Measurement of Cloud Cover at Night by Brightness

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Background

The weather status in Japan is decided based on the cloud coverage. However, as cloud coverage is measured with our own eyes, it is not always accurate. Therefore, in order to improve the accuracy of weather forecast this research was conducted aiming at establishing a new method to measure cloud cover accurately using SQM (Sky Quality Mater: SQM is the observation equipment which measures night empty brightness. The higher than numerical value is the darker the sky is).

Also, safety increases when the night flight understands the thickness of the cloud beforehand. However, the thickness of the night cloud can be measured in only infrared rays. It is not correct. I thought measurement of the cloud coverage and thickness of the cloud at night by brightness.

Method

Experiment1, measurement of the cloud coverage and pollen at night by brightness.

The brightness at night was measured with SQM at two minutes interval. I set SQM on the roof of our school (Honnmachi, Koganei, Tokyo). Based on the data provided by the Japan Meteorological Agency, the sunny days (Cloud cover - 0), the cloudy days (Cloud cover - 10) and pollen’ s day of the day of the new moons were selected. Graphs were drawn using the data collected from 8 p.m. to 3 a.m. (the time with no influence of sunlight) on the days which met the conditions given above.

Experiment2, measurement of the cloud of the thickness.

I prepared two boxes different in the size. I assumed the name of the box A (300mm*300mm*300mm) or B (300mm*300mm*600mm). I put liquid nitrogen in a box and produced steam. I use a darkroom to make the situation same as a night town.

I set up light under the box.I measured volume of light that reflected in SQM.

Experiment 3:change of the brightness due to the pollen.

I put pollen of the ragweed in the box.

In the same way as experiment 2,I measured the light that pollen reflected.

Experiment 4:Transmission spectrum of the pollen

I checked whether a pigment of the pollen absorbed light. I smashed 1g of pollen of the ragweedwhich I used in experiment 3 in phosphate buffer solution.

I was multistoried on 2.3M sucrose and ran to a centrifuge (1, 000* g) for 20 minutes. I measured transmittancy of the light (250-550nm) with a spectrophotometer with a supernatant provided by centrifuging.

Result

Result 1

As for the clear weather, a high value was provided through the whole in comparison with cloudy weather. From this, I understood that it was dark in the clear weather night.

Result 2

Both boxes had a smaller numerical value of SQM than an empty box. The numerical value of box B had lower numerical value of SQM than box A. From this, I understood that a lot of box B reflected light.

Result 3

It was seen that the contained box of the pollen said that numerical value of SQM was higher than an empty box. From this, I understood that a contained box of the pollen was gloomier.

Result 4

The pigment of the pollen understood that it absorbs in a color (350-500nm) of the

blue of something. It is thought that the reason why pollen absorbed light by experiment 3 is that I used light of the white. In addition, it is thought that I am uneven in a change of the volume of light when the light of the night town measures the light of the night town using SQM in spring and summer.

Keywords: cloud covreage, atmosphere, weather, Sky Qyality Mater, pollen

