Explore the Universe: Asteroid Occultations

Science, Discovery, and the Universe

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Research Question

What are the dimensions and shape of an asteroid based on data from recorded occultations?

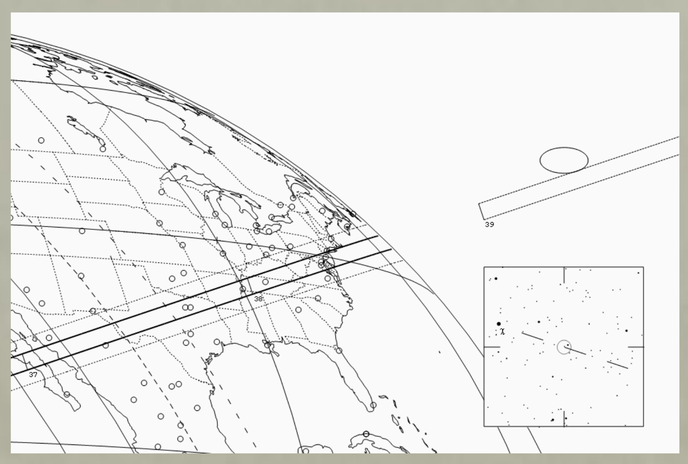
Research Context

Our capstone project was completed at the UMD observatory through the Explore the Universe Research Program. After thorough training, we sought to observe asteroid occultations which occur when an asteroid passes a bright star, casting a shadow. The shadow allows us to determine the object's silhouette.

Photo Cr. J. Horwat

Methods

We aimed to observe asteroid occultations listed in the OccultWatcher database. If we were within the object's shadow, our observed occultation (and light curve) could determine the width of a certain point of the asteroid. Along with data from others around the world, we can determine the shape.



Comacina Shadow Map; Photo Cr. OccultWatcher

Observing

The observation process included many steps of preparation and execution:

Step 1: finding the date and time of an occultation that casts a shadow that is viewable from our location using OccultWatch software.

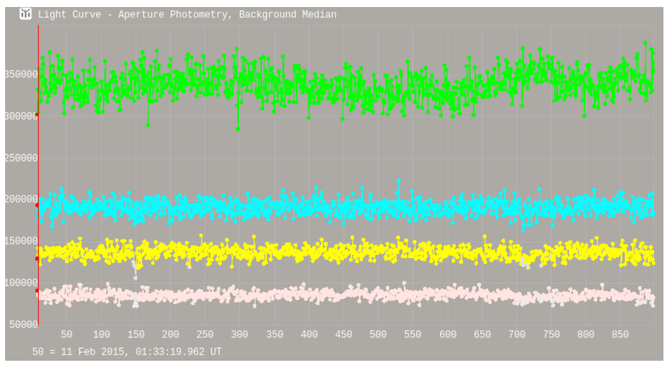
Step 2: printing out a map of the target star and the stars surrounding it along with details about the star's location.

Step 3: setting up the computer and camera system and finding the target star in the field of view of the observatory's 6 inch telescope.

Step 4: recording the target star during the occultation time.

Step 5: analyzing the light curve to determine the asteroids width from our point of view.

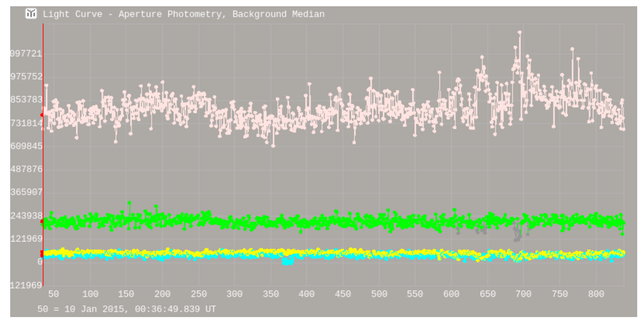
Limitations: time restrictions, weather, technical difficulties.



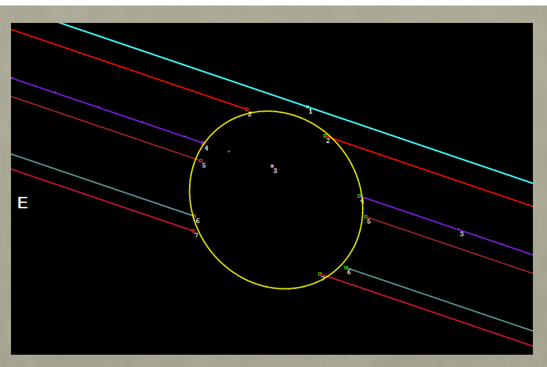
Versale Light Curve (neg); Photo Cr. Tangra3

Collected Data

From our recordings we were able to analyze the light curve of the target star and how it changed as the asteroid, Comacina, passed by, comparing the change in brightness to the surrounding stars. We also observed Versale, which gave us a negative recording.



Comacina Light Curve (pos); Photo Cr. Tangra3



Comacina's Deduced Silhouette; Photo Cr. Asteroidoccultation.com

Analysis & Conclusion

Occultations allow us to investigate and determine the shapes and dimensions of various planetary objects. It is still important to observe when we do not lie in the shadow path because asteroids may shift (giving us an unexpected reading). Negative data can provide limitations on asteroid dimensions. In the future we aim to gather more data, taking into account past challenges and limitations.

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