

Calculation of the Diameter of Asteroids

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Abstract

This research calculates the diameter of asteroids. Photos were taken from PROMPT 8 in Cerro Tololo Inter American Observatory (CTIO) and data were analyzed. The result showed that 423 Diotima, 41 Daphne and 121 Hermione asteroids have diameter 207.4 km, 195.0 km and 286.4 km and that it is not the same with their real diameter that were 0.69%, 12.06% and 37.02% in order.

Introduction

Asteroids are litter stones in the space. They move around the sun. The asteroids that are located between Mars and Jupiter is called asteroid belt. C-type Asteroids are the asteroids that reflect little light from the sun. They are harder to see. It's major component is carbon. They have 75% of all asteroids and they have albedo 0.03 to 0.09. We calculated the diameter by comparing flux of sun with the flux of asteroid.

Methods

1. Finding the data about asteroids C-Type from the data that was based in the website below.
http://en.wikipedia.org/wiki/List_of_notable_asteroids and http://ssd.jpl.nasa.gov/sbdb_query.cgi#x
2. The Researcher chose 3 of asteroids from C-Type namely , 423 Diotima that was been observed and followed from 17-19 August 2557, 41 Daphne that was been observed and followed from 24-25 August 2557 and the last is 121 Hermione that was been observed and followed from 1-4 September 2557. Photos were taken in filter clear for 3 images and use 30 second per image.
3. Images were analyzed using the aperture photometry.

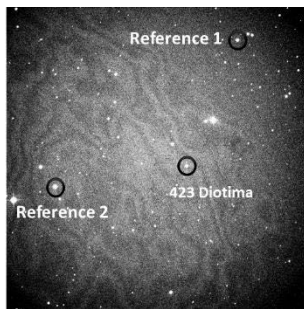


Figure 1 shows 423 Diotima and reference star

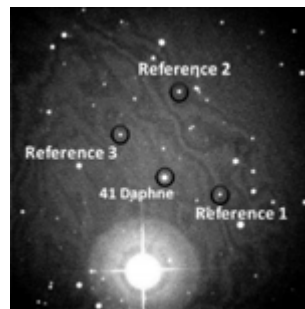


Figure 2 shows 41 Daphne and reference star

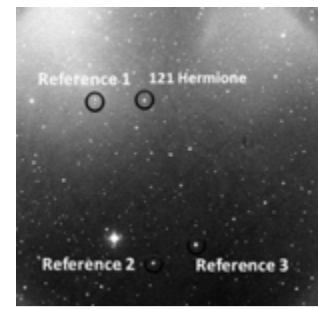


Figure 3 shows 121 Hermione and reference star

4. The apparent magnitude of asteroids were calculated based on flux of asteroids and it's magnitude constant. Magnitude constant was calculated from flux and apparent magnitude of referent star.

$$m_1 = -2.5 \log f_1 + C$$

- m_1 is apparent magnitude
 f_1 is flux of asteroids and referent star
 C is magnitude constant

5. The apparent magnitude of asteroids were used to calculate it's diameter

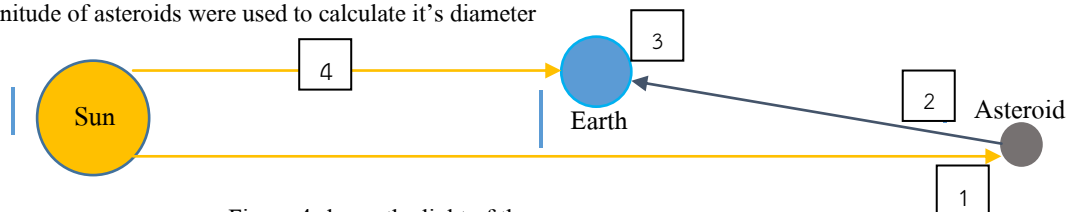


Figure 4 shows the light of the sun

First find flux of the sun on asteroids. Second find luminosity of asteroids. Third find flux of asteroids on the earth. Forth find flux of the sun on the earth and divided flux of asteroids on the earth by flux of the sun on the earth and then I change flux to magnitude and use this equation to find radius of asteroids variable R.

$$m_A - m_S = -2.5 \log \left(\frac{a \cdot R^2 r_E^2}{4 \Delta^2 r_A^2} \right)$$

m_A is apparent magnitude of asteroids

m_S is apparent magnitude of the sun

a is reflection of light from asteroids(albedo)

R is radius of asteroids(AU)

r_E is distance between the sun and the earth(AU)

Δ is distance between the earth and the asteroids(AU)

r_A is distance between the sun and the asteroids(AU)

6. The diameter of the asteroids have been calculated by the used of it's radius and then compared to it's real diameter from the data based in the website <http://ssd.jpl.nasa.gov/> to find an error

Result

The result showed that the apparent magnitude of 423 Diotima 41 Daphne and 121 Hermione are 13.03, 12.92 and 12.25. The Researcher used albedo 0.06 from the average of albedo C-Type asteroid in website <http://nssdc.gsfc.nasa.gov/planetary/text/asteroids.txt> and use distance in website <http://ssd.jpl.nasa.gov/> and stellium program.

Table 1 shows apparent magnitude of sun, asteroid and distance

Asteroid	apparent magnitude of the sun	apparent magnitude of the asteroids	Distance between the sun and the earth(AU)	Distance between the sun and the asteroids(AU)	Distance between the earth and the asteroids(AU)
423 Diotima	-26.78	13.03	1.000	3.066	2.664
41 Daphne	-26.78	12.92	1.000	2.765	2.279
121 Hermione	-26.78	12.25	1.000	3.457	2.629

Use table 1 calculate in equation $m_A - m_S = -2.5 \log \left(\frac{a \cdot R^2 r_E^2}{4 \Delta^2 r_A^2} \right)$

Table 2 show radius of asteroid

Asteroid	Radius (Km)
423 Diotima	103.7
41 Daphne	97.5
121Hermione	143.2

Conclusion

423 Diotima,41 Daphne and 121Hermione asteroid have the diameter of 207.4 km, 195.0 km and 286.4 km(in order) and their diameter that the Researcher obtained is in error compared to their real diameter that are 0.69%, 12.06% and 37.02% in order.

Discussion

After I observed asteroids from Cerro Tololo Inter-American Observatory (CTIO) from the image I have taken of the asteroid using the filter clear. The time the data were being analyze I encountered problems because I can't use the images that I have taken for the reason that the images were not that clear. After analyzing the data I then calculated the apparent magnitude of the reference star and have compared it to the calculated apparent magnitude of asteroids. After that using apparent magnitude of asteroids to calculated diameter of asteroid and error from data base. The Researcher hopes that the research paper will be of a good help for other aspiring researchers for the further study and reference in finding the diameter of the asteroids that has been mentioned in this research.

Acknowledgement

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Reference

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