



Explore the relationship between surface temperature at different times and locations

LIU, RUEI SHENG , PAN, CHING YUAN
Taipei Municipal Wan Fang High School

Taiwan

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Abstract

- We selected seven locations on campus with different surface conditions to observe the surface temperature at 12:00 noon and 17:00 pm, and observed that the sun is the main factor affecting the temperature. Among other things, cloud cover and varying land surface conditions can affect temperatures. There is a high negative correlation between cloud coverage and air temperature, and the surface temperature of the runway is higher than other surface conditions such as asphalt roads and grass at 12:00 noon.

Research Question and Hypothesis:

- Our research Questions

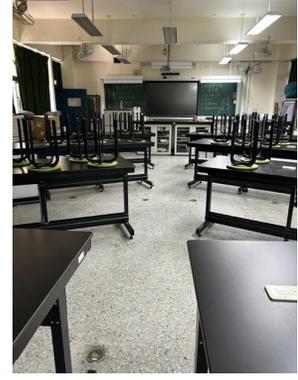
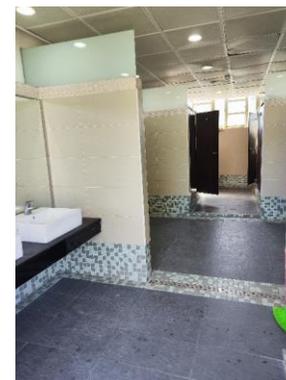
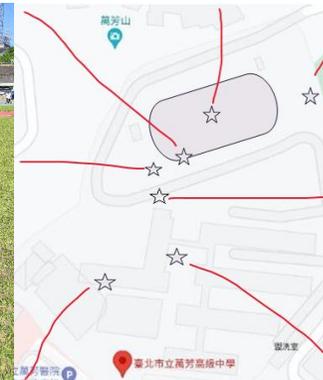
1. What are the differences in air temperature and surface temperature at different times and in different surface conditions?
2. Does cloud cover affect air and surface temperatures?

- Our Hypothesis:

We believe that the sun is the most important key factor affecting the temperature. We believe that in addition to sunshine, water and cloud coverage may also affect the measured surface temperature, because water absorbs heat and evaporates to take away heat, and when cloud coverage is high, it will shade the sun and cause cooling.

Research Methods and Materials

- We apply the surface temperature protocol in GLOBE, use the same instrument to measure the surface temperature. We took surface temperature measurements at seven different locations on campus between 12:00 noon and 5:00 pm on five days during the school day (From December 19, 2022 to December 23, 2022). The following are maps and photos of our seven observation sites on campus. Surface conditions have been dry for five days

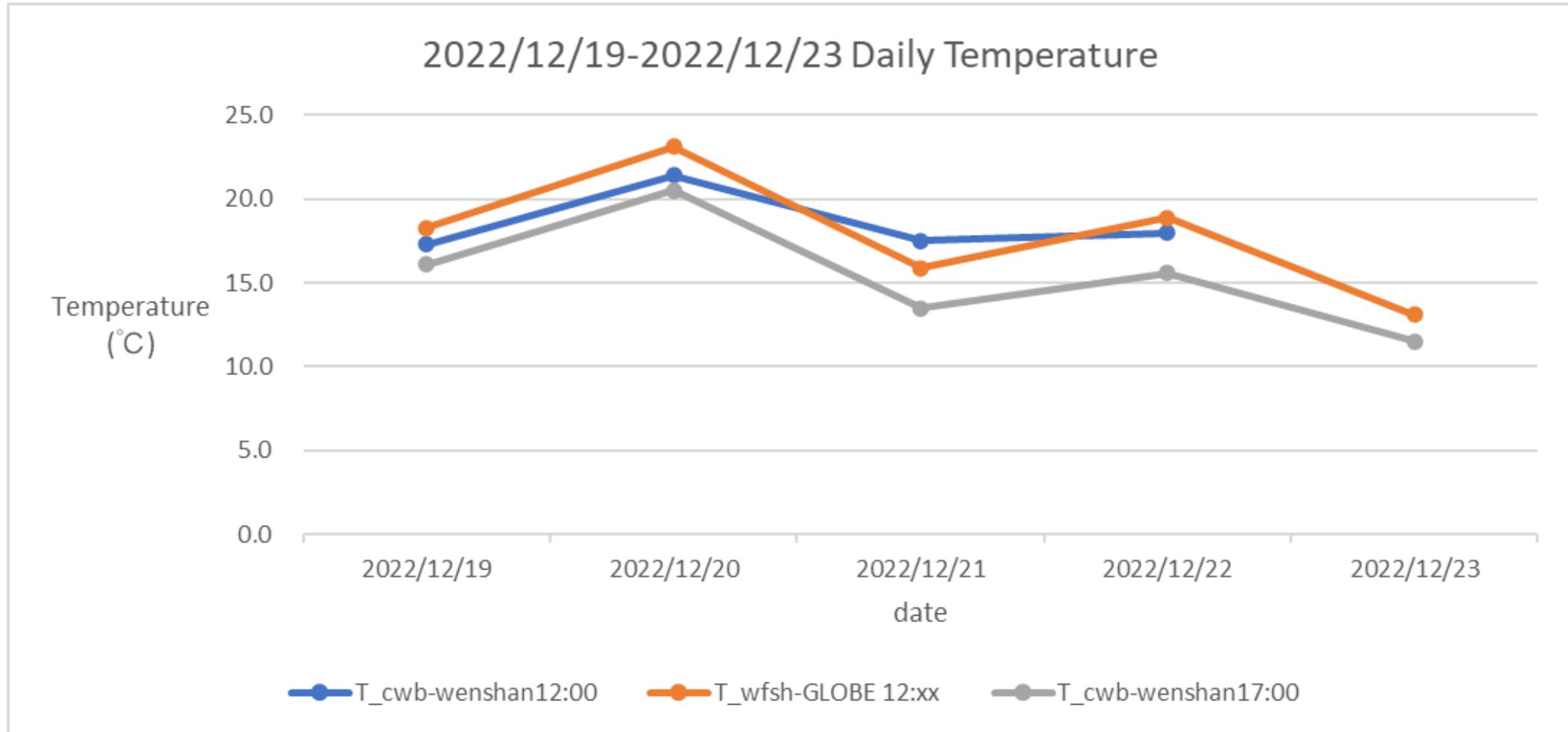


Research Methods and Materials

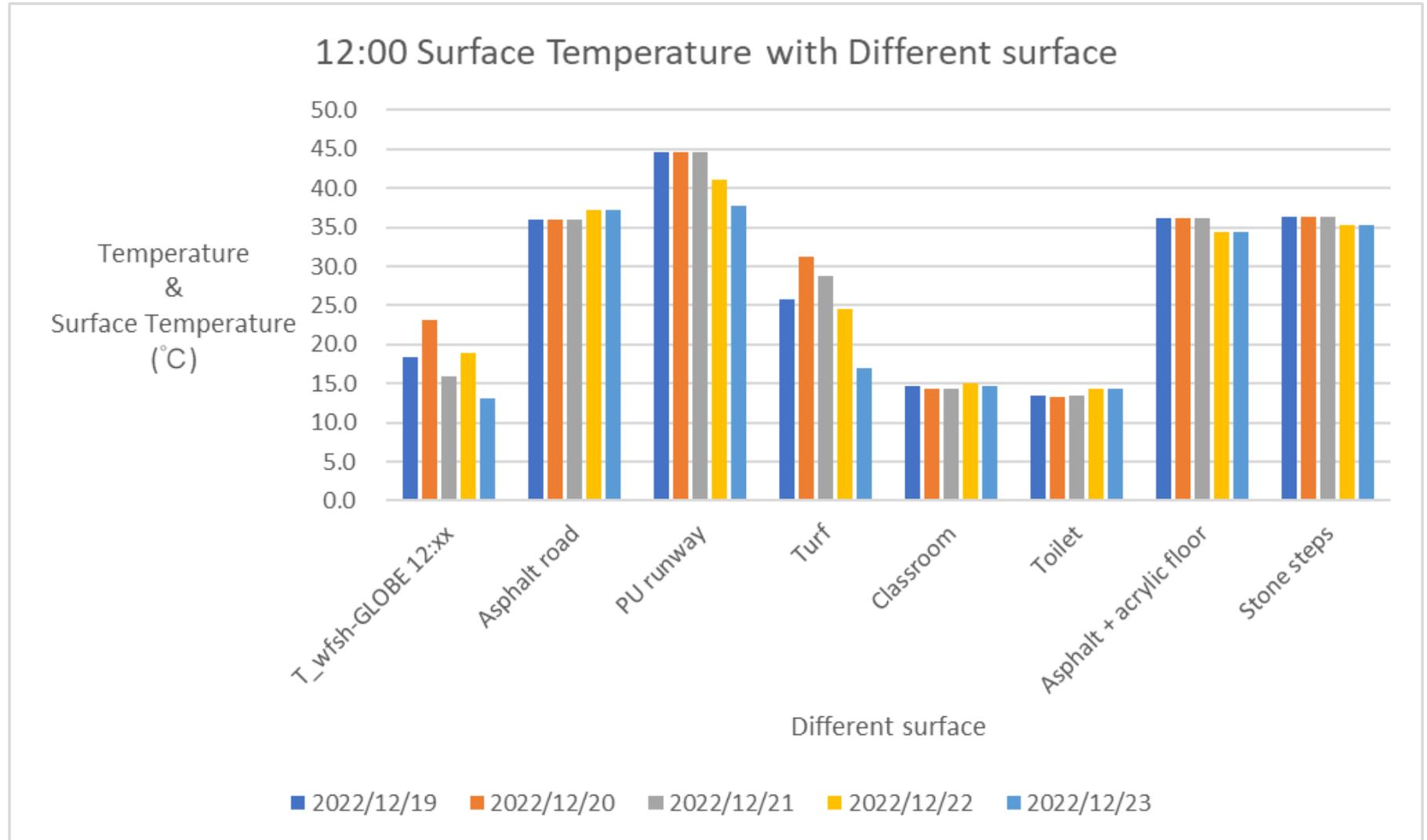
- We use the GLOBE Observer app to observe cloud coverage and upload data at noon during the five days from December 19, 2022 to December 23, 2022. The following are the results of satellite observations and our observations on the ground.



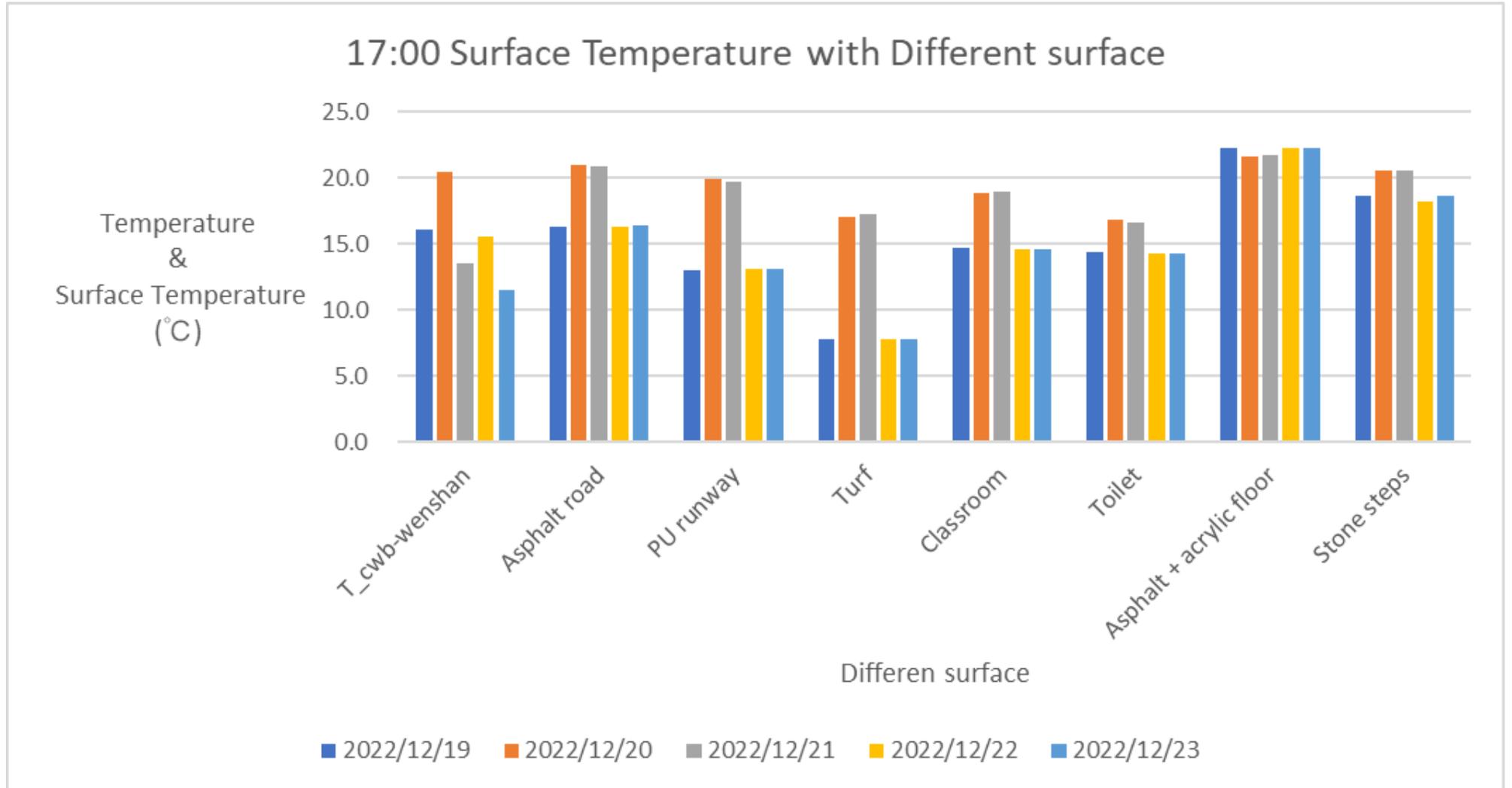
Results



Results



Results



Results

12:00	cloud cover	T_wfsh-GLOBE	Turf	Asphalt road	PU runway	Classroom	Toilet	Asphalt + acrylic floor	Stone steps
2022/12/19	55.4	18.3	25.8	35.9	44.6	14.7	13.4	36.1	36.3
2022/12/20	47.6	23.1	31.3	36.0	44.7	14.4	13.4	36.2	36.3
2022/12/21	100.0	15.9	28.8	36.0	44.6	14.4	13.4	36.2	36.4
2022/12/22	5.9	18.9	24.5	37.2	41.0	15.0	14.4	34.4	35.3
2022/12/23	98.0	13.1	16.9	37.2	37.7	14.6	14.3	34.4	35.3
correlation		-0.7	-0.3	-0.2	-0.1	-0.7	-0.2	0.2	0.3

Conclusion

- 1. The temperature at 12:00 noon is higher than that at 17:00, which means that the incident angle of the sun affects the air temperature.
- 2. At 12:00 noon, the surface temperature of the outdoor environment was higher than the air temperature, and the PU runway was the highest, followed by the asphalt road, Asphalt + acrylic floor and stone steps, and the grassland was the lowest. The surface temperature of the indoor environment is that the classroom is higher than the toilet, and the two values are similar.
- 3. The surface temperature of asphalt roads , Asphalt + acrylic floor and stone steps is higher than the air temperature. The surface temperature of the PU runway and grass field was cooler than the air temperature, except on December 21, 2022.
- 4. The higher the cloud coverage, the lower the temperature and the surface temperature of the classroom.

Discussion

- 1. During the five days we observed, the surface conditions were all dry, so it is impossible to infer whether the surface temperature will be changed when water appears. In the future, we should also measure the surface temperature when the surface condition is wet, so as to discuss the impact of water on the surface temperature.
- 2. The angle of sun radiation, cloud coverage and air temperature have a high degree of correlation, but only a low degree of correlation with the surface temperature, so the surface material will affect the surface temperature.
- 3. We originally thought that the surface temperature of the asphalt road would be the highest at 12:00 noon. Unexpectedly, the surface temperature of the PU runway was the highest. Temperature will affect the speed of evaporation in the water cycle, which in turn affects the balance of the water cycle. If there is a large-scale change in the surface conditions on the earth, such as deforestation and replacement with artificial pavement, the local surface temperature may be increased and the environment will be affected. If the impact of different man-made pavements on the surface temperature can be understood in advance, and the appropriate material or composite pavement can be selected, the impact on the surface temperature and the impact of the environment should be mitigated.

Bibliography/Citations

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2. <https://www.ntsec.edu.tw/Science-Content.aspx?cat=&a=0&fld=&key=&isd=1&icop=10&p=218&sid=12193>
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