

Pluto's Atmosphere at the Time of the New Horizons Flyby from the 29-JUN-2015 Occultation

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Abstract

Pluto is expected to occult a star on 29-JUN-2015, only two weeks before the scheduled New Horizons flyby on Pluto on 14-JUL-2015. This occultation should be remarkable for several reasons in addition to its synergy with the spacecraft observations. First, the occulted star is by far the brightest ever to be observed in a Pluto occultation: its V-mag is 12.10 ± 0.03 , about ten times brighter than Pluto itself. We are deploying a wide array of telescopes to obtain quality lightcurves at 10 Hz, sufficient to resolve vertical atmospheric structure (e.g., gravity waves) at the 2.5-km scale over a range of radii from about 1195 to 1300 km. Second, we plan to obtain lightcurves in infrared wavelengths near $1.7 \mu\text{m}$, where the star's H-mag (about 11) is bright enough to provide useful signal-to-noise ratios, albeit at slower cadences near 1 Hz (about two points per scale height). The combination of simultaneous IR and visible wavelength lightcurves should address the decades-old question: is there haze in Pluto's atmosphere, and if so, what is its opacity? New Horizons should image haze layers in reflected light as the occultation quantifies haze extinction in transmitted light: the combination could potentially let us solve for haze phase functions. Third, the current predicted shadow path is centered over much of New Zealand. We plan to deploy three portable telescopes in New Zealand to locations that are candidates for observing central flashes. If successful, these lightcurves can tell us (a) the oblateness of Pluto's atmosphere and (b) the detailed density gradient profile at radii near 1215 km, which (in turn) is a function of trace abundances of CO and CH₄ a few tens of km above Pluto's surface.

We will report on lightcurves obtained on 29-JUN-2015, the column abundance of Pluto's atmosphere just two weeks before the New Horizons flyby, the detection (or not) of haze, and – if central flashes are obtained – the oblateness of Pluto's atmosphere.

1. Figures

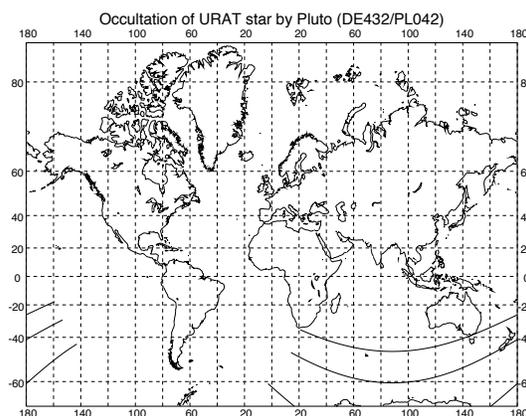


Figure 1: Our current prediction (circa 6-MAY-2015) for the stellar occultation by Pluto on 29-JUN-2015. Continental Australia is a nominal miss at this point, Tasmania should see positive lightcurves, possibly grazing events, and New Zealand should provide central flash lightcurves. The N/S errors on this prediction are approximately 11 mas, or about 280 km.