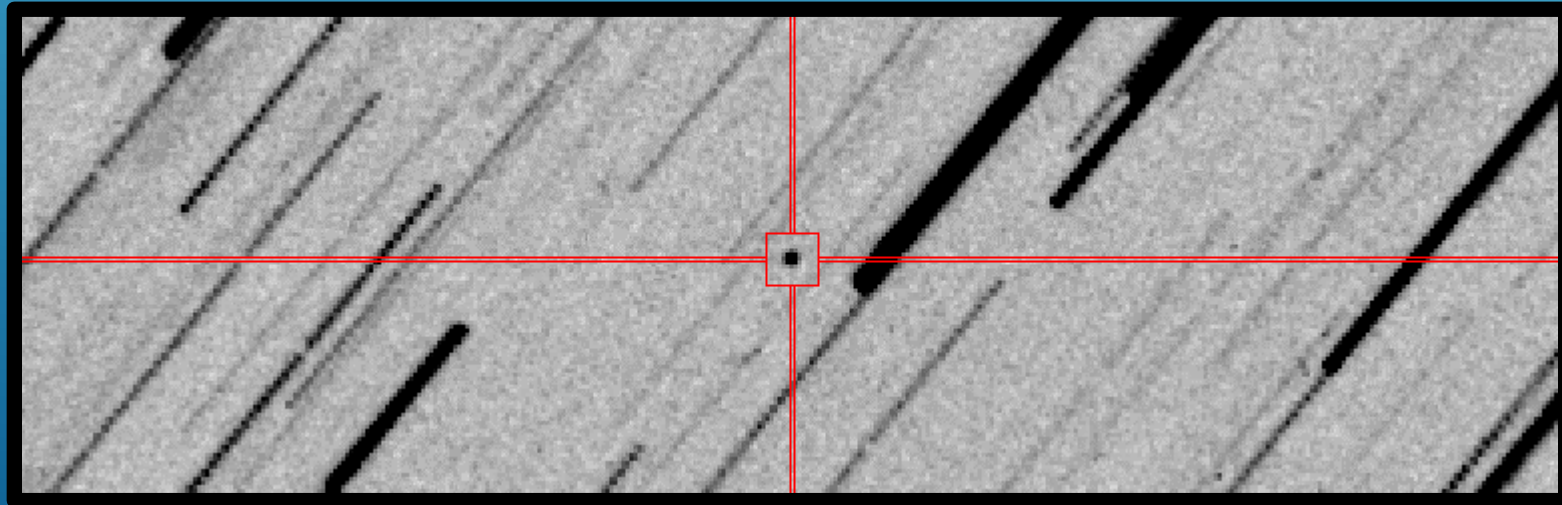




Tycho Tracker

A tool for the detection and measurement of asteroids and comets



Overview

- Discovery of new minor planets
- Recovery/follow-up
- Photometry of asteroids
- New Photometry enhancements
- Lightcurve of (1627) Ivar
- Lightcurve of (9) Metis using Seestar S50

Background

- **Conventional technique:**
 - 3 or 4 images
 - Revisit field (gaps of 20 minutes)
 - SNR is limited to single exposure
- **Synthetic tracking:**
 - Detect 10x fainter
 - Dozens or more images
 - Continuously dwell on field

Discoveries

- 200+ NEOs
- 10+ comets
- 2 impactors
 - 2023 CX1
 - 2024 BX1
- 138 of the smallest asteroids from JWST

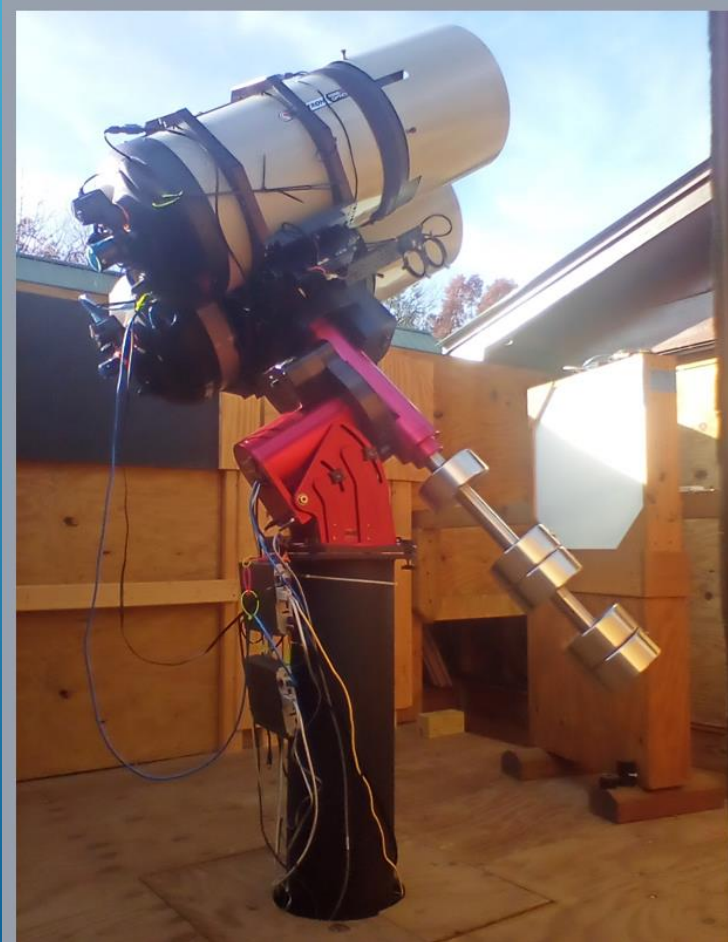
Discoveries



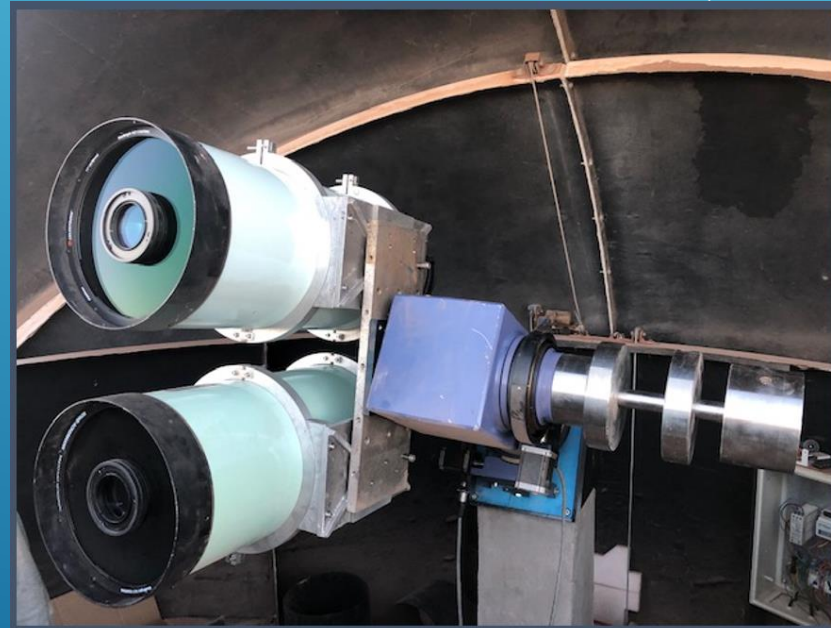
- JWST: Discovery of 138 decameter-sized asteroids
- Used the synthetic tracking component of Tycho Tracker

Discoveries

W16 – Alabama, USA

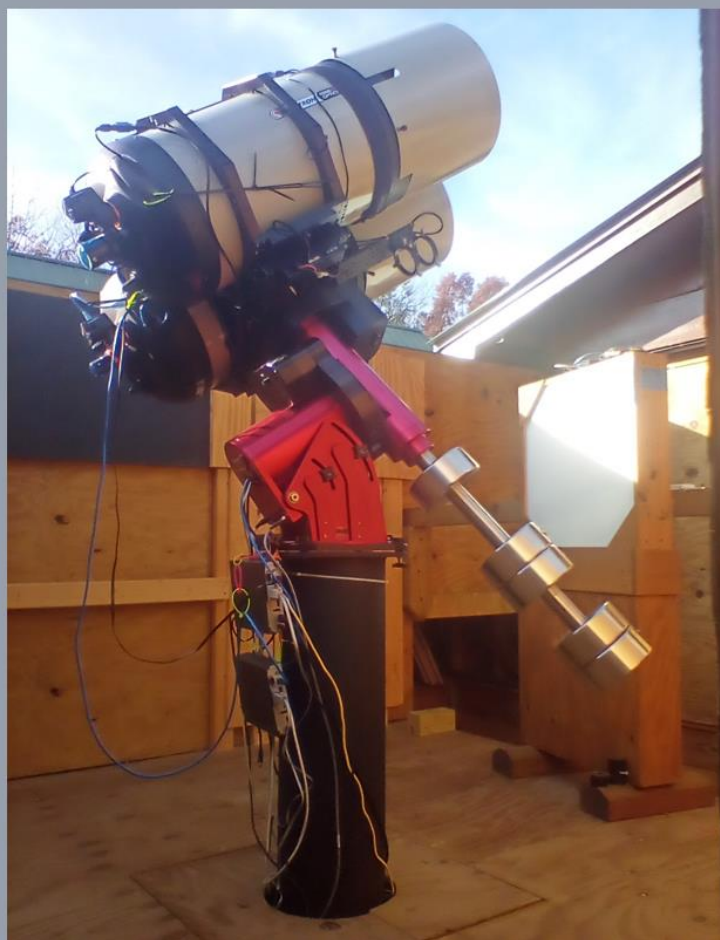


W94 - San Pedro de Atacama, Chile



Discoveries

W16 – Alabama, USA



Notable discoveries:

2024 LZ4 (0.72 lunar distances)

2024 WY70 (PHA NEO)

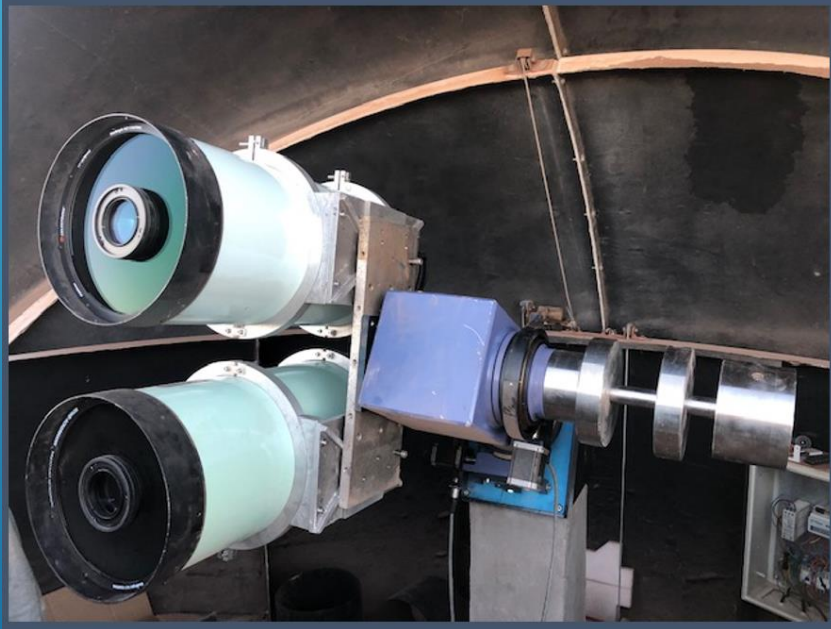
2024 XQ16 (1+ KM NEO)

100 discoveries in total:

<https://mpec.jostjahn.de/W16-stat-discoveries.html>

Discoveries

W94 - San Pedro de Atacama, Chile



Discovery Statistics:

358 asteroids

11 comets (including C/2026 A1)

369 discoveries in total:

<https://mpec.jostjahn.de/W94-stat-discoveries.html>

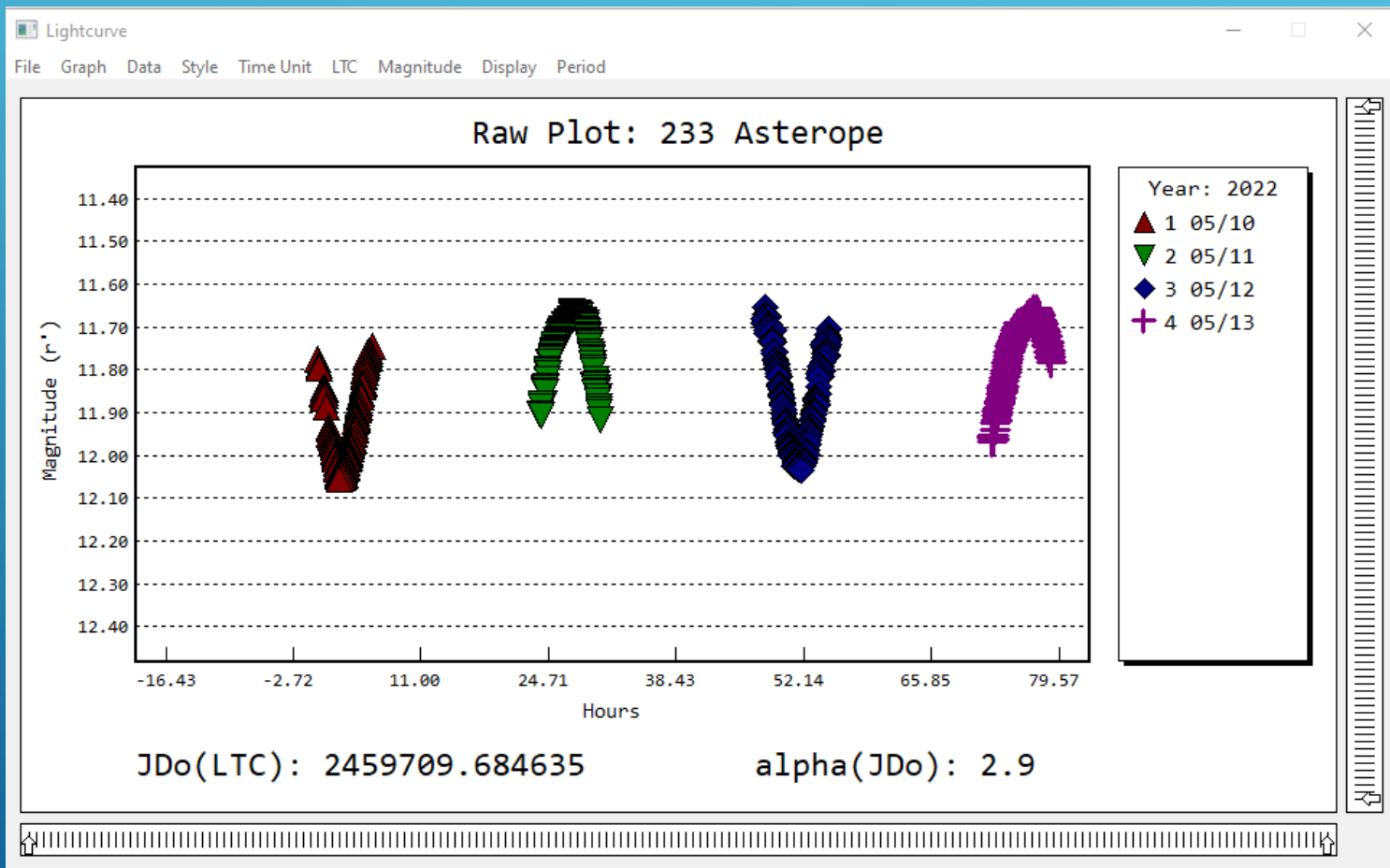
Recovery/Follow-up

- Objects having high uncertainty in orbit
- ST can explore wide range of motion vectors
- New discovery: could have been at SNR limit at time of discovery => another reason to use ST

Photometry

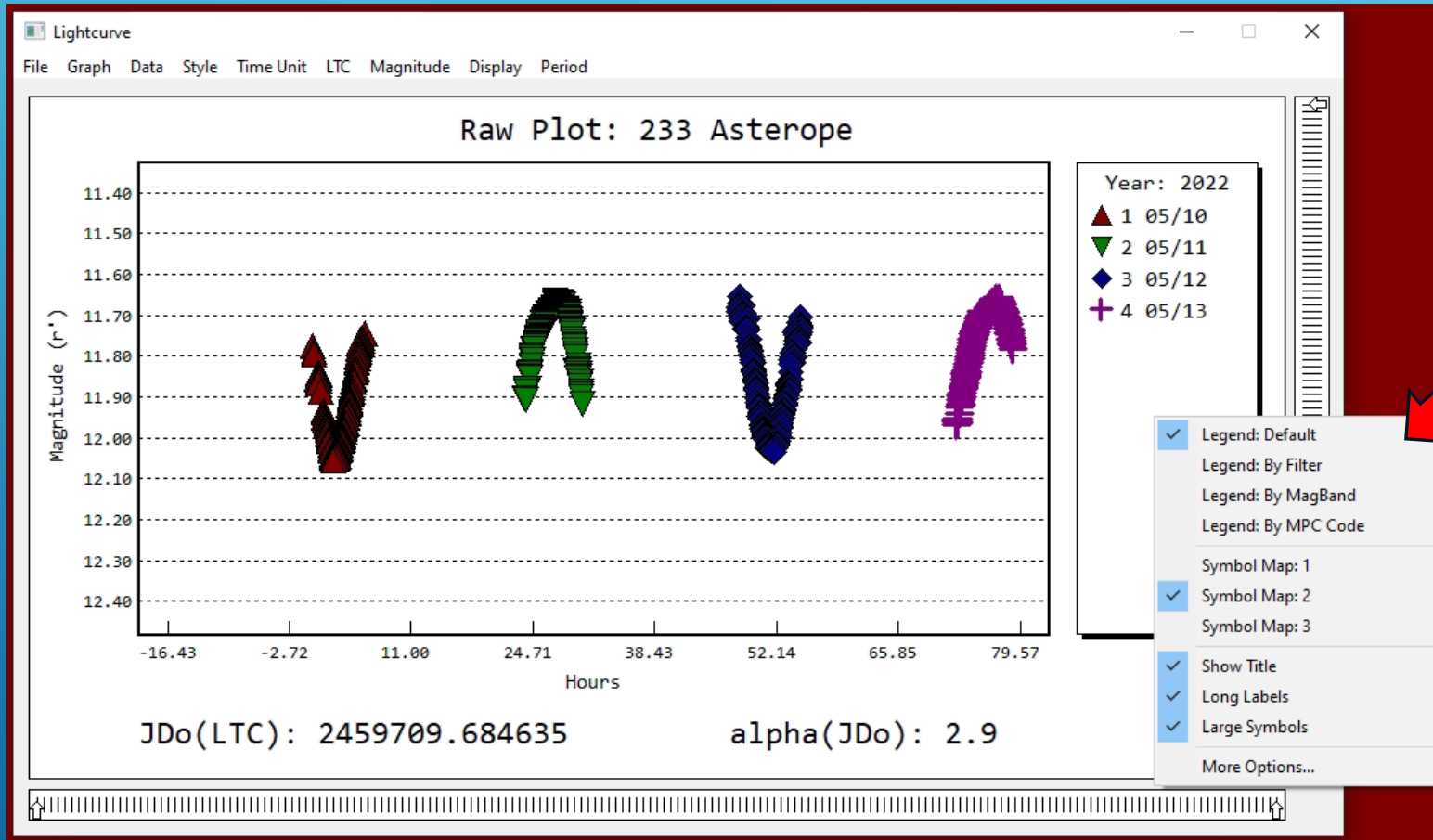
- Construct lightcurve
- Determine rotation period
 - Can inform the composition (when paired with size of asteroid)
 - Spin barrier: 2.2 hours
 - >2.2 hours: likely rubber pile
 - ≤ 2.2 hours: fast rotation; metal or solid rock
- Determine Albedo quantity (comets)
 - Dust production rate
 - New Comet Photometry module added last year

Photometry Updates



Default Layout

Photometry Updates



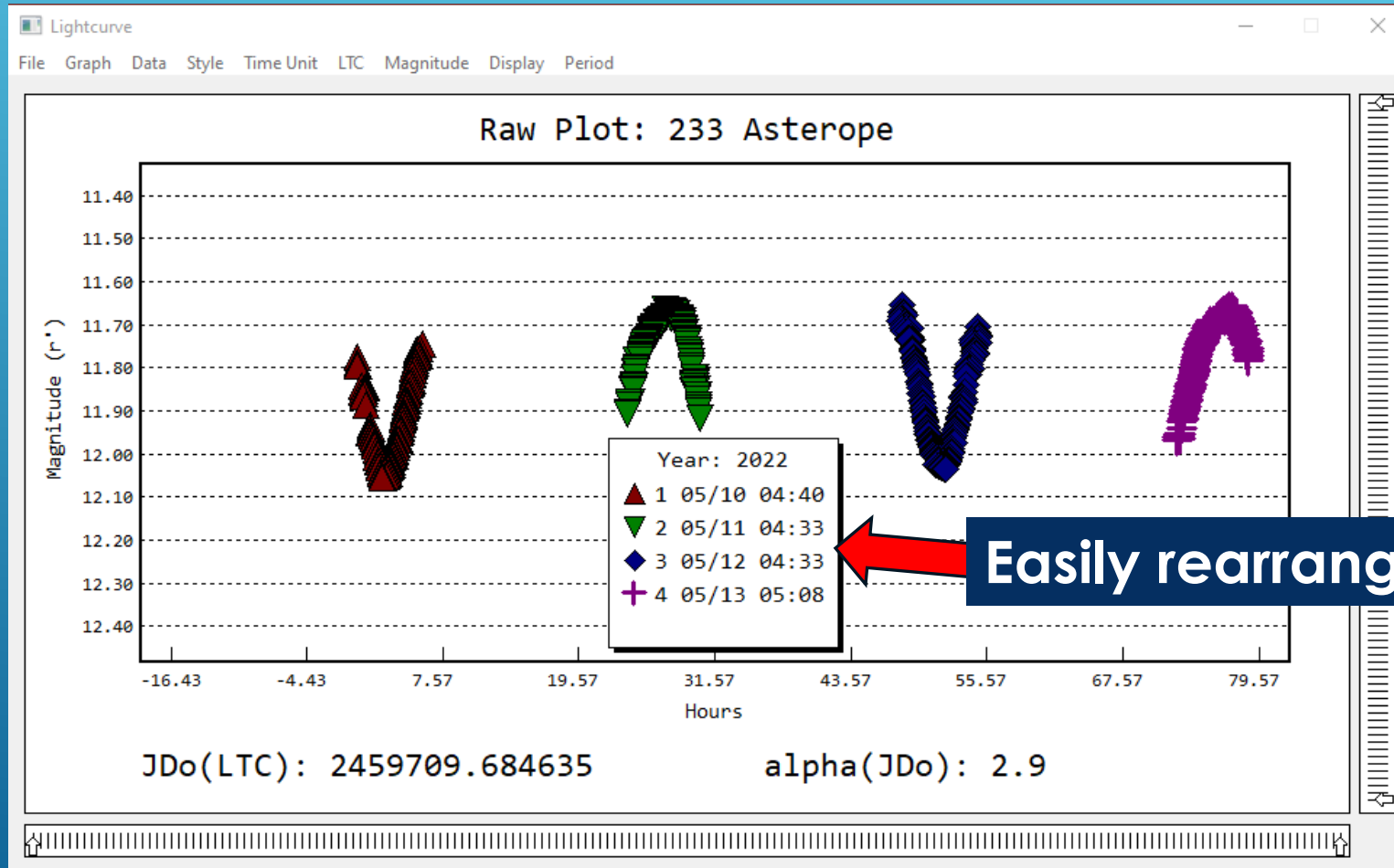
New menu for Legend

Photometry Updates



New options for labeling

Photometry Updates



Easily rearrange chart elements

Demo

- Asteroid Recovery Example
- Photometry of (1627) Ivar
- Photometry of (9) Metis from SeeStar S50 data