ALPHA Observatory Campaign 7 Data Analysis

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Abstract:

The purpose of ALPHA Observatory Campaign 7 is to analyze **1 Terabyte** of data from ALPHA's first run not just focused on asteroids but also variable stars and exoplanets. The images of all objects are run through multiple scripts to determine the eligibility to be submitted. **30** asteroids are submitted to Minor Planet Center while the **4** exoplanets (3 confirmed and 1 pending) and **15** variable stars are made light curve graphs and submitted to AAVSO.

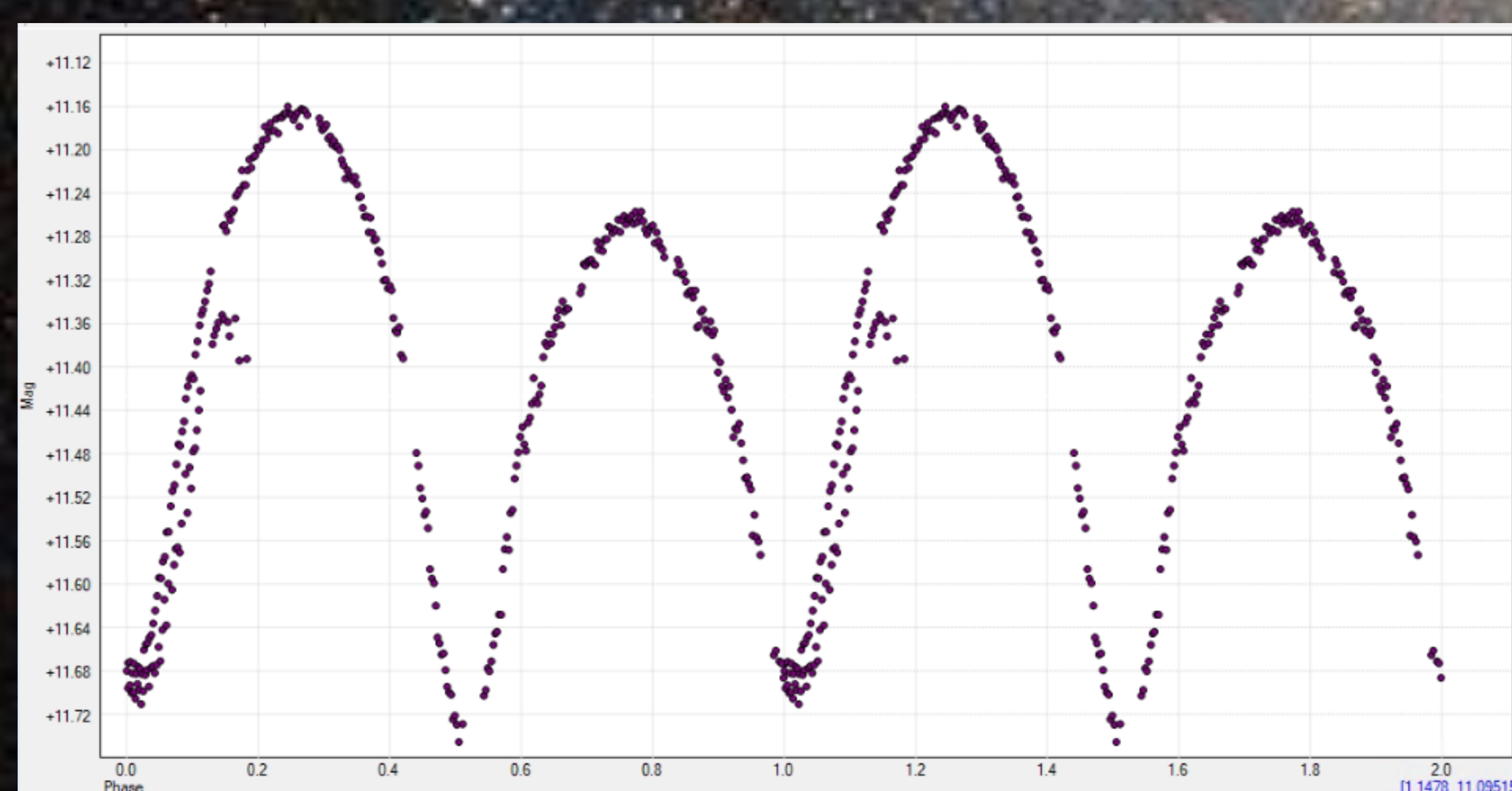Figure 1: (above) Photograph of the ALPHA observatory with the telescope exposed
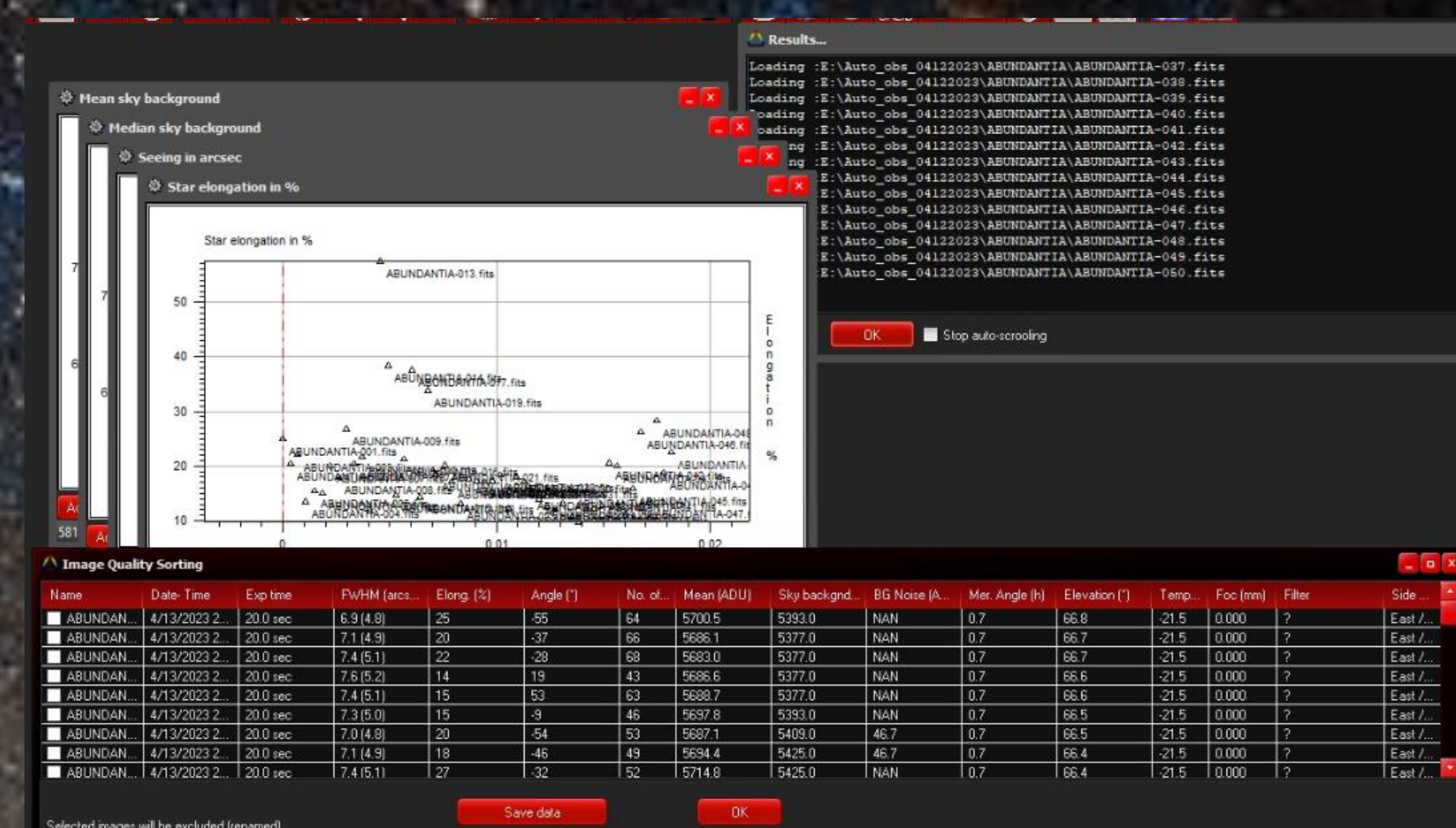
Figure 2: (Above) Is a screenshot of PRISM working through a photoset.
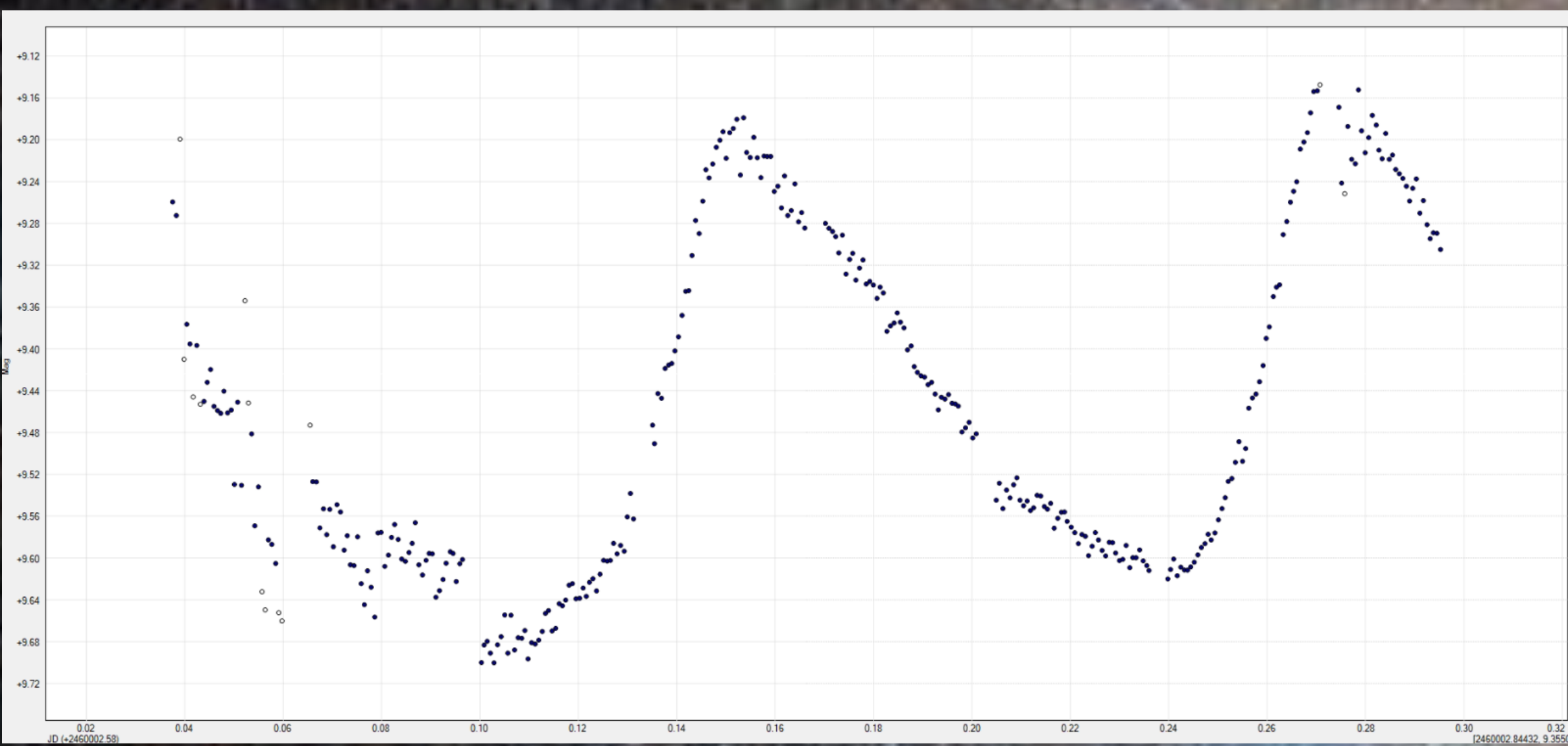
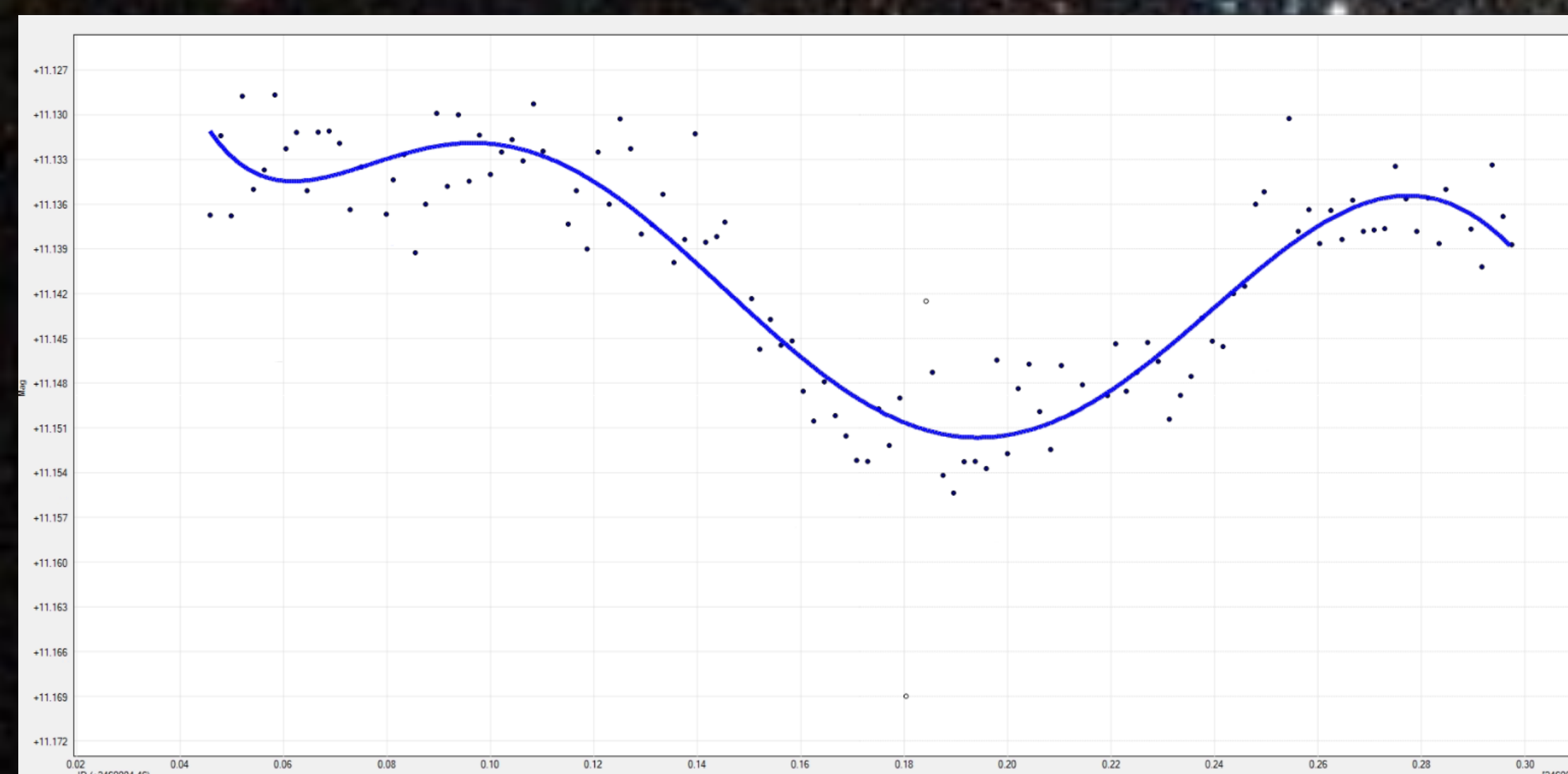Figure 3: (above) Light Curve of Object SZ LYN, a Cepheid Variable star.

SZ LYN:

A variable star in the lynx constellation with a period of **3.035 Hours**
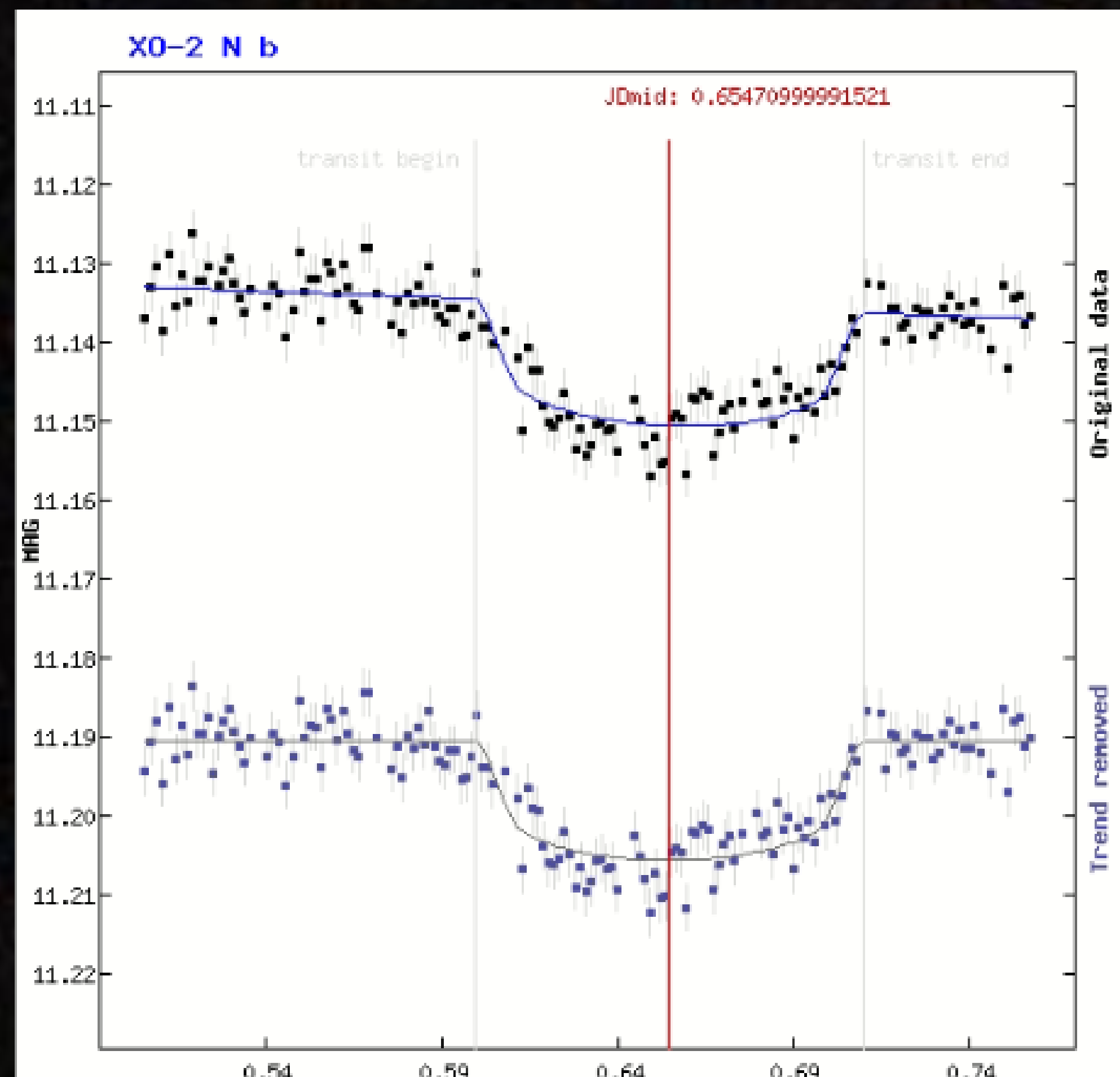Maxima: 9.6
Minima: 9.19

RW-COM:

RW-COM is an eclipsing (contact) binary system in the constellation Coma Berenices with a **period of 5.73 Hours**, This plot shows the period of the system. This is the **first eclipsing system** that ALPHA has captured!
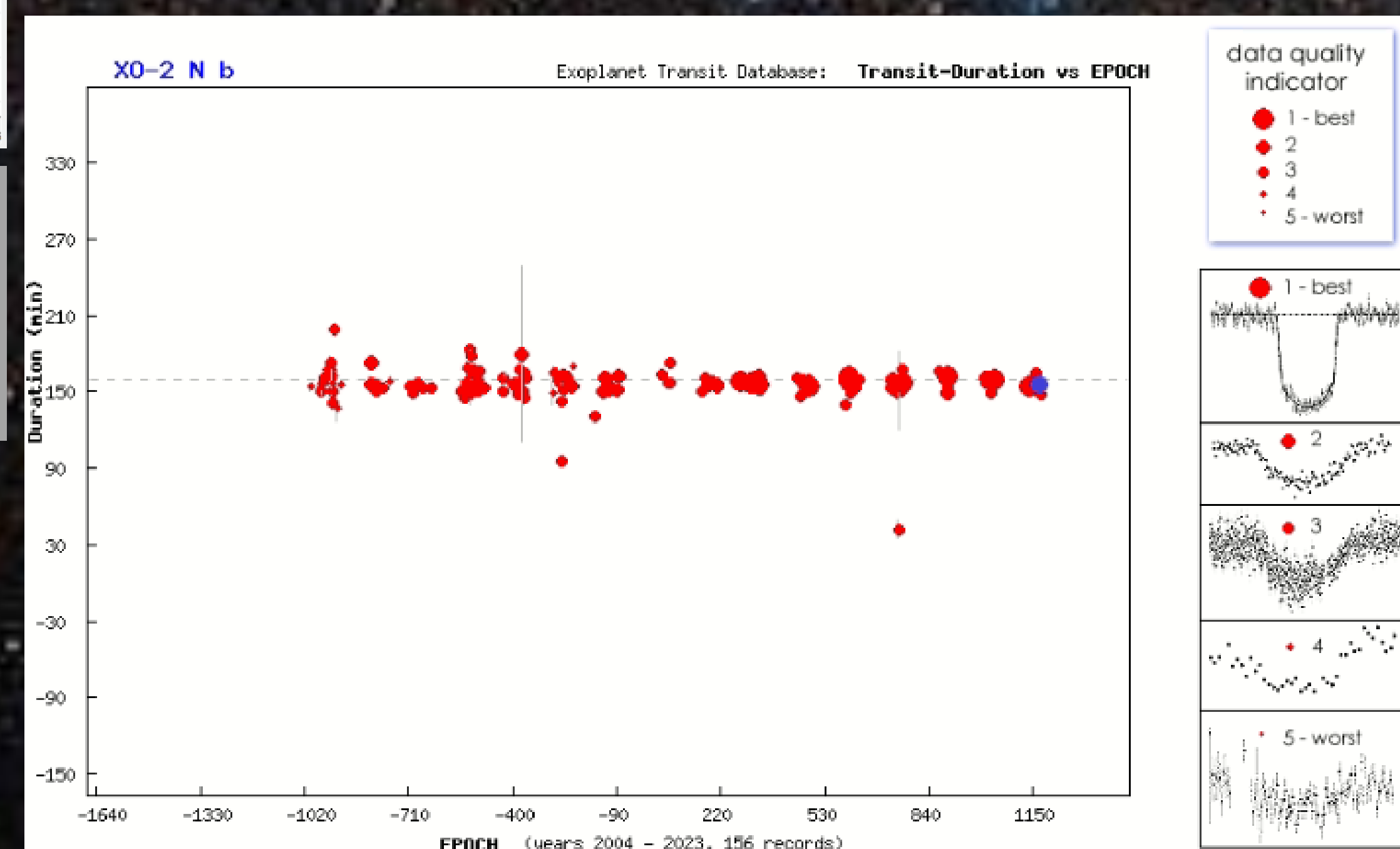

Figure 4: (Above) Full period of RW-COM as rendered in Perenzo.

Minor Planet Center (MPC) Submission Process

PRISM

1: Quality (elongation) Check
2: Preprocess
3: Clarifying script
4: Subtraction script

TYCHO

5: Manual Quality Check
6: Plate Solved (Express Mode)
7: Track objects in image
8: Verify Confidence in Observation
9: Create submission file

SUBMIT to MPC

Figure 7: (Above) Flow chart of how objects are submitted to Minor Planet Center

XO 2NB:

A hot Jupiter exoplanet
Observed Transit Period: 162 min
ETD Transit Period: 159 min

Figure5: (above) this is one period of the light curve Exoplanet XO-2NB with a 6th degree polynomial of best fit of the data
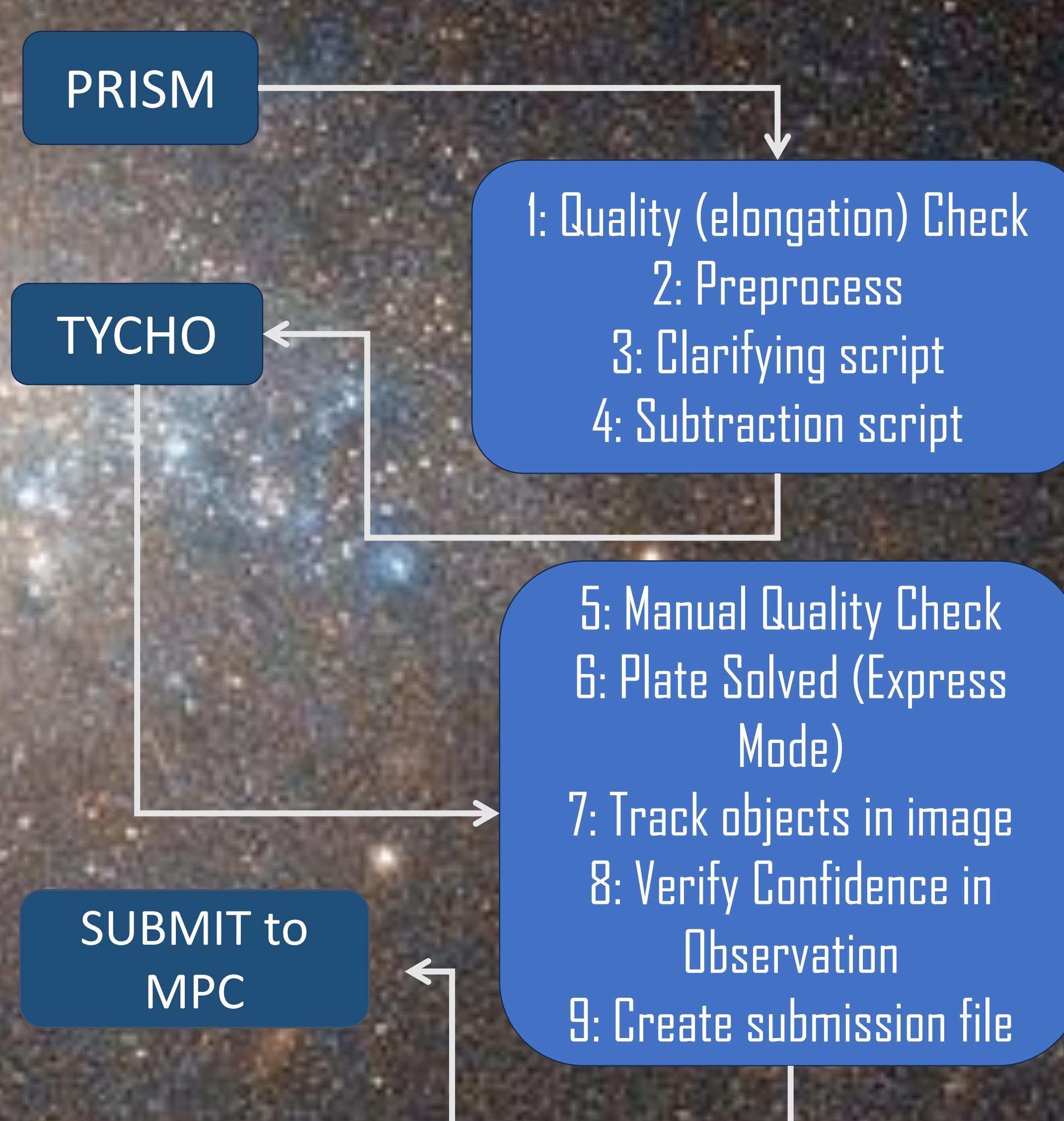Figure 6: (below) ALPHA data graphed in trend with Exoplanet Transit Database data, comparing the two datasets

Figure 8: (Above) Artist rendering of a binary star system by NASA
Figure 9: (left) Exoplanet Transit Database Transit graph(red) compared with ALPHA data (blue)
Figure 10: (Below) artist rendering of XO-2NB by NASA
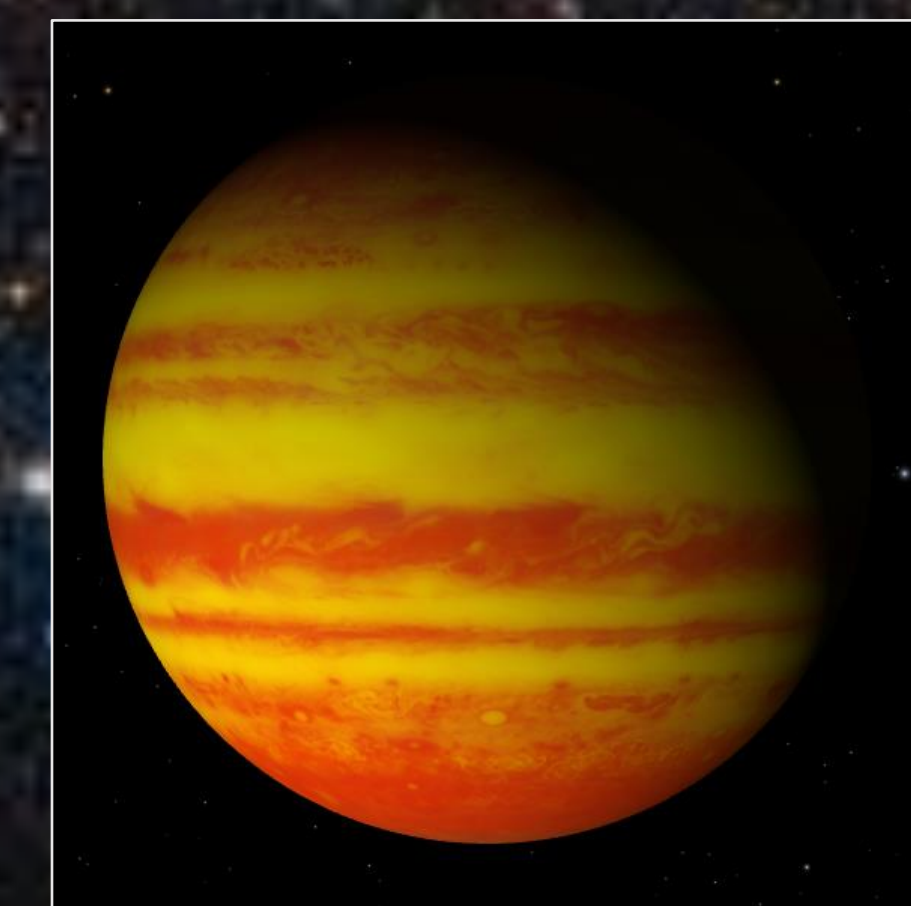
Challenges and Lessons Learned:

Throughout this project I dealt with large quantities of data. 1 Terabyte of data in total. A difficulty faced was the unpredictability of weather. The winter versus spring weather have each their own unique difficulties. In this project I was able to find the transit time of ALPHA's First exoplanet from looking at the raw data. I also learned how the clarity of the image to the human eye does not immediately omit the image from being used to track the intended object.

Special Thanks:

I would like to thank Professor Mabson for teaching me the nuances of astronomy through this project. I also want to thank Dr. Bowden, Matt Collinge, and Maryland Space Grant for this opportunity.

Poddany S., Brat L., Pejcha O., New Astronomy 15 (2010), pp. 297-301, *Exoplanet Transit Database. Reduction and processing of the photometric data of exoplanet transits* (arXiv:0909.2548v1)