

Lightcurves of the August 15, 2018 Pluto occultation from the San Pedro Martir observatory

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Abstract

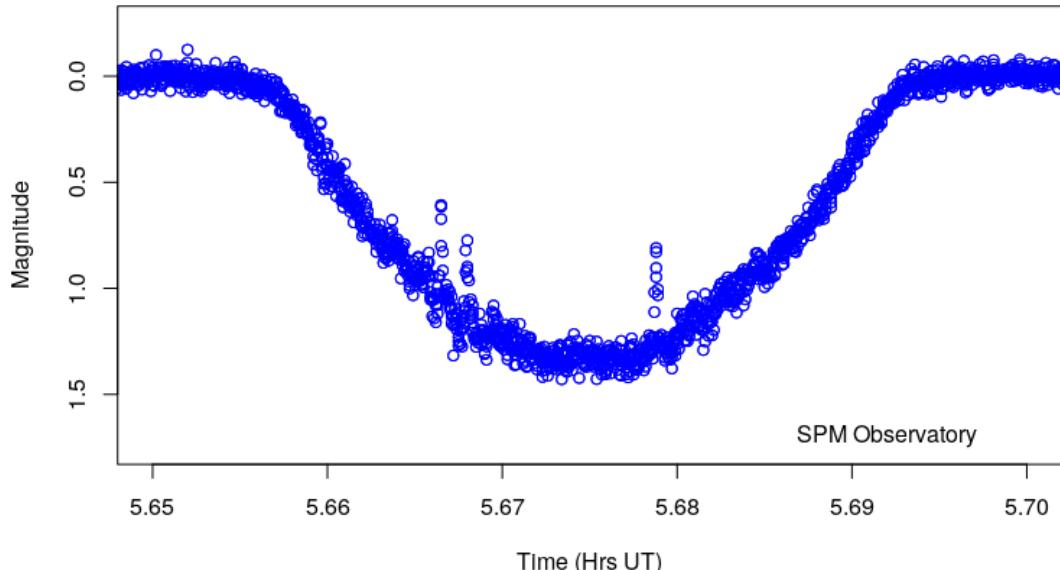
Our planetary astrophysics group participated in the international campaign organized to observe the stellar occultation of star UCAC4 341-187633 by Pluto that occurred on August 15, 2018. In this work we present results of our high-speed photometry observations with the 2.1m telescope at the Observatorio Astronomico Nacional in San Pedro Martir, Baja California, Mexico. The quality of the data obtained allows the clear identification of several bright spikes presumably resulting from localized features in the dwarf planet's atmosphere. In addition, together with other lightcurves obtained with the TAOS II telescopes at SPM (in different photometric filters), we are currently developing models for the differential refraction to constrain the vertical profiles of atmospheric properties at the time of the occultation.

1. Introduction

High SNR lightcurves from stellar occultations by Pluto have been used to infer the existence of its atmosphere as well as its temperature, density and pressure profiles by comparing the observations with models for the differential refraction of light rays from the star, traversing through the atmosphere at different altitudes (Elliot et al. 1989).

Atmospheric properties, such as the possible presence of an atmospheric haze layer and/or a thermal inversion, are suggested by features in the occultation light curves (Elliot and Young 1992, Elliot et al. 2003). In addition to variations from nearly exponential atmospheric vertical profiles, some lightcurves exhibit strong fluctuations (bright spikes) presumably resulting from local density perturbations which can focus the occulted star's rays (e.g. Sicardy et al. 2003, Young et al. 2008).

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2. Results

Observations were carried out with the 2.1m telescope at SPM equipped with an Andor iXon Ultra 888 camera and the *Rueda Italiana* filter wheel with a Gunn i filter. A readout cadence of almost 10 Hz (9.46 Hz) is used with a reference time precision of approximately 0.1 s.

The lightcurve resulting from the differential photometry using a couple of nearby stars for reference, is shown in the Figure. Additional data obtained over periods several times that shown, both before and after the event, are used to establish a good reference baseline for the brightness of Pluto and the occulted star.

3. Summary

At least 2 bright spikes are observed on ingress and 1 more is observed on egress as the star traverses the planetary atmosphere. Each of these events is clearly resolved, containing 6-8 data points.

A modest change in the slope of the decaying lightcurve starting shortly after 5.66 hrs (UT) and then again shortly before 5.69 hrs (UT) is also observed.

Additional results on the interpretation of our observations, together with those of the TAOS II telescopes (on a different filter) but also at SPM, are currently still being studied and will be presented at the meeting.

Acknowledgements

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References

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