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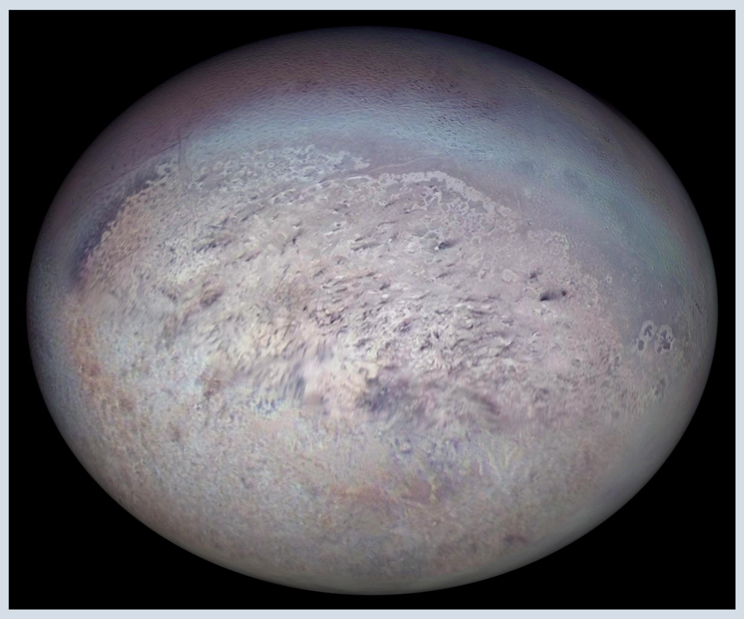

Triton (Image Credit: Anne's Astronomy News)

Detecting Seasonal Volatile Transport on Triton through Photometric Observations

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OVERVIEW

Broadband Photometry will be obtained to provide data on Triton. Our data will be collected over a series of nights of time-resolved Bessel BVRI photometry using the 0.6-m telescope at the JPL Table Mountain Observatory (TMO) located in Wrightwood, California. The objective of these observations is to detect and measure volatile transport on Triton. The vapor pressures of nitrogen and methane vary over the seasonal cycles of Triton and Pluto. The seasonal migration of frost can be detected by a combination of changes in the rotational lightcurve. Previous work of Triton has shown that these exhibit the transport of volatiles on their surfaces. The purpose of acquiring another lightcurve is to determine whether volatile transport is still occurring and to track it. Our current goal is to fill in the missing longitudes that we not obtained during our last observations of Triton. Our previous work detected an opposition surge for the first time, and these observations will allow us to further characterize it. With our measurements and ground-based data of Pluto and Triton, we will hopefully have a greater understanding of seasonal volatile transport on Kuiper Belt Objects. This understanding will help us predict, search for, model, and possibly observe seasonal changes on other Kuiper Belt Objects.

Figure 1: TMO 0.6m (24 inch) Telescope (Image Credit: NASA)

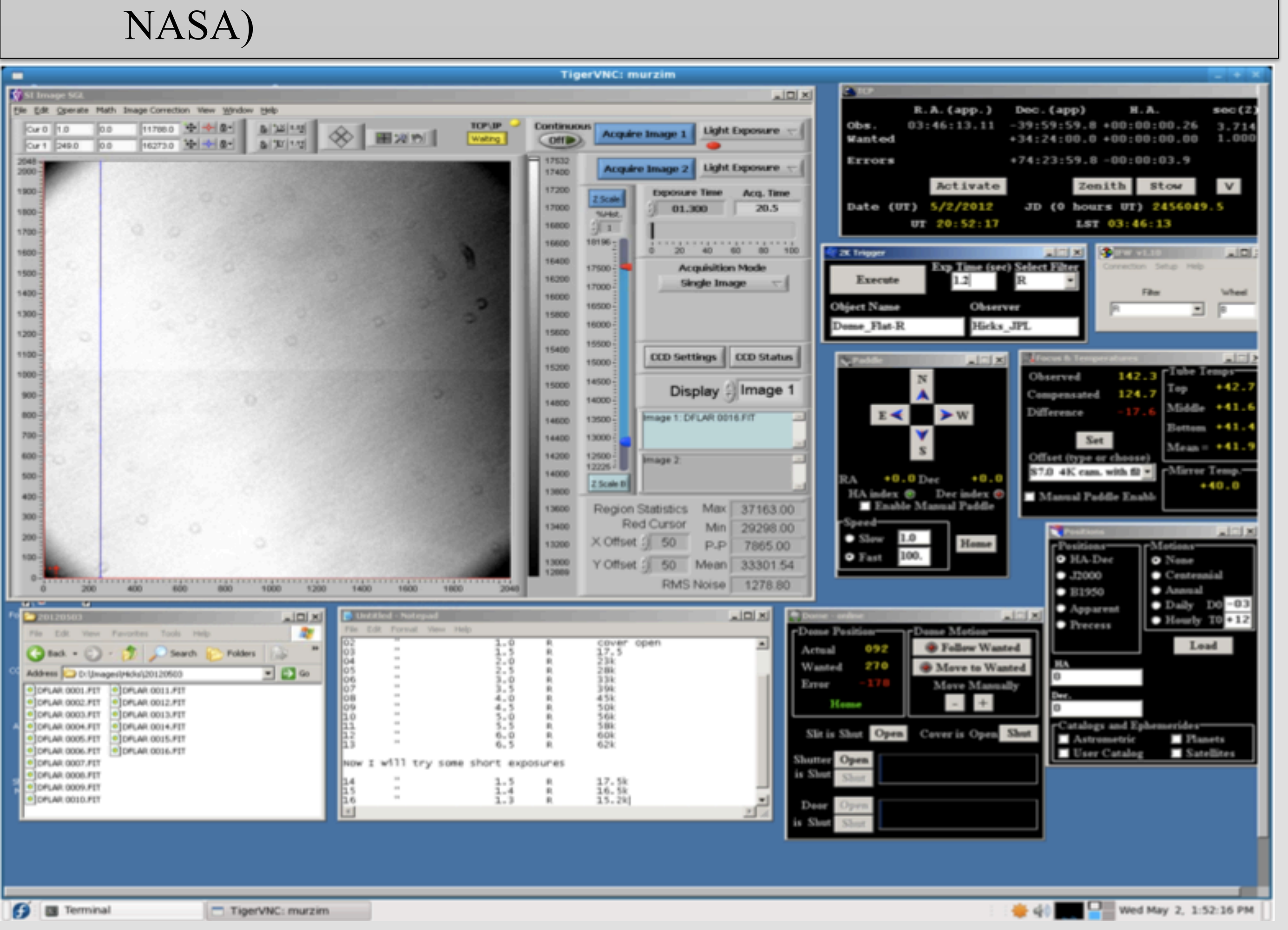

Figure 2: Control Screen (Image Credit: NASA)

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INTRODUCTION

Photometry, in astronomy, is the measurement of the brightness or intensity of objects in the sky. Such measurements give large amounts of information on the objects' structure, temperature, distance, age, etc. Broadband photometry refers to photometry using different color filters. With advances in technology, especially charge-coupled-devices (CCDs) our knowledge of planets composition has increased.

METHODS/DISCUSSION

We are able to observe remotely at JPL by establishing a connection to the computer Murzim, which allows us access to the programs we need to control the dome and telescope. With broadband photometry, we first take biases; by taking a series of dark exposures while the dome is closed. This indicates the pixels from the charge-coupled-devices (CCDs) that have remained charged. These images are then formed into a single bias frame to determine which pixels have remained charged and will later need to be removed.

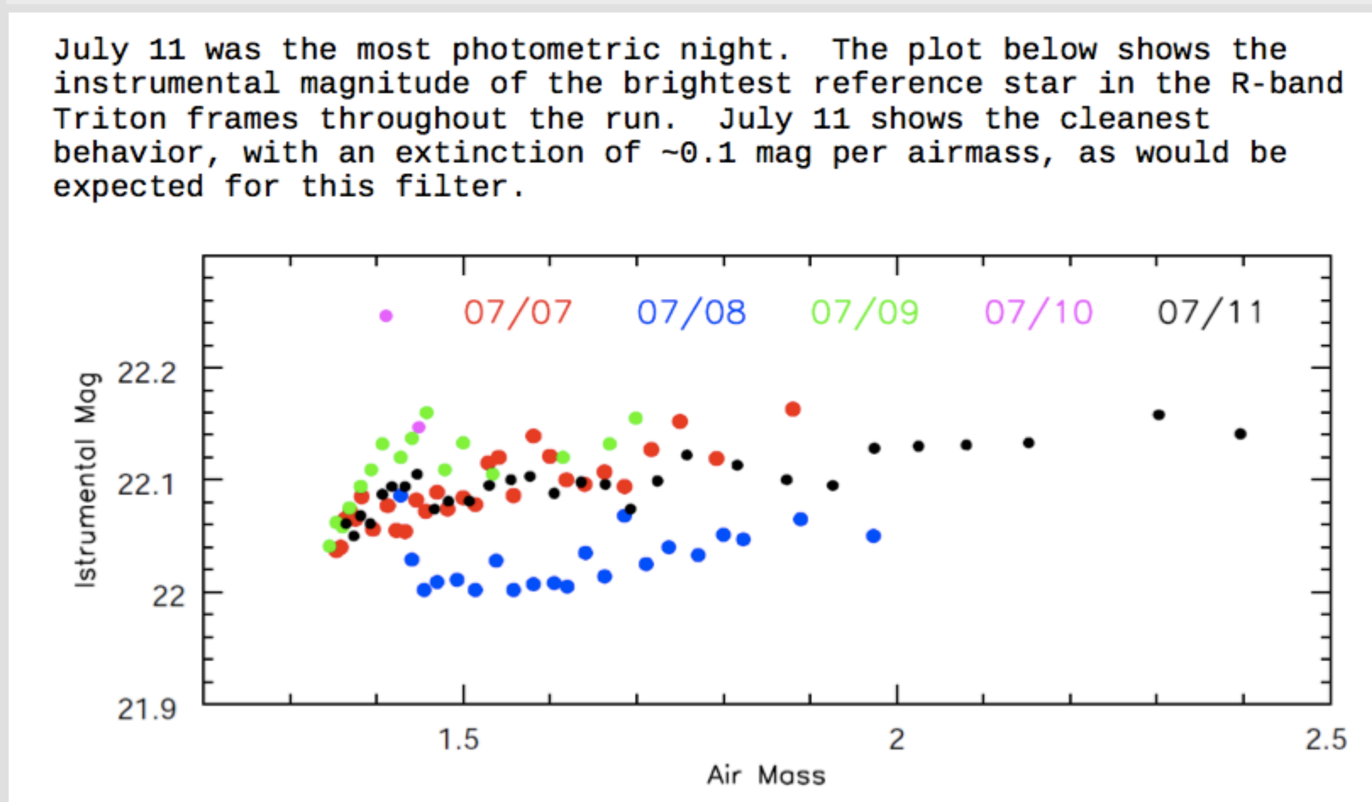

Figure 3: July's Run of Instrumental Magnitude vs. Air Mass for Triton (Image Credit: M. Hicks, 2017)

Next, we take sky-flats, which are images taken around sunset when the sky appears more uniform. Errors can occur due to the sensitivities of each pixel in the charge-coupled-device. Sky-flats are meant to correct for this error. In addition, sky-flats are taken in each color-band filter.

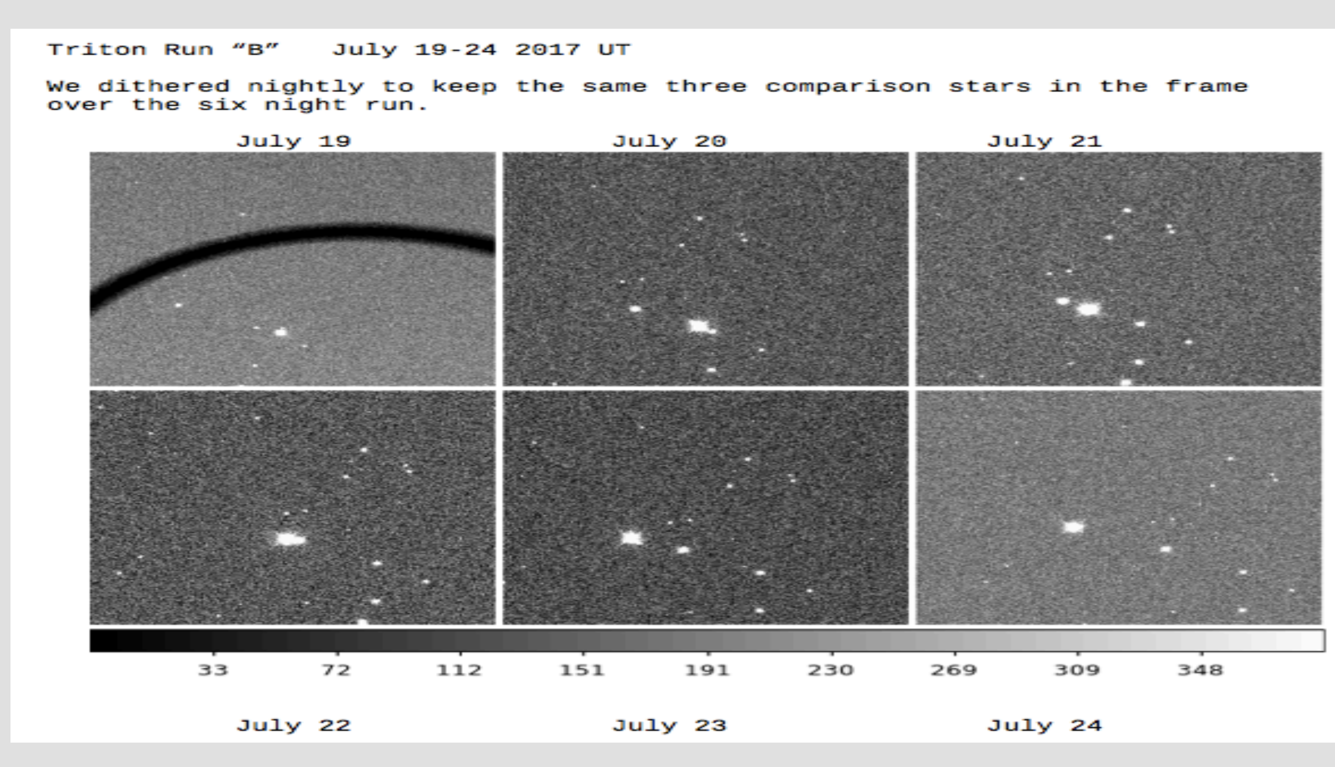

Figure 4: Telescopic Observations of Triton (Image Credit: M. Hicks, 2017)

The remainder of the evening is devoted to observing Triton, using a pattern of R-V-B-R-V-B (R for red filter, V for visible, and B for blue filter, also known as the broadband spectrum), with differing integration times for each filter. In the middle of observing, we often take observations of standards, which help us account for changes in atmospheric pressure.

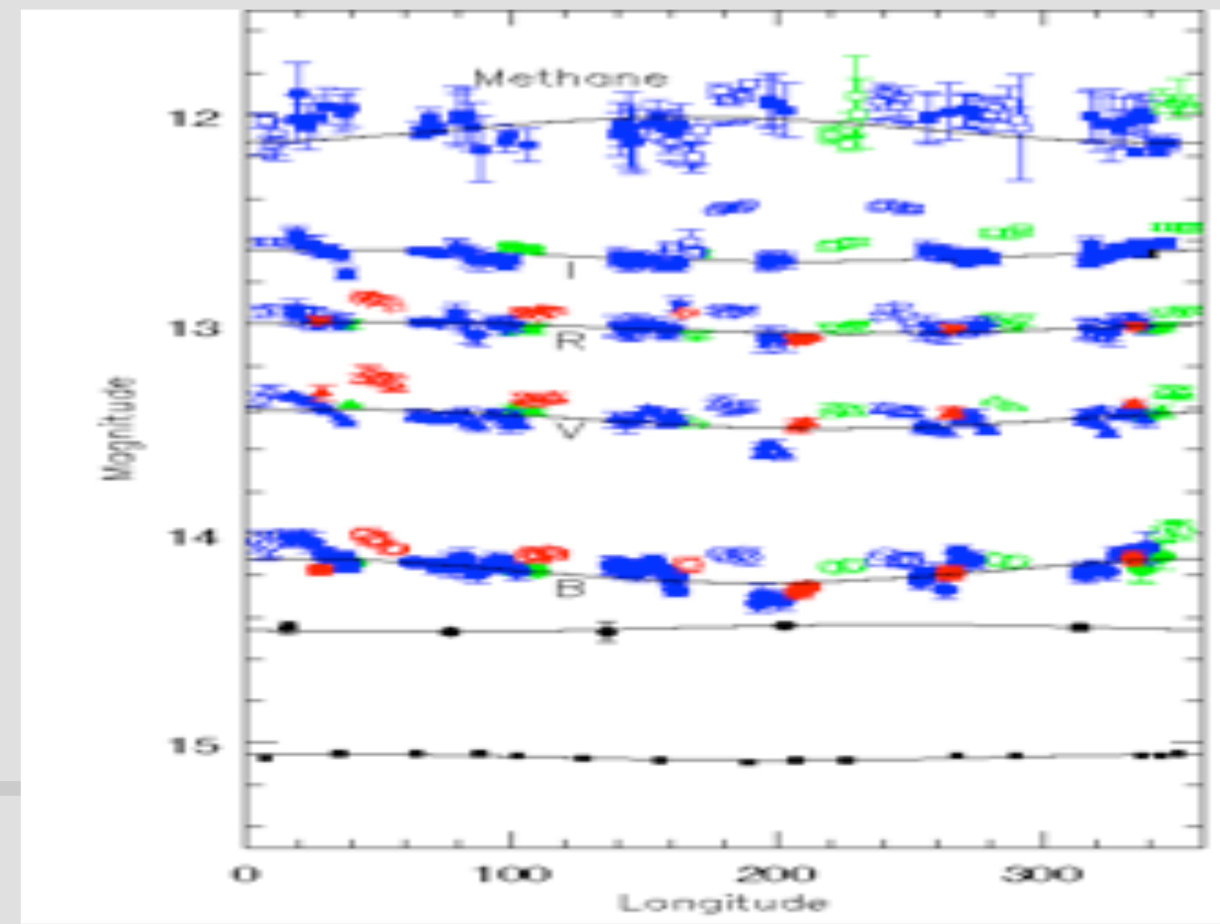

Figure 5: Light Curves of Triton in the BVRI and methane 0.89 µm) filters obtained in 2000, 2002, and 2004 (Image Credit: B. Buratti et al. 2011)

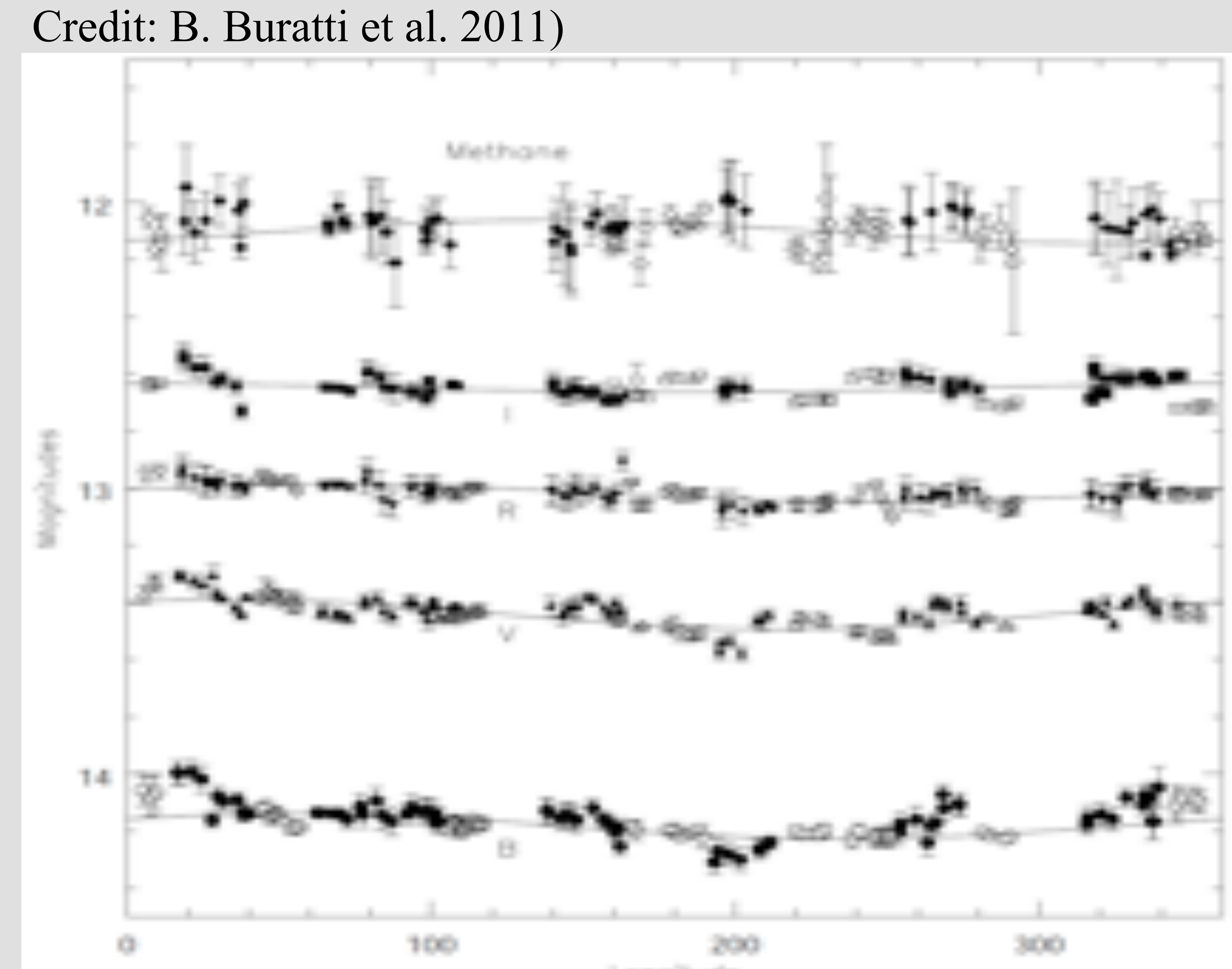

Figure 6: Triton Solar Phase Curve (Image Credit: B. Buratti et al. , 2011)

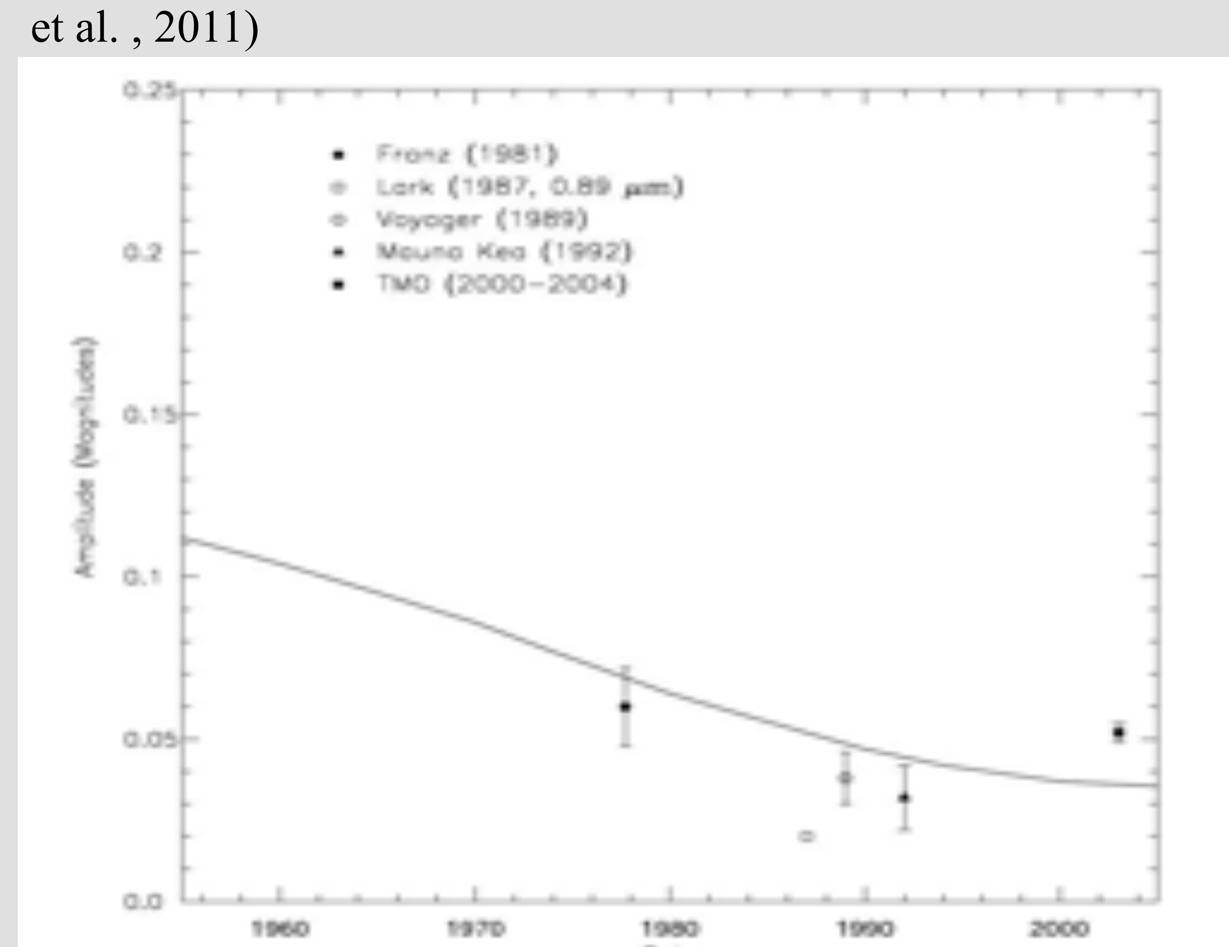

Figure 7: Magnitude of Triton's V-light curve compared with the static frost model (Image Credit: B. Buratti et al. 2011 & Hillier et al. 1991)

CONCLUSIONS

Our data will be analyzed through various programs, where we will use both biases and sky-flats to make any correction to the images and we've obtained of Triton. Once we have analyzed the data, we will be able to calculate and plot Triton's solar phase curve. Our goal is to create detailed and longer-term comparisons of our data with Voyager images and other volatile-transport models.