

## The study of relation between color and brightness of the moon with the amount of dust particles in the atmosphere

ผู้จัดทำ Patrick Apo Siedlowski, Chalisa Srikum

E-mail: patsiedlowski@gmail.com, chalisa2547@gmail.com

Advisor Bannaruck Tanjaphatkul Varee Chiangmai School

### Abstract

The study of relation between color and brightness of the moon with the amount of dust particles in the atmosphere, by taking images of the moon with DSLR camera through a dobsonian telescope. Then Analyze images with Color Analyzer application and Adobe Photoshop CS6 program. Compare the data of moon's color and brightness with amount of dust particles of PM 2.5 and PM 10 to study about the relation between them.

Results of the analysis and comparison data from all moon's images which has an similar brightness with an equal altitude of observation and no difference in air quality, have been found that the amount of dust particles in the atmosphere is another factor that effects the moon's color and brightness which we are able to notice by the large amount of PM 2.5 and PM 10 will effect the color of the moon which turns to yellowish or reddish.

**Keywords:** Moon, Color, brightness (Luminosity), PM10 ,PM2.5

### Introduction

Every year during the months of March and April, Chiang Mai Province is one of many provinces in the north that has experienced a high amount of dust particles in the atmosphere for over 12years. Such problems has affected many aspects, especially in health and visibility. Our team therefore had the idea to observe the color and brightness of the moon by comparing with amount of dust particles in the atmosphere to study the relation between them. We expected to be able use this observation as an air quality supposition index. It also creates awareness of people in the area when they see some bad changes that occur around them which will lead in raising awareness of participation to solve environment problems.

### Research objective

To study the relation between color and brightness of the moon and the amount of dust particles in the atmosphere.

## Method

1. Take a photo of the moon with a DSLR camera through a dobsonian telescope during the months of March to June, by choosing the night which has similar brightness area, both waxing and waning moon.
2. Analyze the color of moon in CMYK color with “Color Analyzer application” and analyze moon’s luminosity with “Adobe Photoshop CS6 program”.

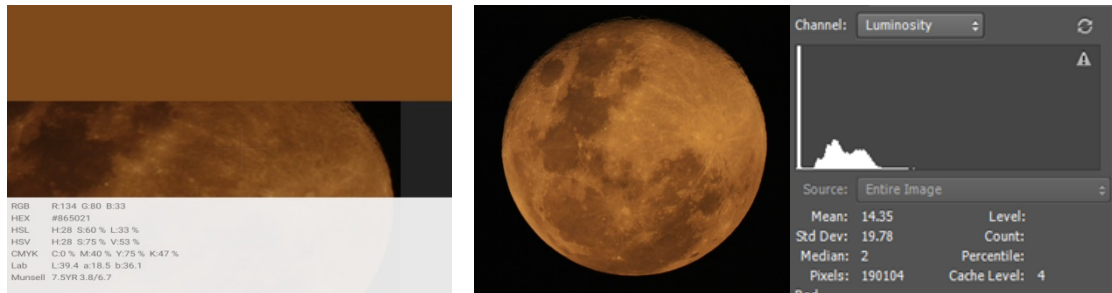


Figure 1. Moon’s color and luminosity Analysis

3. Compare data of moon’s color and luminosity with PM2.5 and PM10 density that measure by station of Climate Change Data Center, Chiang Mai University.
4. Create a graph to analyze the relation between color and luminosity of the moon and the amount of PM2.5 and PM10.

## Results

From the research, the moon’s position is the main factor which affects the moon’s color and brightness. When the moon is in low altitude, the color is approximately to be red. While it is in the higher point above the horizon, it significantly changes to yellow and turns into white afterwards. Also, the luminosity and the level of CMYK increase as we analyze by Color Analyzer application and Adobe Photoshop CS6 program

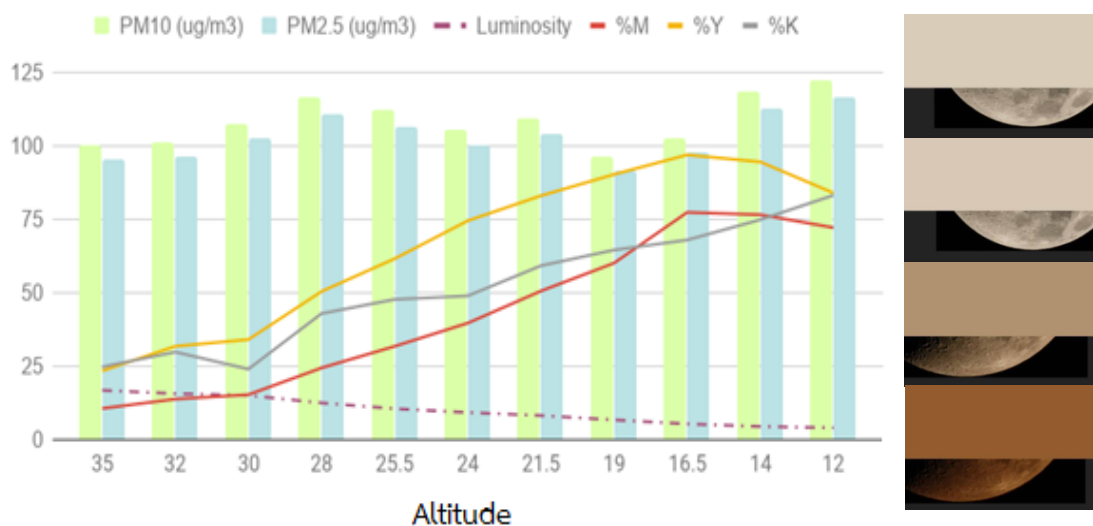
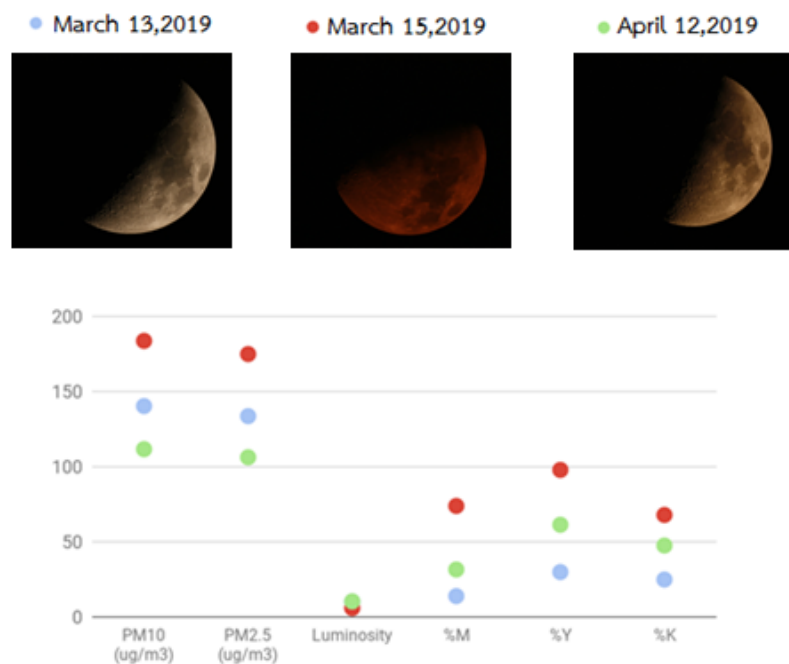


Figure 2. Changing the color and luminosity of moon when altitude is lower

After concluding the graphs, we have found out that besides the moon's altitude, the amount of dust particles in the atmosphere also affects the color and the brightness of the moon. Due to moon phases, altitude, and similar weather, we compared pictures of the moon on 13th March (7th day of waxing moon), on 15th May (9th day of waxing moon), and on 12th April (8th day of waxing moon). We have found that the same altitude of the moon with similar weather, amount of PM 2.5 and PM 10 affects to increase color level MYK while the moon's luminosity decreases.

### Conclusion

From the analysis, we have found out that the night with large amount of dust particles in the atmosphere the color of the moon will likely to be towards the red color and have smaller amount of luminosity than the night which has less amount of dust particles. Other than amount of dust particles, there are more other factors that affects the color and brightness of the moon. For example, wind speed, moisture, clouds etc. Which means that we are able to predict the weather from the color of the moon if looking at the naked eye. But there are other factors that can affect the color and brightness as well.



at altitude 25° (in the nights which have different PM2.5 and PM10 amount)

## References

Jacob E. Safra, James E. Goulka et al.(1998). Moon. **The New Encyclopædia Britannica**, vol 8, pp. 299). U.S.A: Encyclopædia Britannica, Inc.

Jacob E. Safra, James E. Goulka et al ( 1998). Moon. **The New Encyclopædia Britannica**, vol 23, pp. 1. U.S.A: Encyclopædia Britannica, Inc.

William Morrow. (2006). **The dangerous book for boy**. U.K. : HarperCollins Publisher.

สำนักงานเทคโนโลยีอวกาศและสารสนเทศ (องค์การมหาชน): GISTDA. (2015). พื้นฐานการรับรู้ระยะไกล(2).

24 พฤษภาคม 2019: สำนักงานเทคโนโลยีอวกาศและสารสนเทศ จาก <https://www.gistda.or.th>

สำนักพิมพ์มหาวิทยาลัยนเรศวร.มาทำความเข้าใจระบบสี CMYK กับ RGB ภายใน 3 นาที. 20 พ.ค. 2019,

จาก <http://www.nupress.grad.nu.ac.th>.

Climate Change Data Center of Chiangmai University.Statistics. 3 พฤษภาคม 2019, จาก

<http://www.cmuccdc.org>.