

Relationship between sun elevation and RGB values of sunlight color

*Shun Takada¹, Kotaro Takemura¹, Taio Koizumi¹, Hayato Ishiguro¹

1. Sapporo Nihon University Senior High School

The color of sunlight can be quantified using RGB values and RGB values are known to change with the altitude of the sun. In this study, we aimed to investigate the relationship between solar altitude and RGB values in detail. The sun was photographed through a self-made light control plate with a 4-mm-diameter hole and the RGB values were analyzed using adobe photoshop, which is a bitmap image editing application software. The results showed that the ratio of R value increases and the ratio of B value decreases when the solar altitude is smaller than 9°. We derived a theoretical formula that represents the relationship between the solar altitude and the thickness of the atmosphere through which sunlight passes. Assuming that the thickness of the earth's atmosphere is 100 km, the observation results and the theoretical formulas indicate that the thickness of the atmosphere through which sunlight passes is about 500 km when the solar altitude is 9°. This means that when the thickness of the Earth's atmosphere is reduced to about 20 km, no red sunset will be observed all over the world.

Keywords: sunlight color, RGB value, sun elevation