

The Analysis of Total Solar Eclipse Pictures on August 21, 2017 at Wyoming, USA

C P Asmoro^{1*}, A R Achmad¹, A F C Wijaya¹, N D Ardi¹ and S H Budisulistiorini²

¹Earth and Space Laboratory, Physics Department, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudhi No 229 Bandung 40154

²Earth Observatory of Singapore, Nanyang Technological University

*cp.asmoro@upi.edu

Abstract. Total Solar Eclipse has become a magnet for everyone, especially scientists. That's because every eclipse will have their own characteristics. Even using simple instrument such as digital camera, tripod, tele lens, and solar filter, the eclipse pictures obtained. The digital picture of solar corona taken several times with different shutter speed to get the best solar corona composite with radial blur procedure and stacking technique. From that editing procedure, the structure of solar corona can be analyzing and also the maximum height of solar corona determined which is 502513.53 km or equal with 0.72 times radius of the sun.

1. Introduction

Total Solar Eclipse is one of the rarest events that happen on earth. Total Solar Eclipse is the most waited event by the entire scientist around the world because it provided many solar phenomenon's that can be observed such as, the solar corona and prominence. Total Solar Eclipse also gives the best condition to measure the solar corona [1]. To analyze Total Solar Eclipse data, it can be used video metric and spectrometric combination method [2], higher spatial resolution pictures [3], or spectroscopic technique on the solar corona structure [4]. But those researches need a good and expensive instrument to take the data. Another research was just using simple instrument such as DSLR Camera who attached to a telescope to take Total Solar Eclipse data as a package with SQM graph [5]. In this research, it will explain how to take the pictures of Total Solar Eclipse with very simple instrument, and do the photo editing procedure for analyzing the solar corona and determine its maximum height that can be taken with the instrument.

2. Methods

To get the picture data of Total Solar Eclipse, it just using simple instrument such as SONY ILCE-6000, tele lens with focal length 200mm and tripod. This camera has pitch width 3.88 μ m [6]. The picture was taken with different shutter speed to make varieties of the data and saved with jpg format. After that, the photo edited with photo editing application to make the photos easier to analyse. The photos were radially blurred and then subtracted with initial photos. After that, the subtracted photo was multiplied with radially blurred photos then stacked to be 1 HDR photo [7]. IRIS app used to determine the maximum height of corona by choosing the highest pixel point of corona and the initial point of the sun disk.



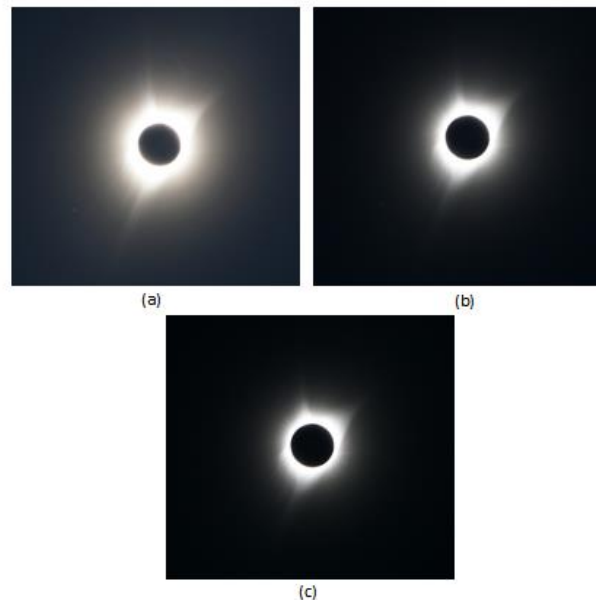


Figure 1. The Pictures of Total Solar Eclipse with shutter speed (a) $\frac{1}{2}$ s (b) $\frac{1}{8}$ s (c) $\frac{1}{13}$ s

On the camera there will be image scaling which is the equation 2.1

$$\theta = \frac{206265''}{F} \cdot pw \dots \dots \dots (2.1)$$

to get the exact units, with ($''$) is arcsec, F is focal length of the lens in mm, and pw is pitch width of the sensor of the camera in μm [8]. After the difference of coordinate point in 2 positions obtained, so the maximum height of solar corona can be determined.

3. Results and discussion

Based on Figure 2, obtained pixel coordinate data as listed in the Table 1 Where K1 is the highest point of the corona and K0 is the sun disk point. The average angle of solar corona is 693 arcsec which is equal with 502513.53 kilometre or 0.72 times radius of the sun.

From the Figure 2 also obtained the solar corona structure which is more visible than before because the light was more reduced by radial blur procedure.



Figure 2. The post-processing photo of Total Solar Eclipse

Table 1. Pixel Coordinate x and y of the solar corona highest point (K_1) and the sun disk (K_0)

K_0		K_1		"
x	y	x	y	Arcsec
732	198	800	356	688
735	192	799	357	708
735	197	795	357	684
735	194	799	356	697
731	195	800	354	694
725	202	799	356	684
728	198	799	356	693
731	197	799	356	692
732	194	797	353	687
728	193	797	356	708
Average				693

4. Conclusion

Finally, the analysis of total solar eclipse can be done even with the most simple instrument and with jpg data. With appropriate photo editing procedure and good technique in photography, the solar corona structure can be obtained and analyze.

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