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NATIONAL KINMEN SENIOR HIGH SCHOOL



# THE RELATIONSHIP BETWEEN KINMEN'S TEMPLE AND CO<sub>2</sub>

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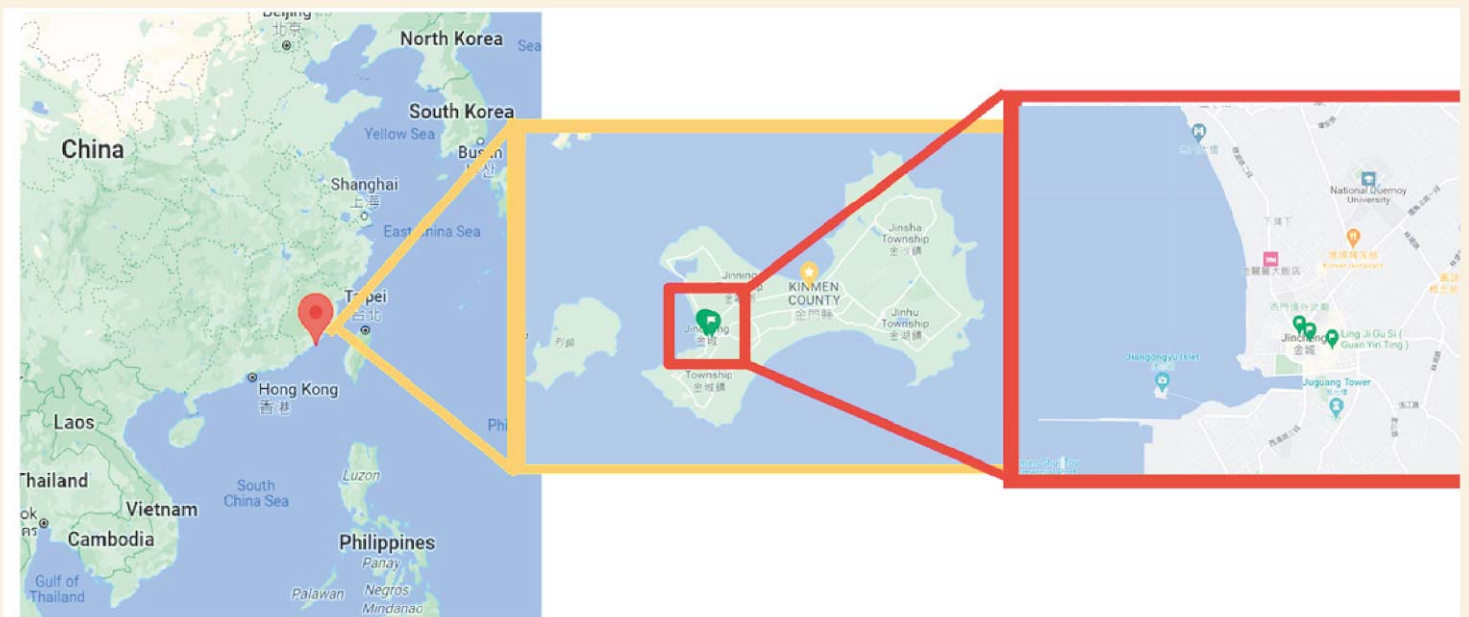


# Abstract

This study points out the correlation between the CO<sub>2</sub> values of temples and the usual worship habits of the Kinmen people, as well as the numerical differences between the temple inside and outside the temple. To discuss the influence of temple structure on it, and compares the environment, date, and related objects that produce CO<sub>2</sub> in the temple. It was found that the CO<sub>2</sub> value was indeed higher at the beginning of the day, and the Ximen Waiwu Temple with a higher value was also significantly smaller in terms of architectural structure.

# Background

## Where is Kinmen?





Buddhism and Taoism is the largest religious group in Kinmen, it can be seen everywhere in the prosperous area, and the annual religious events have affected the lives of many local residents, and worship is also commonplace, but every time I go to the temple, there is smoke, we speculate that these may come from burning gold paper, incense, candles and other burning behaviors, and those smoke may be CO<sub>2</sub> formed by combustion.



# Research purposes

- Will the CO<sub>2</sub> value in the temple be relatively high? Why?
- The relationship between customs and carbon dioxide values

## Research method

- (a) Measuring the CO<sub>2</sub> index inside and outside three different temples with hand-held CO<sub>2</sub> detectors and recording the observation data with mobile phones.
- (b) Every evening from 2.19-2.25, to the Wu Temple outside Ximen, the CO<sub>2</sub> index is measured by hand-held CO<sub>2</sub> detector, and the observation data is recorded with mobile phones.
- (c) CO<sub>2</sub> Sensor :



▲Measure handheld

# Discussion

## ► Difference in CO<sub>2</sub> inside and outside the temple (2\19)

### (A) Observational data

	Outside the temple	Outside the temple
<b>Ximen Waiwu Temple</b>	<b>442(ppm)</b>	<b>856(ppm)</b>
<b>Huodao City God Temple</b>	<b>440(ppm)</b>	<b>666(ppm)</b>
<b>Lingji Ancient Temple</b>	<b>509(ppm)</b>	<b>1341(ppm)</b>

### (B) Temple differences

	Temple size	Number of incense burners	Temple environment
Ximen Waiwu Temple	middle	5	The incense burners are close and there are no vents on the left and right
Huodao City God Temple	big	8	There are passages on the left and right sides, and the space is wide.
Lingji Ancient Temple	small	6	The air circulation is poor and the surrounding streets are crowded



incense  
burner



Ximen  
Waiwu  
Temple



Huodao  
City God  
Temple

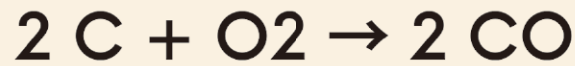


Lingji  
Ancient  
Temple



## (C) Discussion of the outcome

- Through the data, the CO<sub>2</sub> value in the temple is higher than that outside the temple. We observe that the reason is that there is a large amount of burning incense in the temple, according to the chemical formula:



It is caused by the production of CO<sub>2</sub> after combustion.

- CO<sub>2</sub> value: Xudao City God Temple < West Gate Outer Martial Temple < Spirit Sacrifice Ancient Temple. The reasons: The temple itself or the surrounding crowd, CO<sub>2</sub> can not spread outward. Although the Island City God Temple has the largest number of incense burners, but each incense burner is very scattered, the space inside the temple is also very wide, so the CO<sub>2</sub> index is slightly lower.
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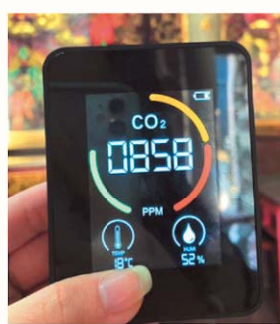
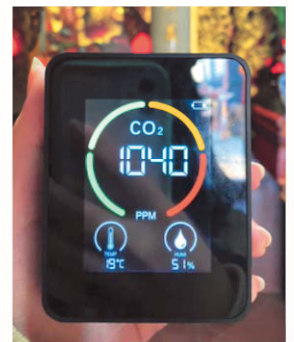


# ► Daily observation of CO<sub>2</sub> value in the Wu Temple outside Ximen

## (a) Observational

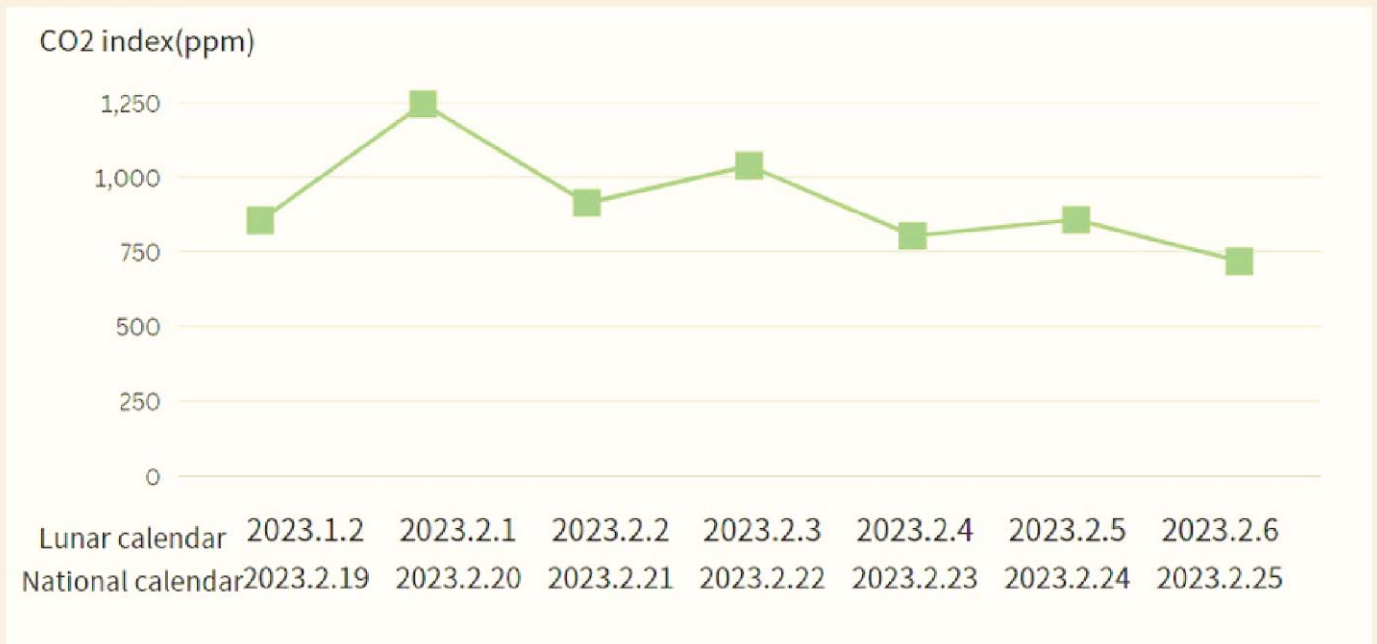
National calendar date	2023.2.19	2023.2.20	2023.2.21	2023.2.22	2023.2.23	2023.2.24	2023.2.25
Lunar date	2023.1.28	2023.2.1	2023.2.2	2023.2.3	2023.2.4	2023.2.5	2023.2.6
CO <sub>2</sub> value(ppm)	856	1247	915	1040	804	858	719
wind speed (m\s)	5.1	6.7	6.9	3.6	2.7	5.1	6.8

[Lunar calendar: The lunar calendar is a lunisolar calendar traditionally widely used in Chinese character cultural circles, which is suitable for the timing of agricultural production, hence its name.]



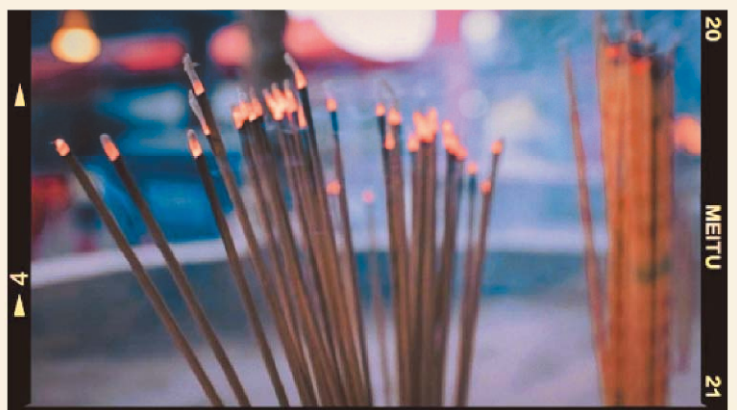


## (b) Discussion of the outcome



▲Daily line chart of CO<sub>2</sub> values at Ximen Waiwu Temple (Figure 2-1)

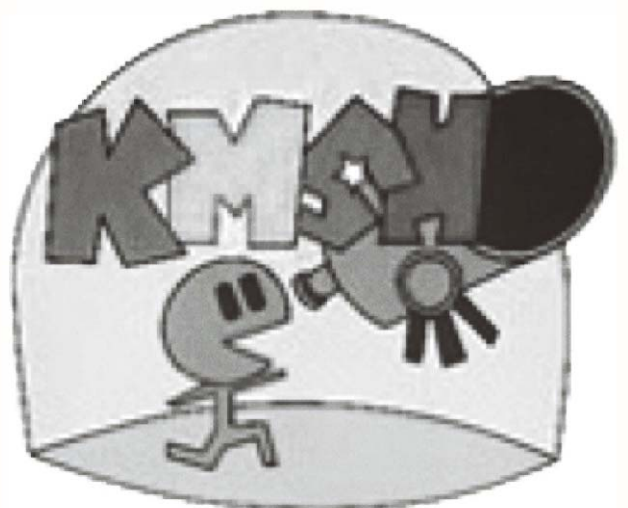
It was found that the CO<sub>2</sub> value on the 2.20 day (2.1 of the lunar calendar) was higher than that of other days. After checking the Internet and asking the elders, I learned that many families would go to the temple to worship on the first and fifteenth of each month of the lunar calendar, which originated from the fact that in ancient times, merchants would worship in order to respect the local gods and pray for their business prosperity, so they would worship on the 15th day of the first year.





▲Daily wind speed line chart of Ximen Waiwu Temple (Figure 2-2)

In addition, we compared the CO<sub>2</sub> data. If the temple is ventilated, the wind speed will be inversely proportional to CO<sub>2</sub>; Conversely, if the temple is not ventilated, the wind speed will be independent of carbon dioxide. From Figure (2-1) and Figure (2-2), it was found that wind speed and carbon dioxide were not directly related, so it was inferred that the Wujing Temple outside Ximen was generally not ventilated.



# Conclusion

- (1) The production of CO<sub>2</sub> is positively correlated with the practice of worship, and the temple environment is also a contributing factor.
- (2) There are also special festivals to worship on the first and fifteenth days of the Kinmen lunar calendar, so the crowds increase, resulting in a change in the famous line of CO<sub>2</sub> values.
- (3) The Wujing Temple outside the West Gate is generally airtight.

## Team photo





# References

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