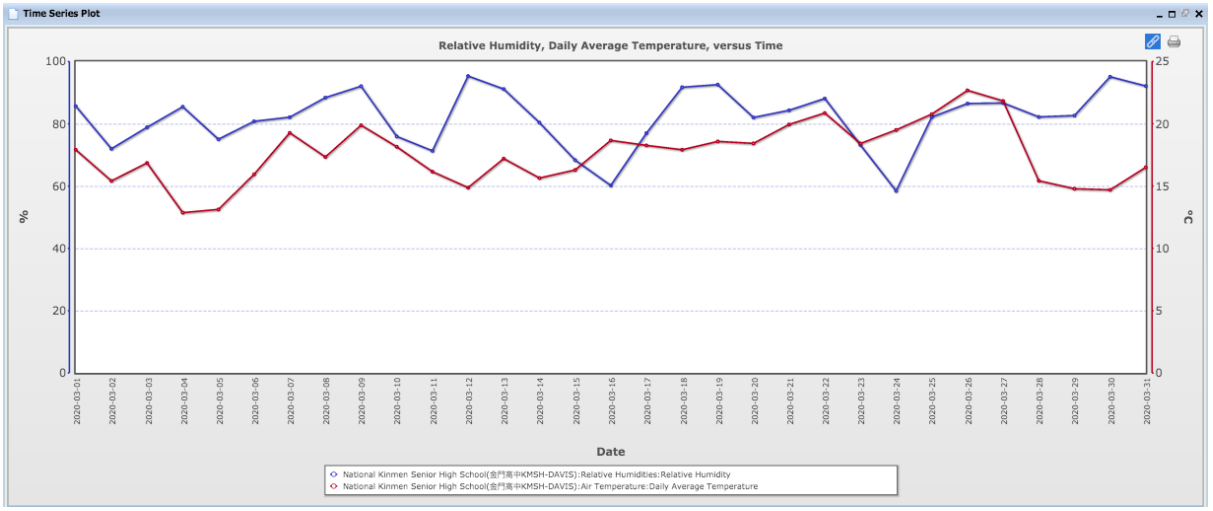
Research Conclusion

1. All our data are taken from 2020.

2. Y-axis is a value of visibility (km) and PM2.5 (μg/m^3).

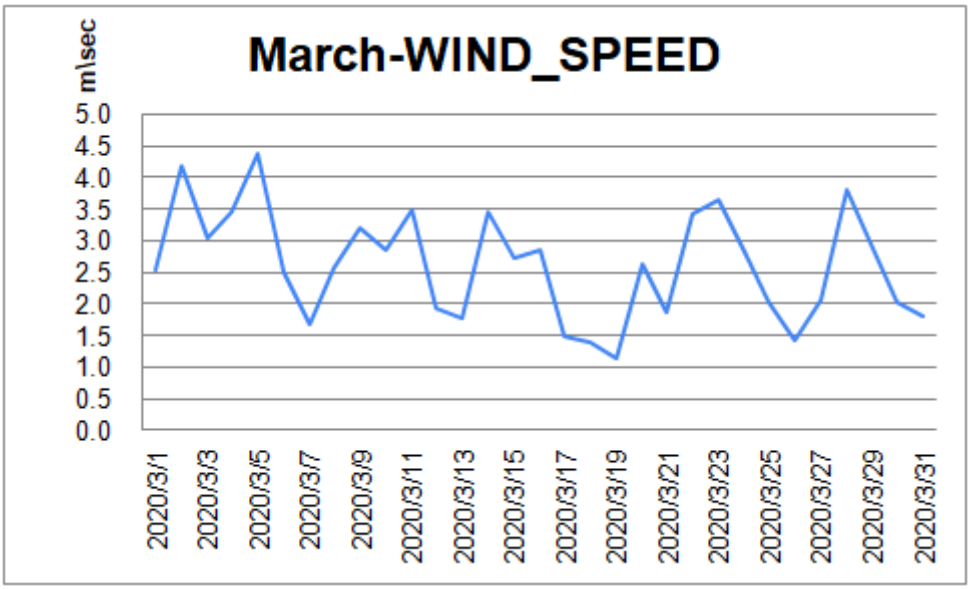


*There has been a marked increase in PM2.5 from sixteenth March to eighteenth.

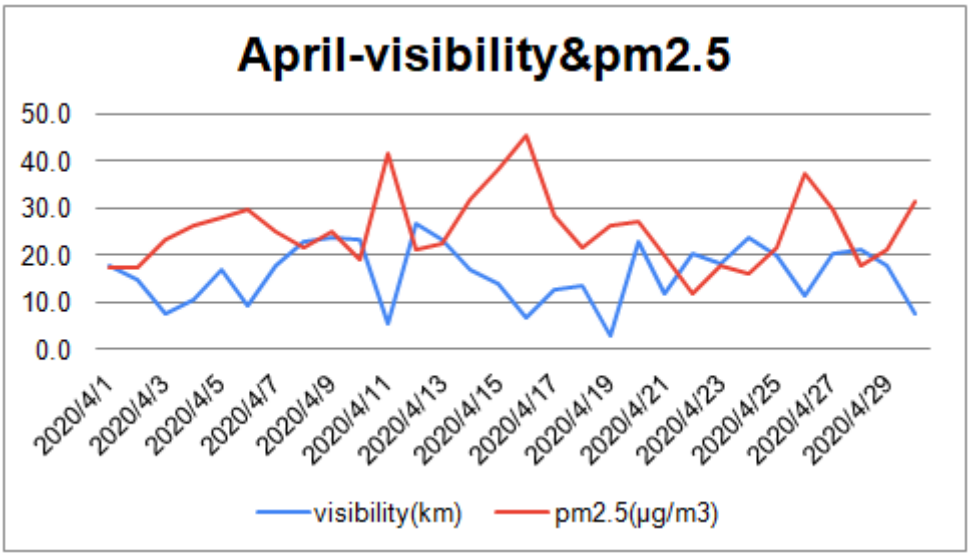


*The relative humidity is not proportional to the temperature when fogging.

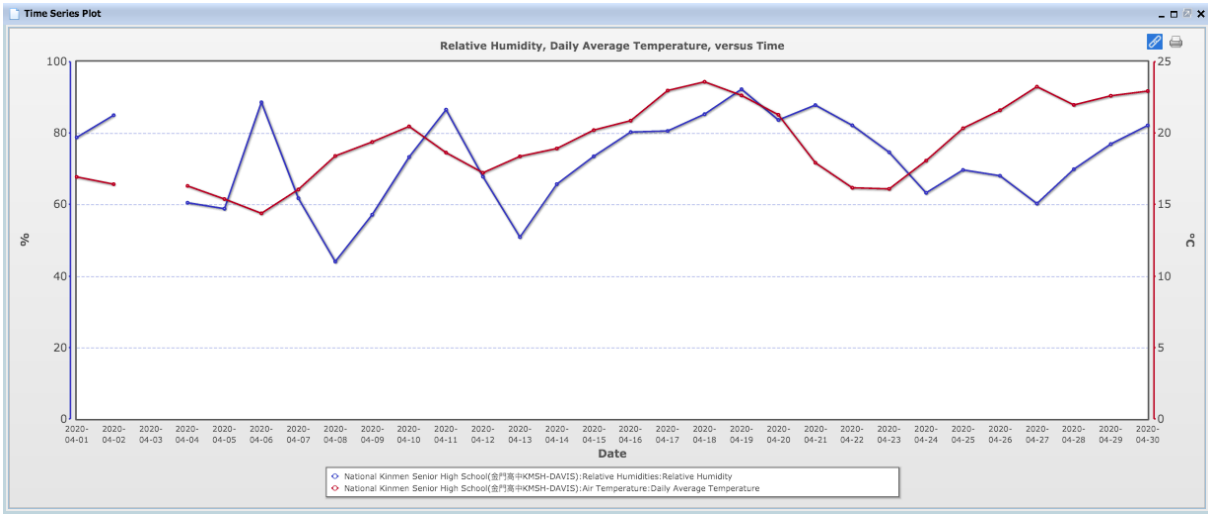
*By the relation between temperature and humidity, it can be seen that the temperature of foggy days is moderate and humidity is high.



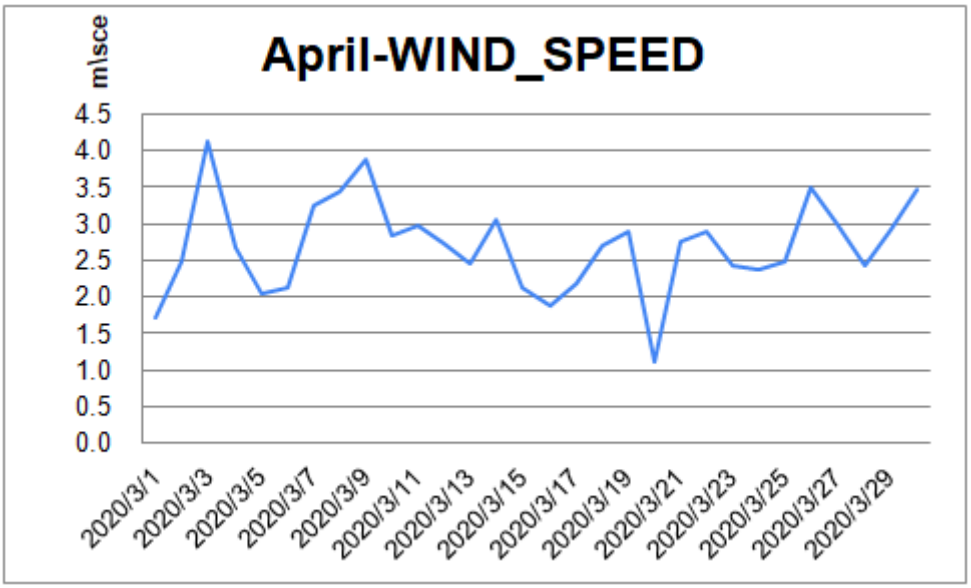
*With the wind speed data, we can know that the wind speed on foggy days is not high.



*There is a clear gap of PM2.5 on sixteenth April.



*By the relation between temperature and humidity, it can be seen that the temperature stable humidity on foggy days has great fluctuations.



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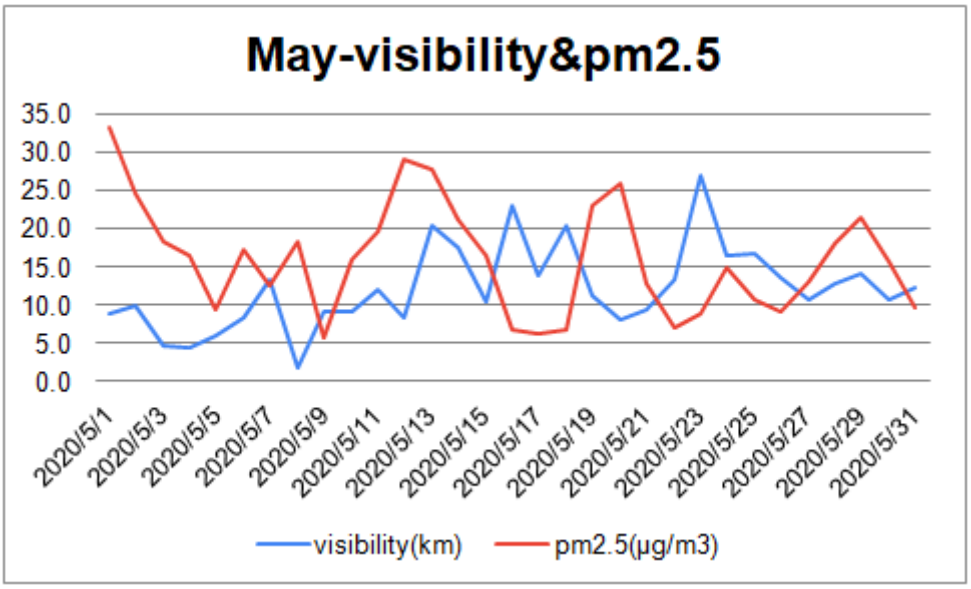
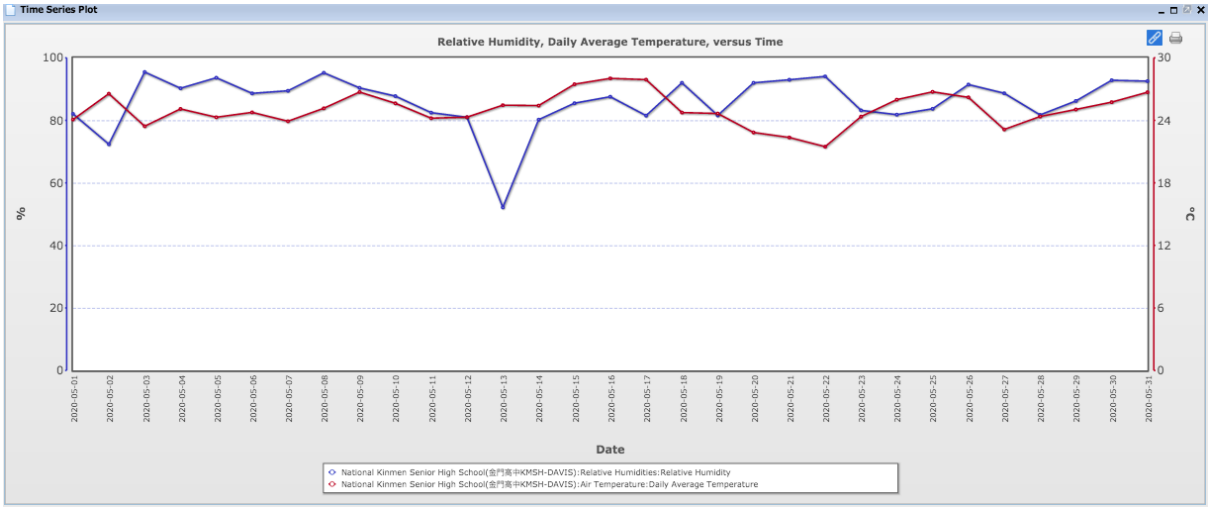


*Visibility was good on May 12th, and it was known that the purple warning did not mean fog. When the moisture in the air increases, visibility decreases, but the concentration of PM2.5 increases.



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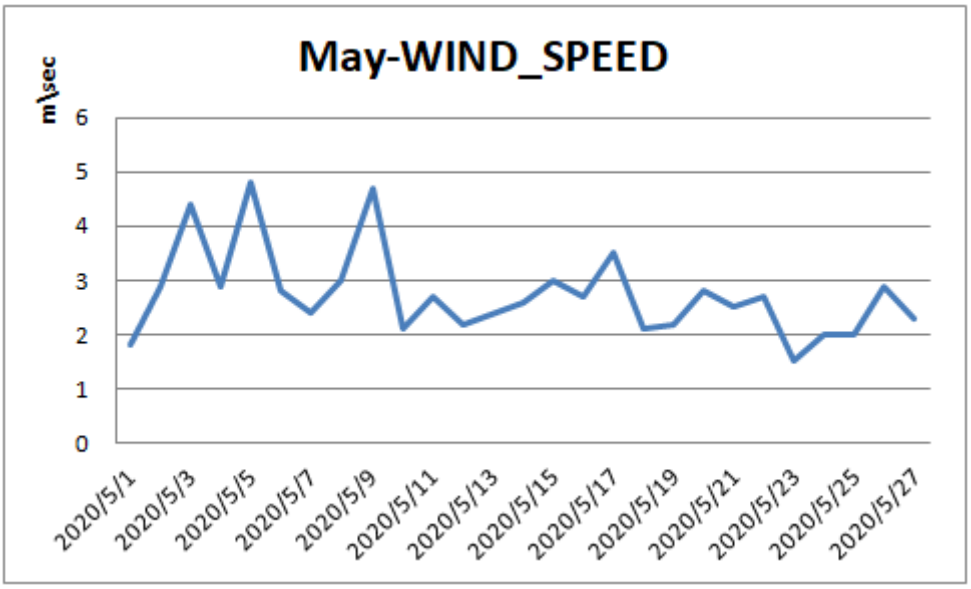

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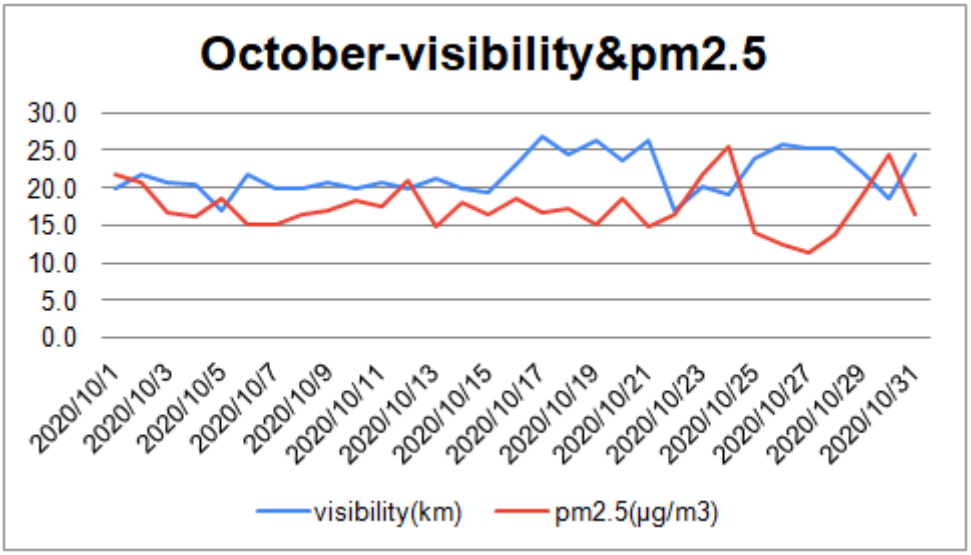
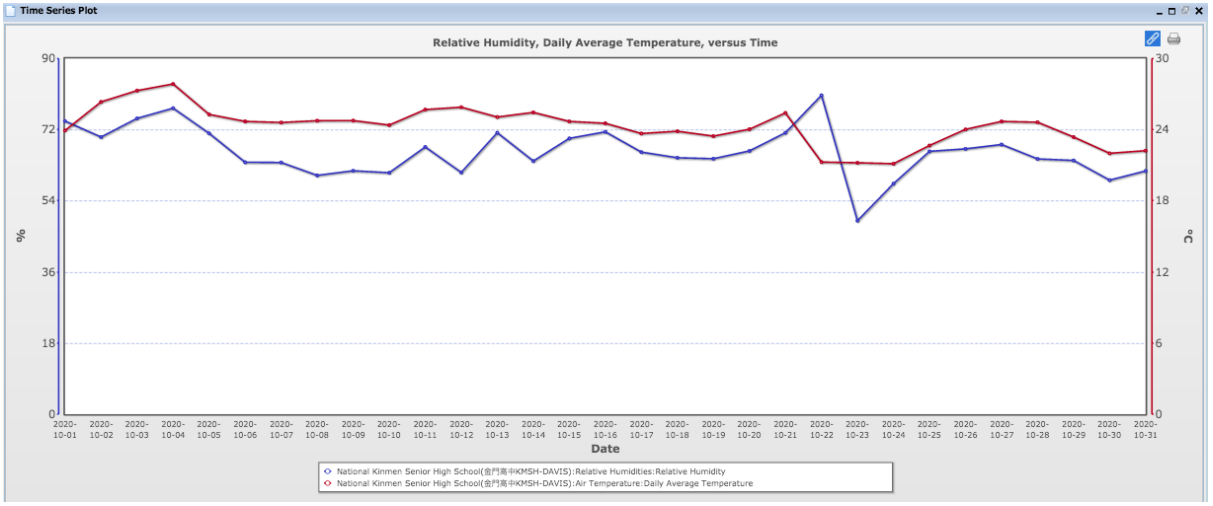
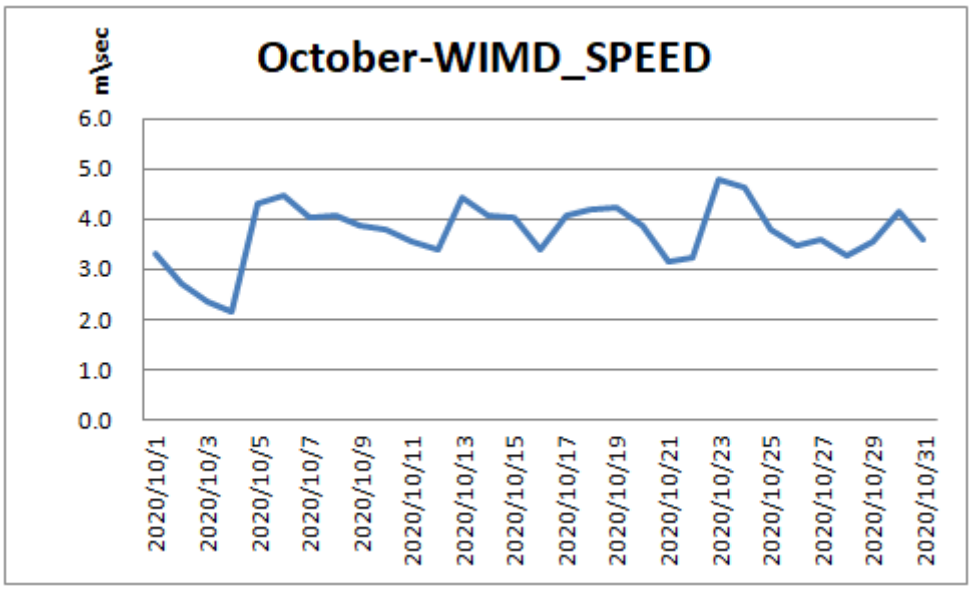


*The autumn figures don't contrast too sharply.



*Even if there is no fog in October, the humidity figures are not too low.



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Because Kinmen is located around the sea, there are no mountains to block moisture, coupled with the southwest wind brought about by warm and humid air, and cold air, so that Kinmen can easily form fog. **According to our research, humidity is generally low and foggy conditions are not easy in October in Kinmen.**

Discussion

Comparing this with other fog-less data, it is learned that the PM2.5 instrument was unable to distinguish between moisture and PM2.5, resulting in PM2.5 instruments being forced into the PM2.5 calculation in the spring data when they measured water particles in the air. So when the PM2.5 value rises, it's not necessarily the particles that the front brings to the factory, it's also possible that spring is coming, causing the moisture content in the air to rise.

The cause of the northeast monsoon is that the high pressure of the mainland southwards, in the bringing of water and gas mixed with air pollution and dust from local factories, and the southwest wind is blown by the Indian Ocean air, in addition to bringing water and gas does not bring too much pollution.

Conclusion

In this report, we learned that when a "purple warning" occurs, it is sometimes not entirely PM2.5, or that fog may have caused the machine to misjudge the moisture to PM2.5. Relative humidity was not associated with PM2.5 concentrations. Perhaps in the future, technological developments can make measuring devices more accurate, but also to avoid this often "purple warning" situation, so that PM2.5 accusation can be less.

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