

# PROJECT PANOPTES

DISCOVER NEW WORLDS

***Panoptic Astronomical Networked Observatories  
for a Public Transiting Exoplanets Survey***



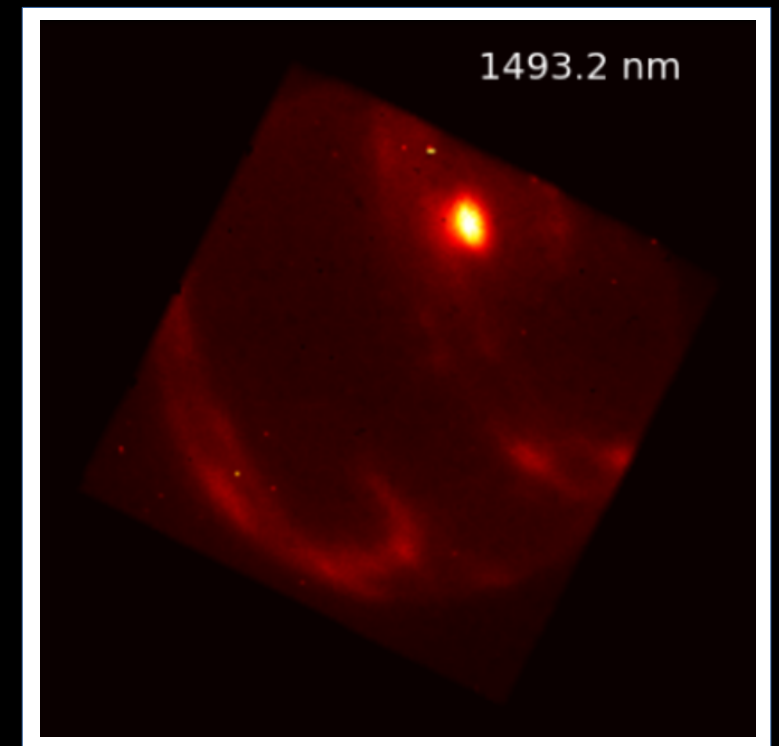
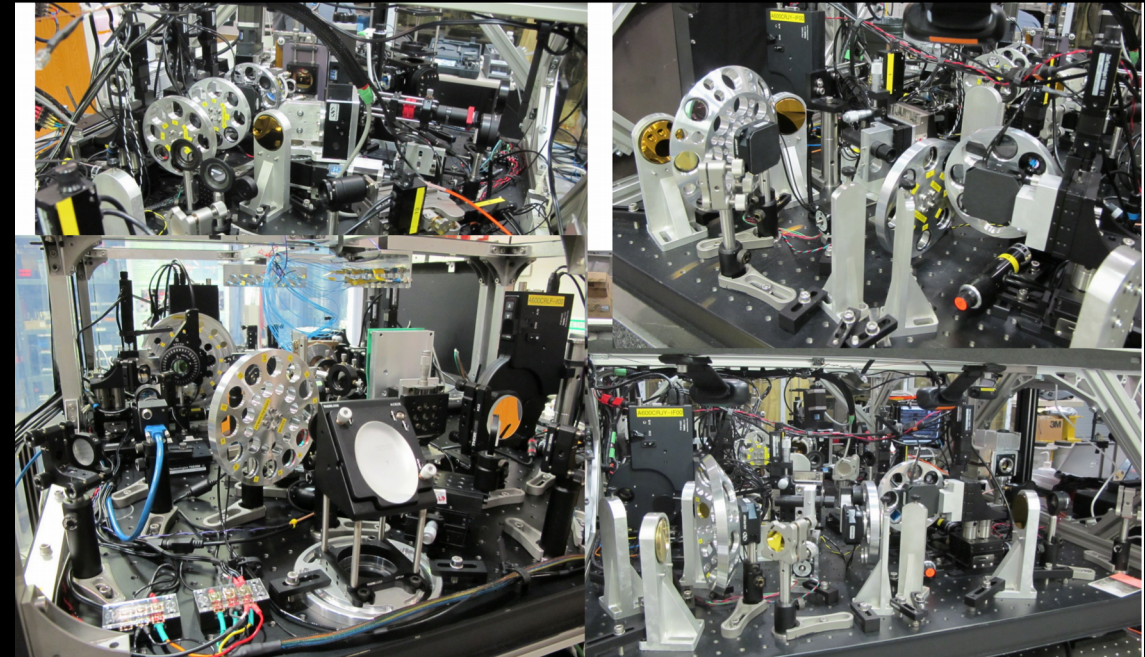
# Short intro about my “day” job

I develop an instrument to image exoplanets on the Subaru Telescope

A few facts about our instrument:

- It has a small field of view, about 1 arcsecond (Neptune does not fit in our widest field camera)
- 
- It costs > \$10M
- 
- It uses bleeding edge technologies, including advanced cameras (for example, a superconducting camera running at 0.1 K temperature)
- 
- It is very complex and delicate. Only 5 people in the world can run it ... and it takes these 5 people to run it
- 

**SCEXAO** Subaru Coronagraphic  
Extreme Adaptive Optics



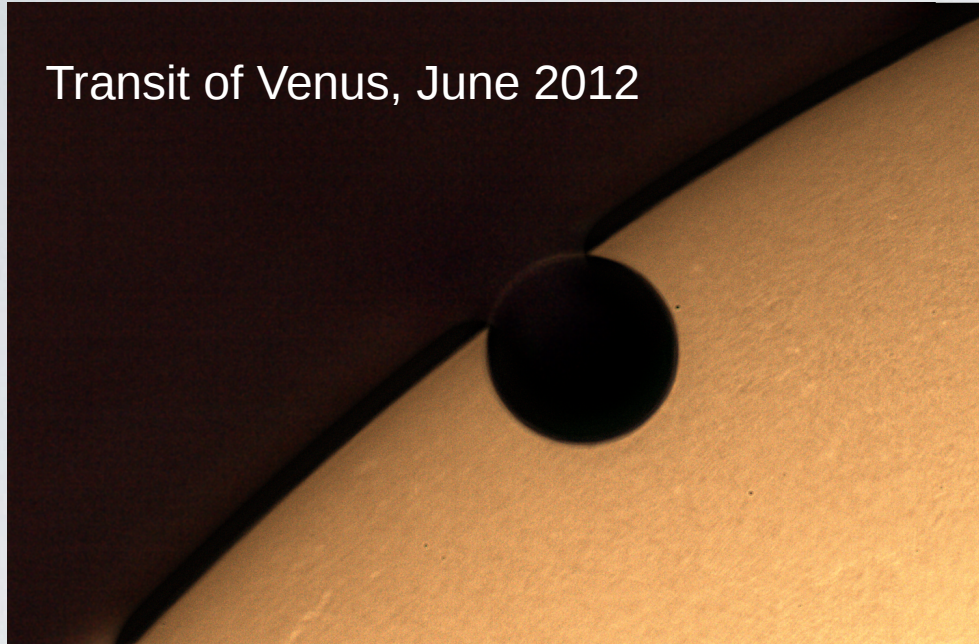




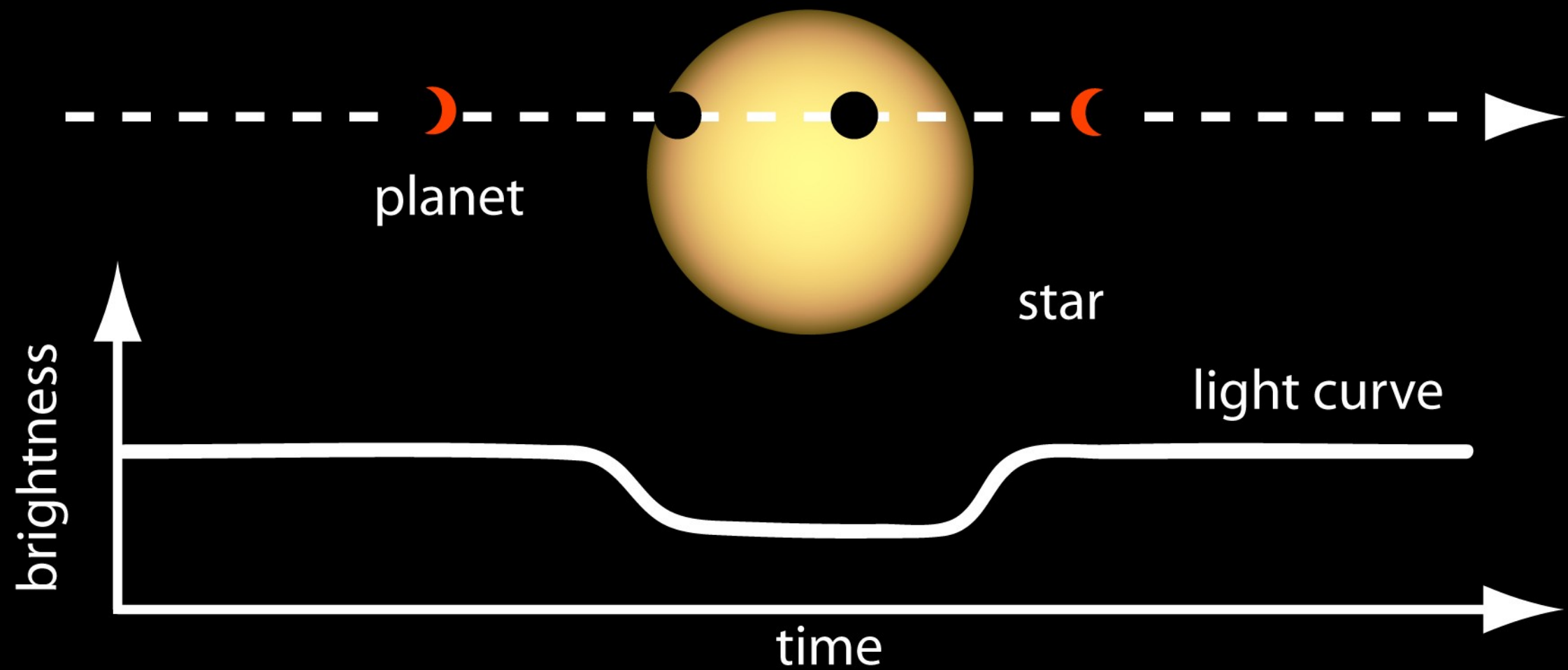
**~300 billion stars in our galaxy**



Transit of Venus, June 2012

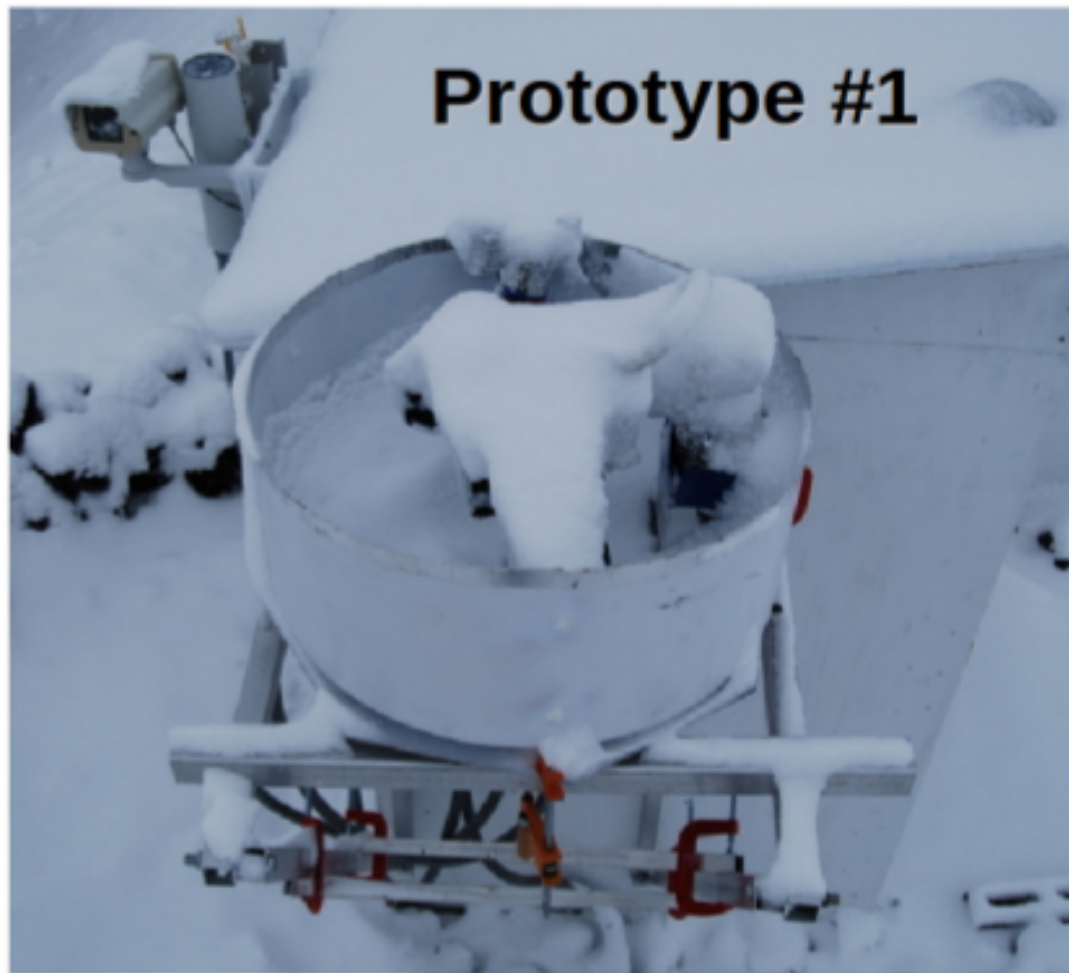


# Exoplanet Transit





**Prototype #1**



**Prototype #2**



**Prototype #3**





# Earlier prototypes (not ours)

Omnibot (1985)

TELL HIM WHERE TO GO.



And what to do when he gets there. And what to say. Omnibot 2000 is the state-of-the-fun robot with a mind all your own.

Exercise remote control and he'll deliver cocktails or breakfast in bed. He'll even walk the dog.

Program his 7-day, 24-hour memory and the alter ego-driven Omnibot 2000 will wake you up, pour your coffee and recite the day's agenda on his built-in tape system.

Of course, he's always open to self-improvement. Add his optional

photo sensor and he'll react to movement. Or the infra-red sensor. And he'll react to obstacles.

Then there's the computer interface. It allows you limitless programming potential off your own home computer.

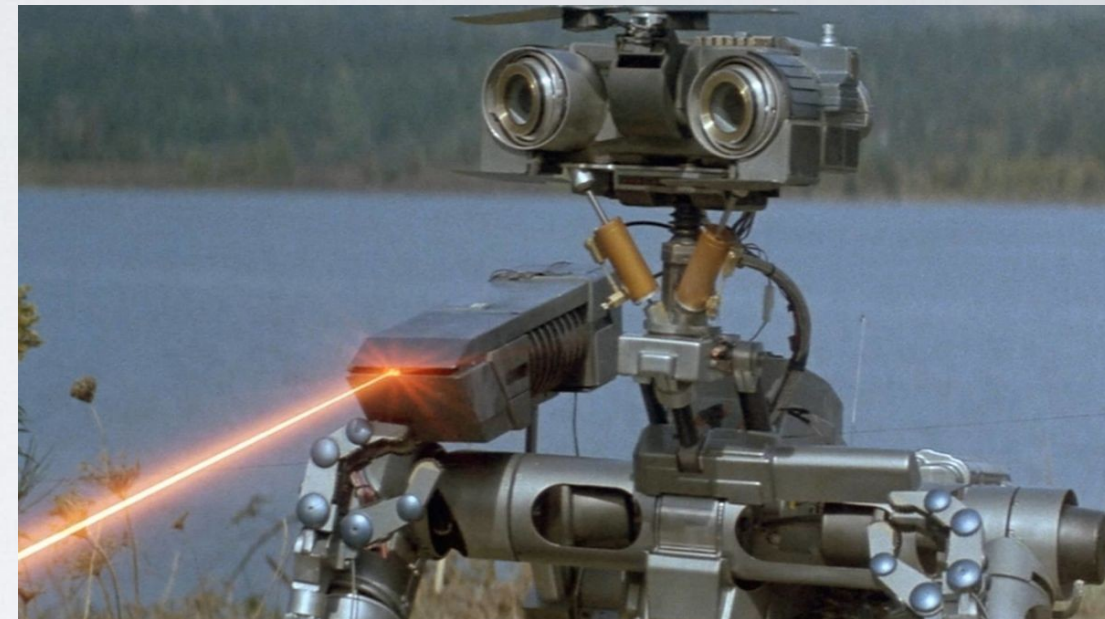
In Omnibot 2000, high technology serves its highest purpose: You.

For the nearest retailer, call 1-800-822-OMNI (in California call 1-800-421-8496). We'll tell you where to go.

**OMNIBOT 2000™**  
THE STATE-OF-THE-FUN-ROBOT FROM TOMY.®



Johnny 5 (1986)



Wall-E (2008)





Control  
Box

Camera  
Lenses

Camera  
Enclosure

Weather-  
Proofed  
Equatorial  
Mount

Telescope  
Pier

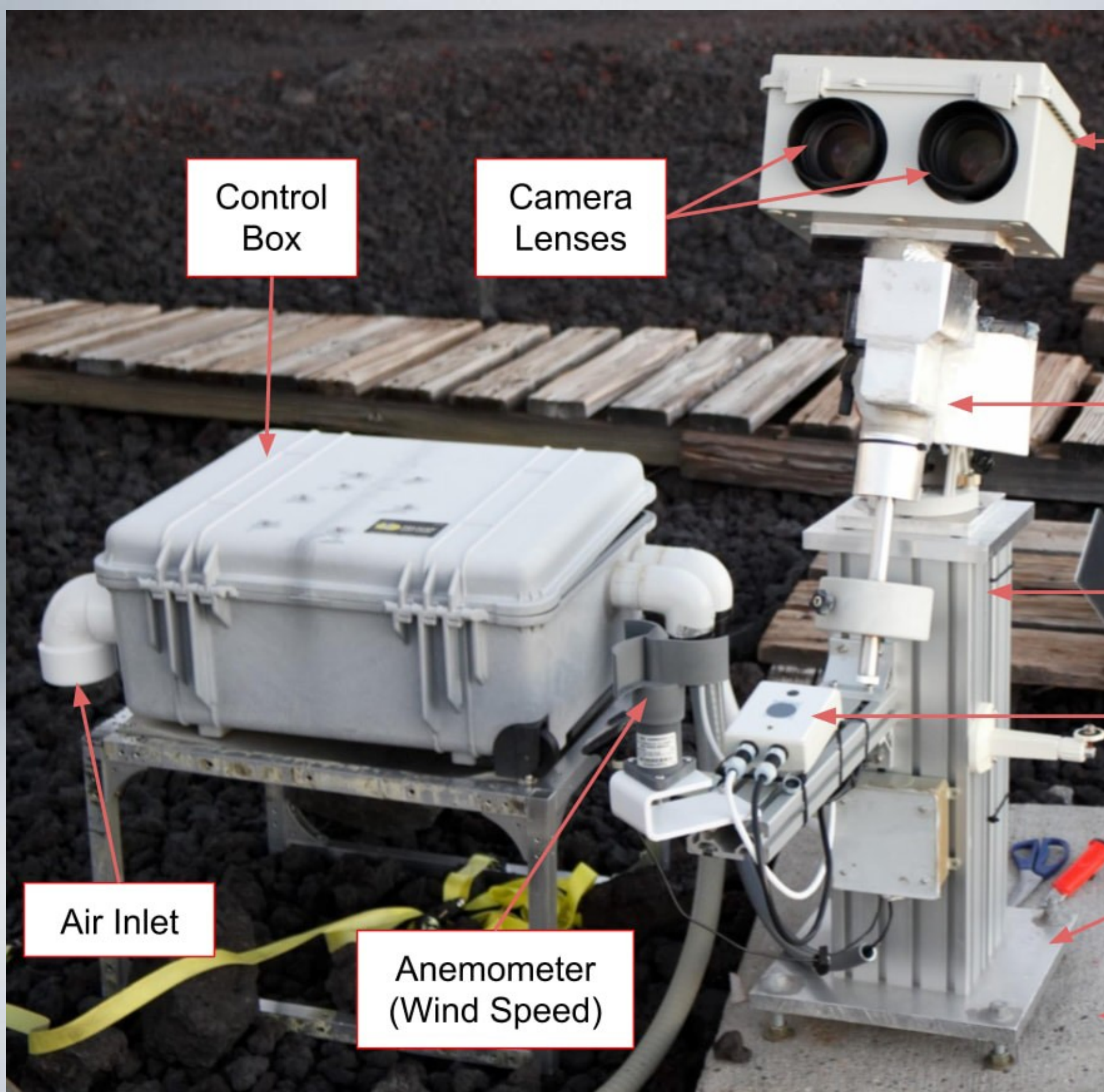
Cloud  
Sensor

Levelling  
Plate

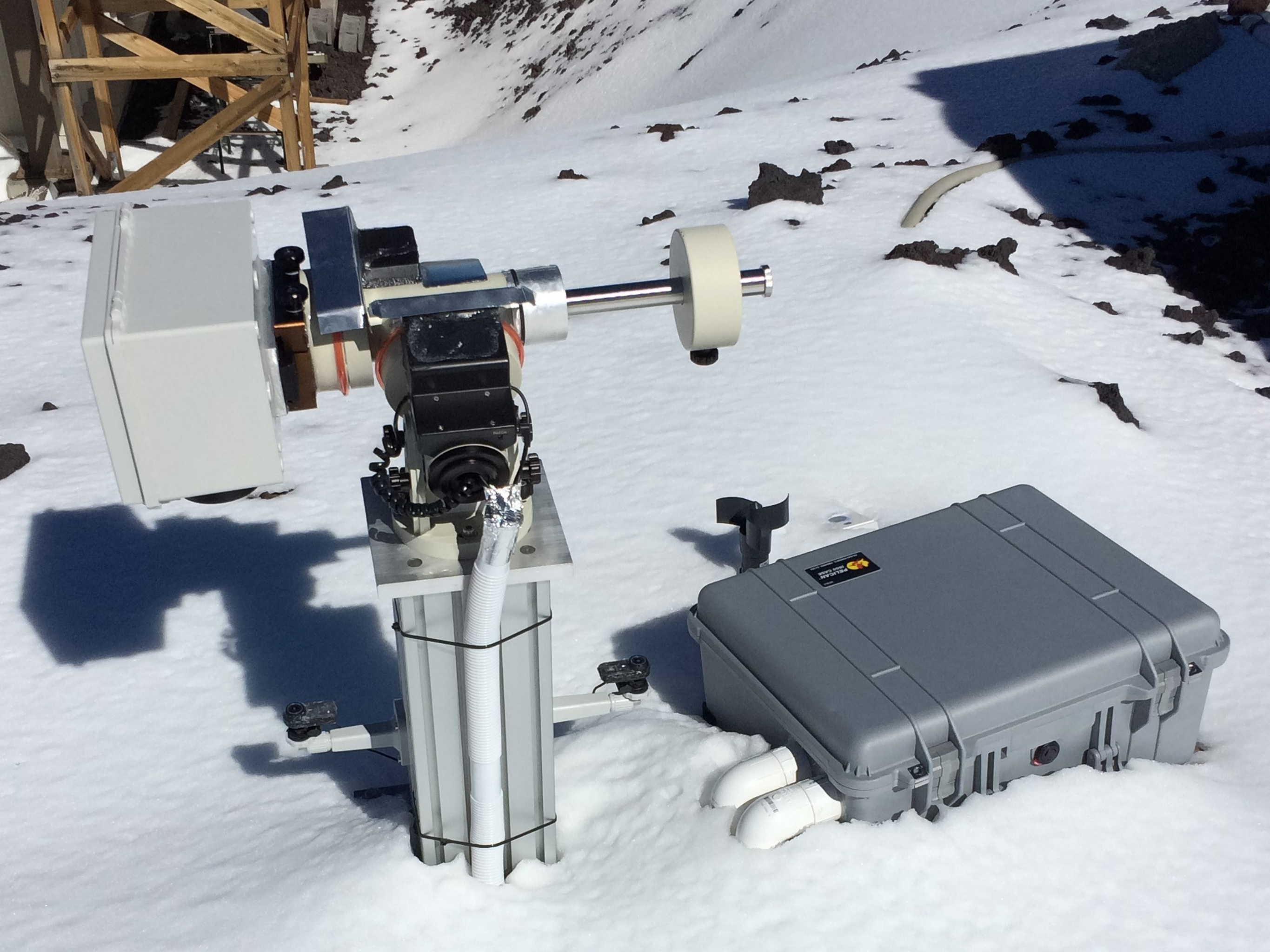
Concrete  
Slab

Air Inlet

Anemometer  
(Wind Speed)

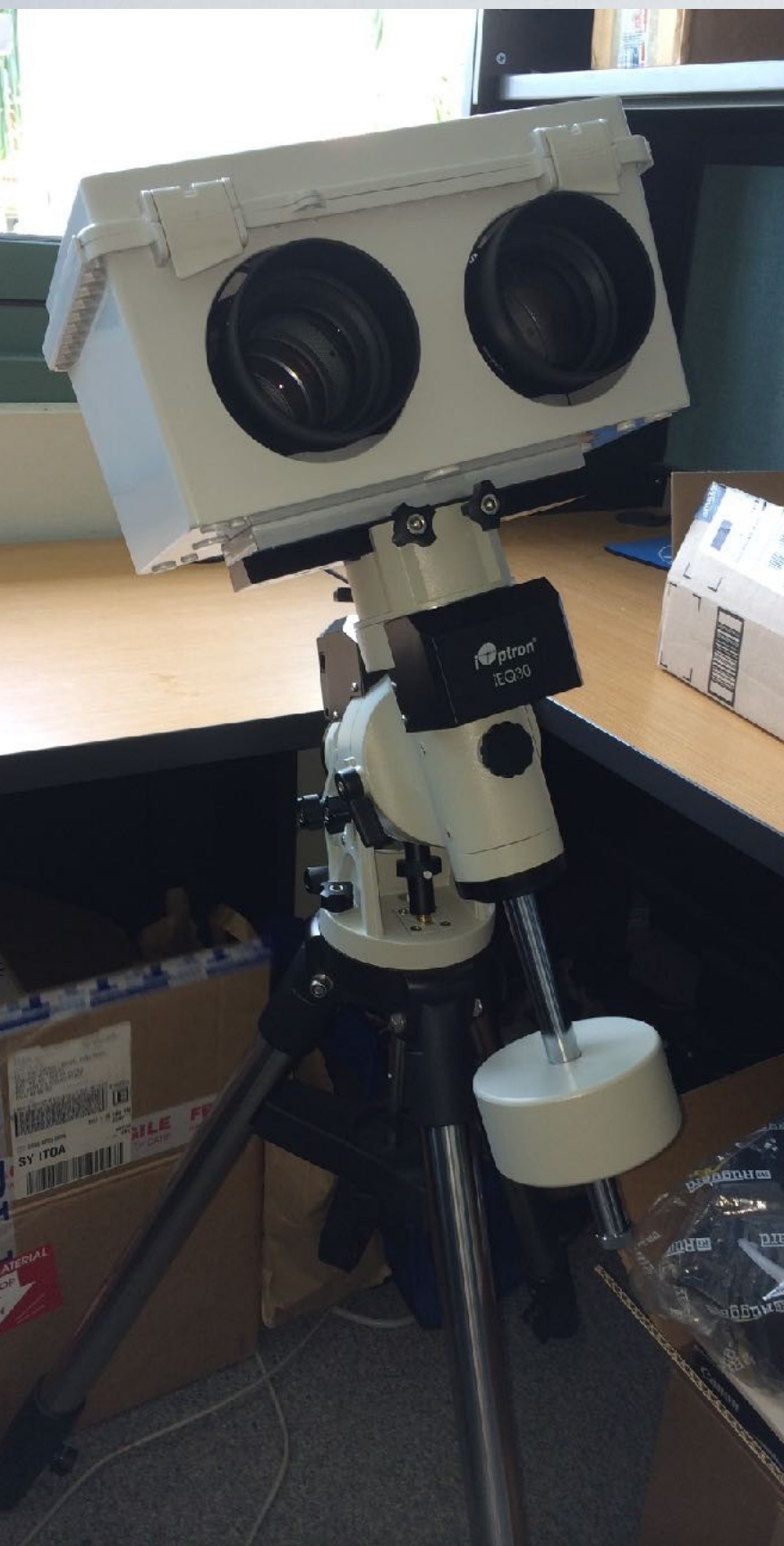








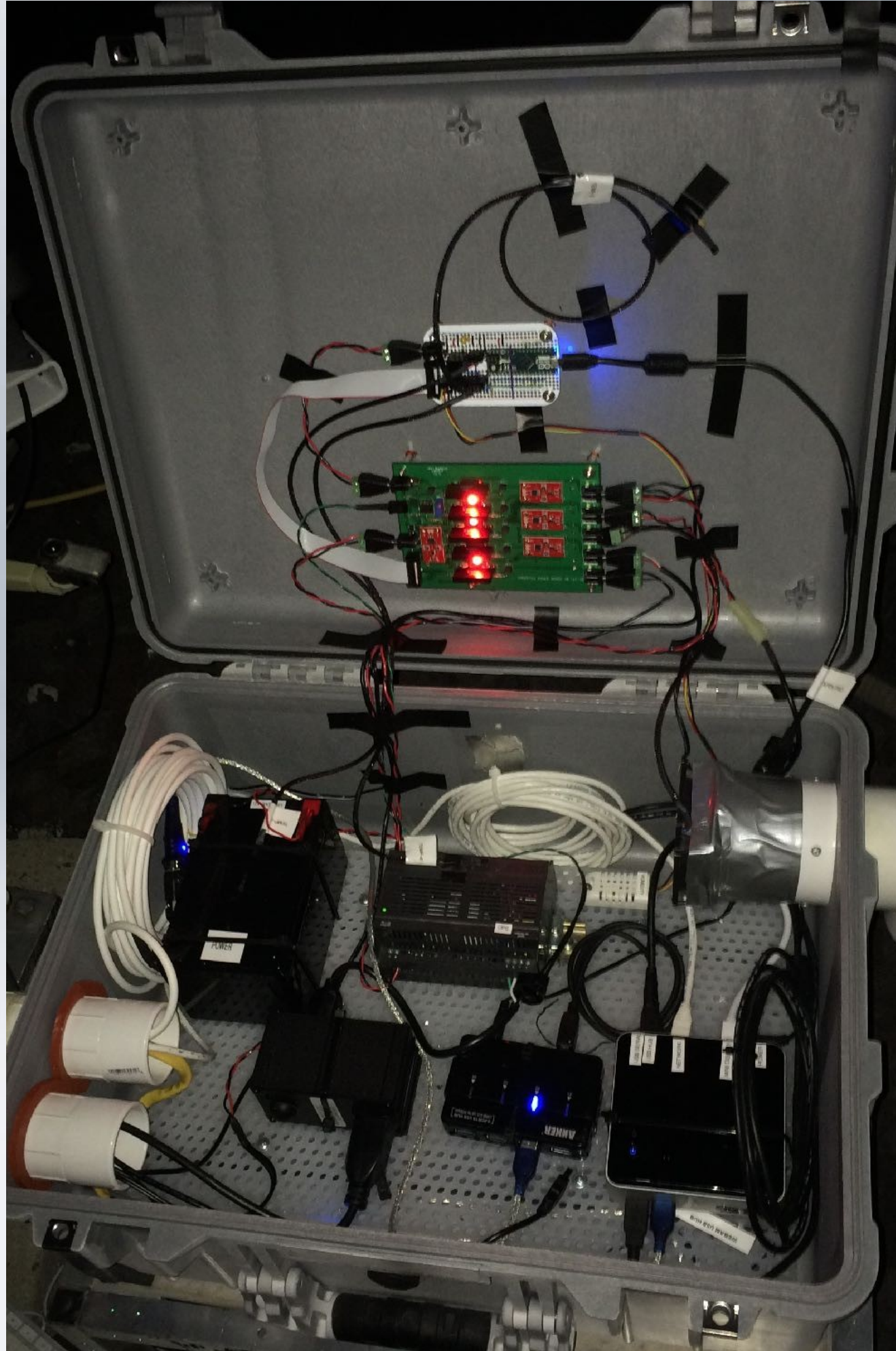
# Final design







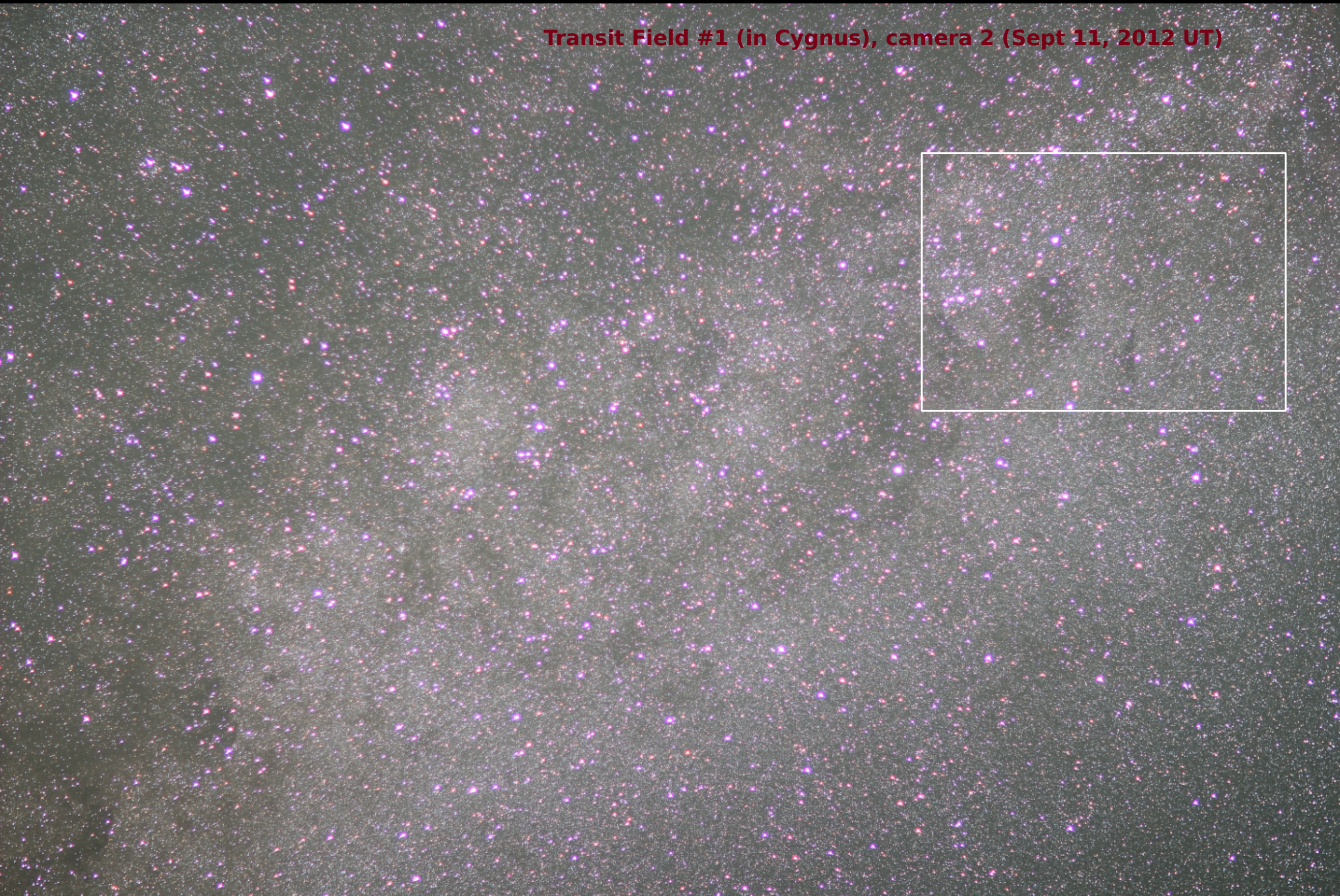




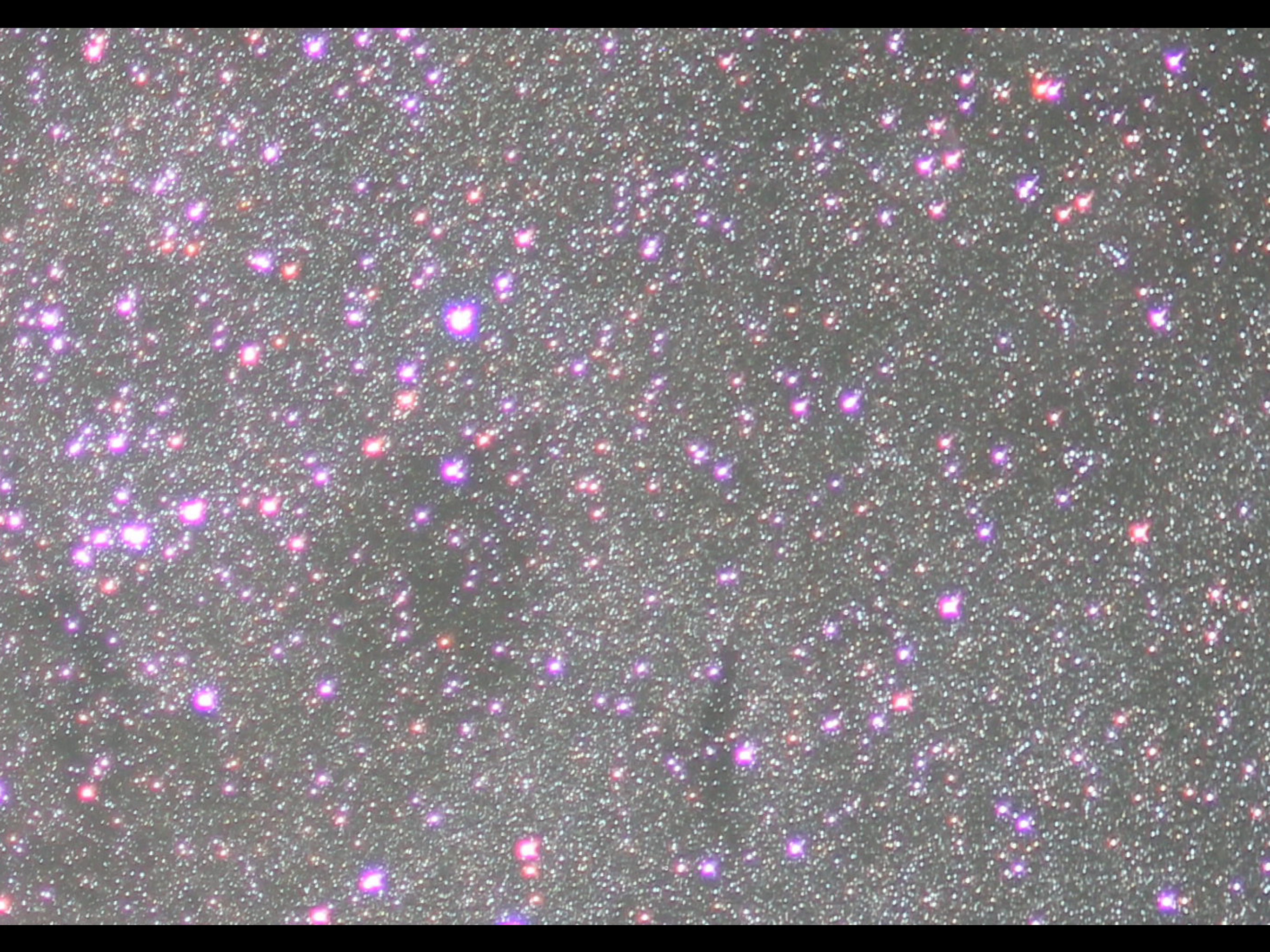


**Example image (Cygnus field):  
>100,000 stars in a single image**

**Transit Field #1 (in Cygnus), camera 2 (Sept 11, 2012 UT)**









Example image – 315 sec exposure, ISO 100 (March 1, 2011)



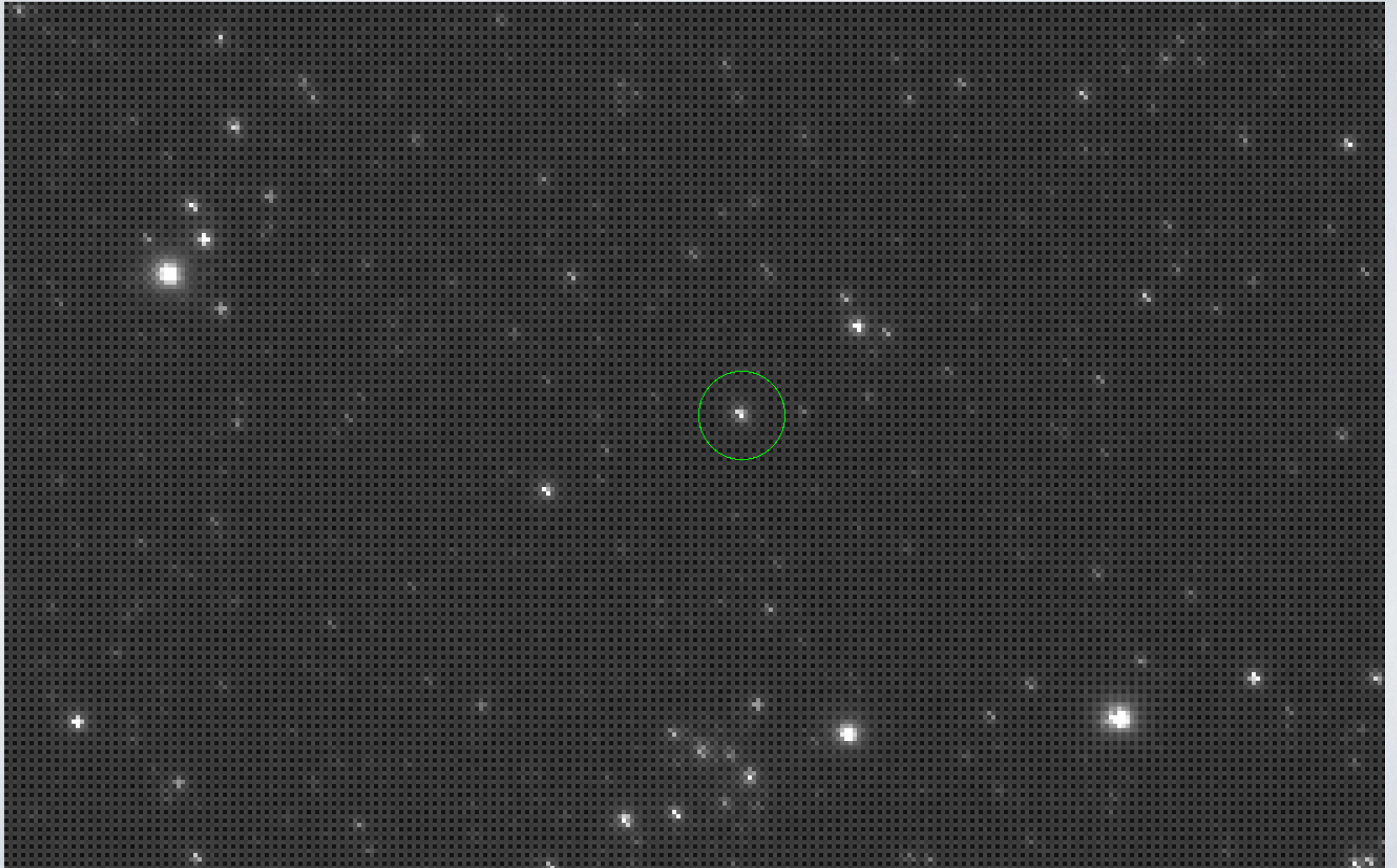


Lower left corner of previous image





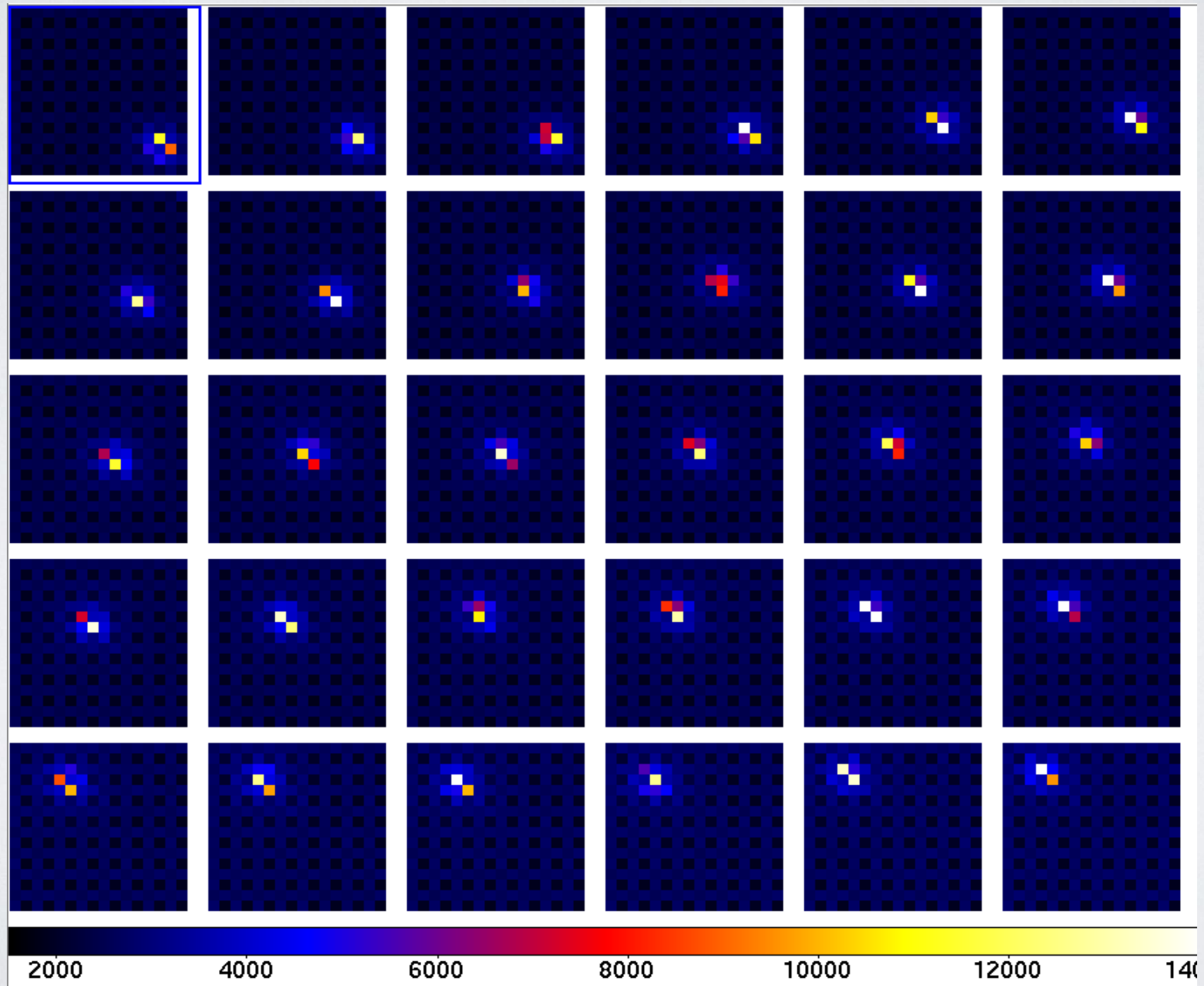
Test on star HD54743 ( $V=9.35$ )  
1 mn cadence





# Test on star HD54743 ( $V=9.35$ )

## 1 mn cadence

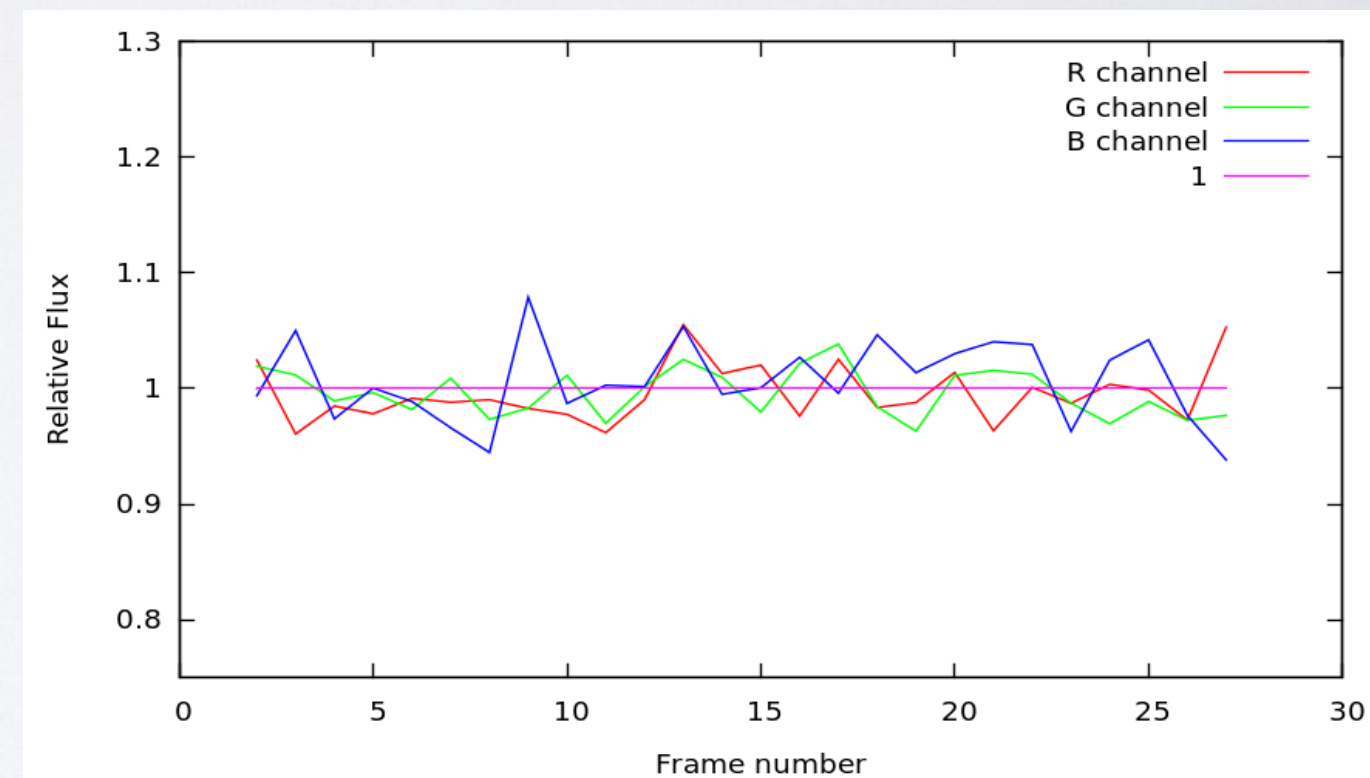
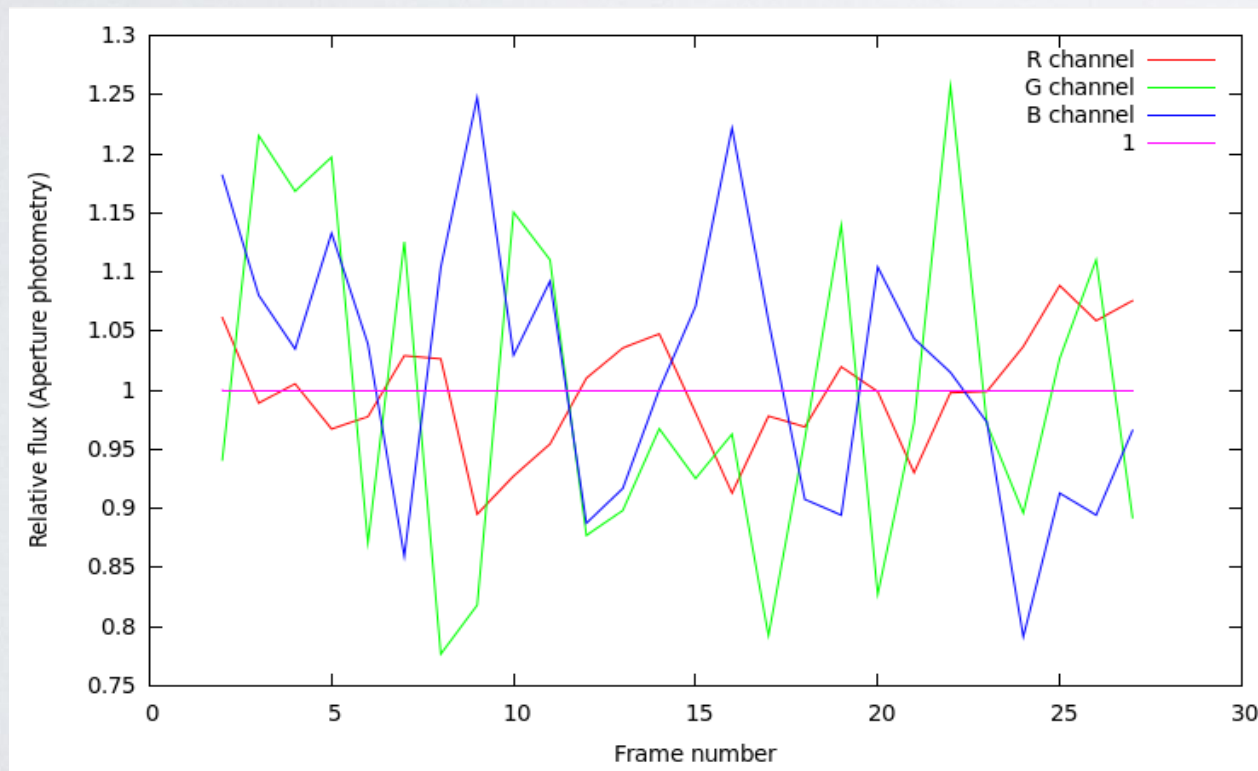




# Test on star HD54743 (V=9.35)

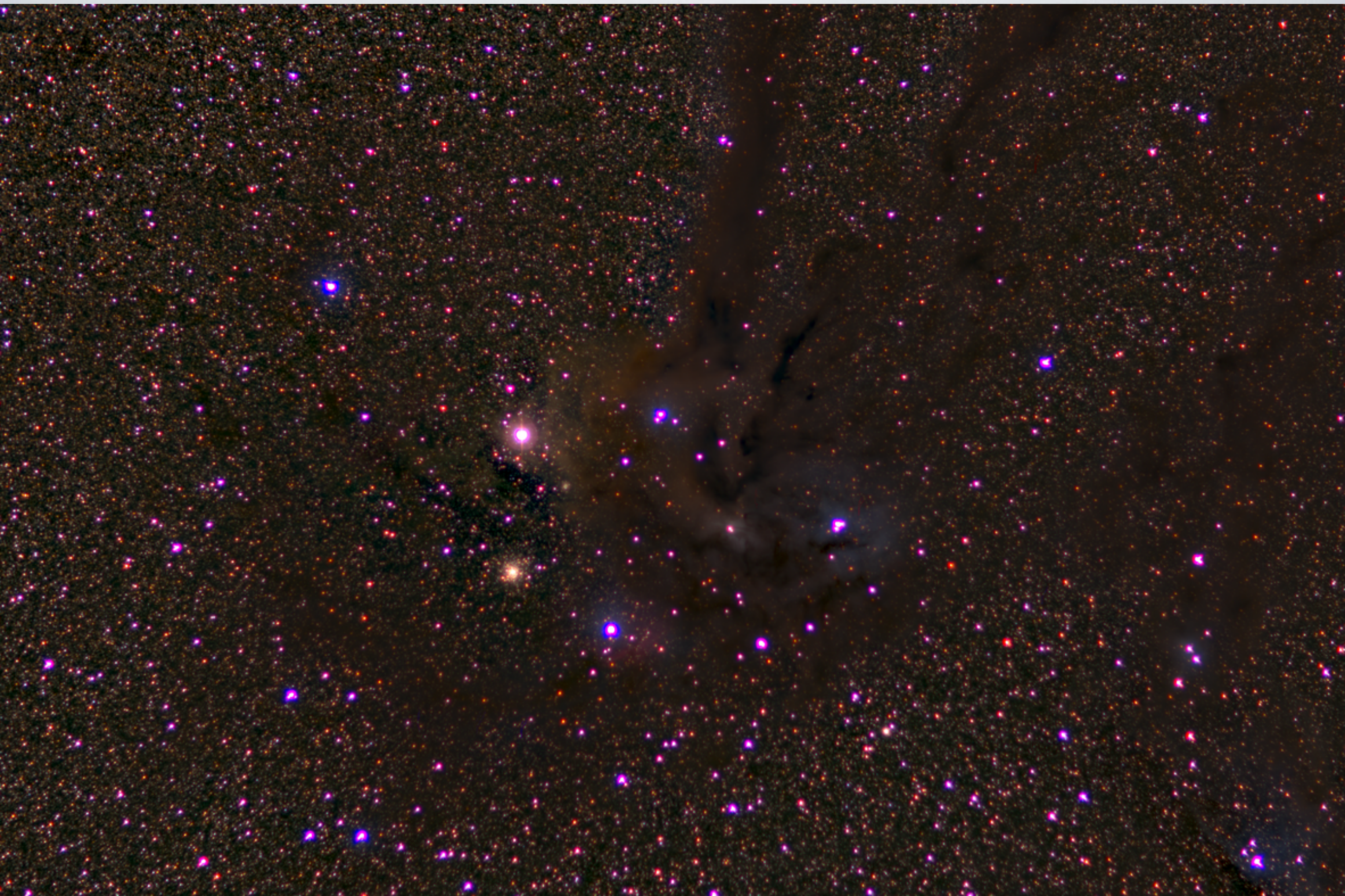
## 1 mn cadence

Error term	R channel	G channel	B channel	Notes
<b>Atmospheric Scintillation</b>	0.3%	0.3%	0.3%	
<b>Photon Noise</b>	2.79%	1.00%	2.24%	mV=9.35, includes background contribution (bright time, r=40arcsec mask)
<b>Readout Noise</b>	0.40%	0.23%	0.71%	
<b>Flat field error</b>	0.5%	0.4%	0.5%	Error term irrelevant with good tracking
<b>Total (expected)</b>	2.88%	1.14%	2.42%	
<b>Achieved</b>	<b>2.48%</b>	<b>2.04%</b>	<b>3.51%</b>	



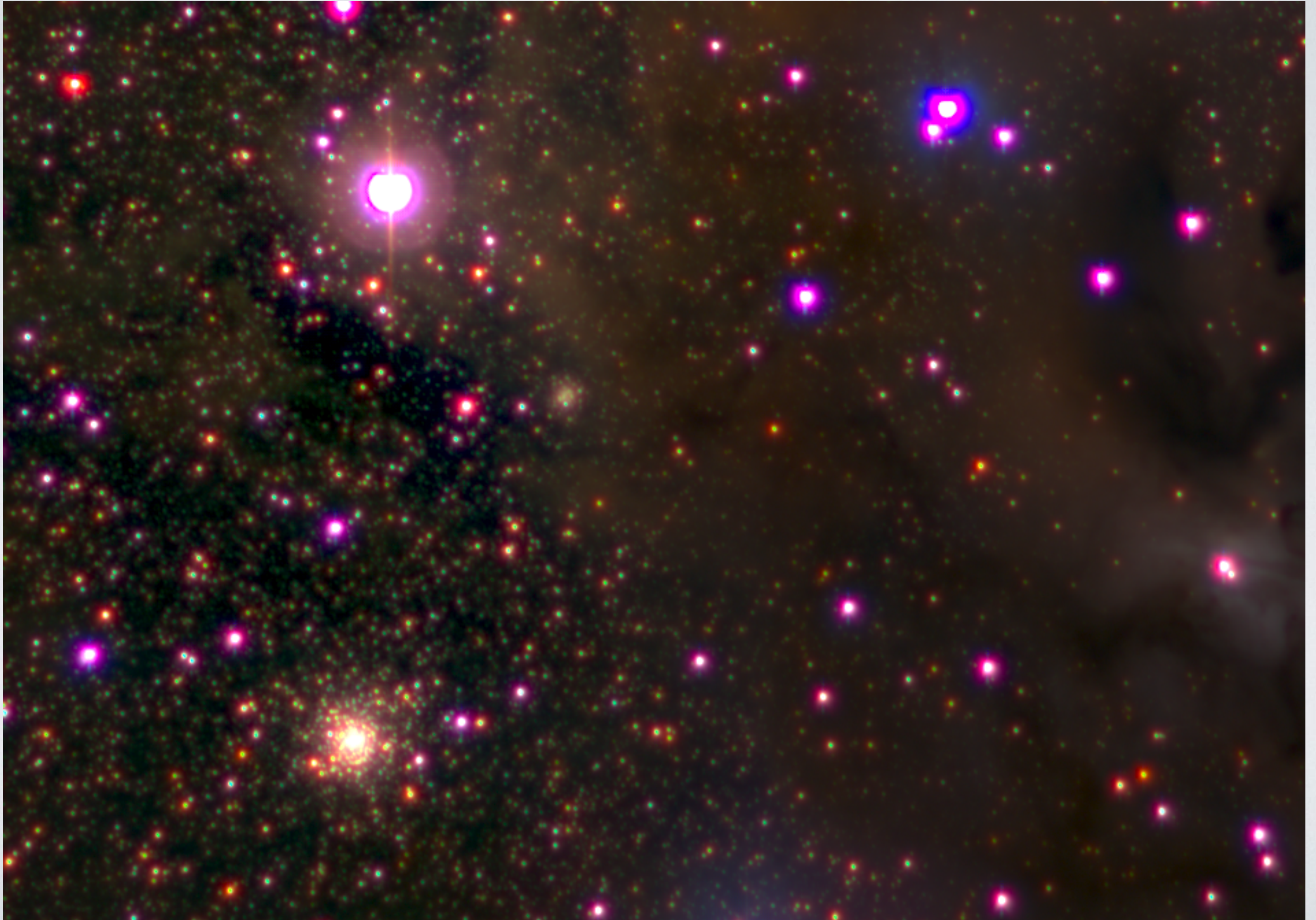


PANOPTES will also take pretty images





PANOPTES will also take pretty images









# Horsehead Nebula





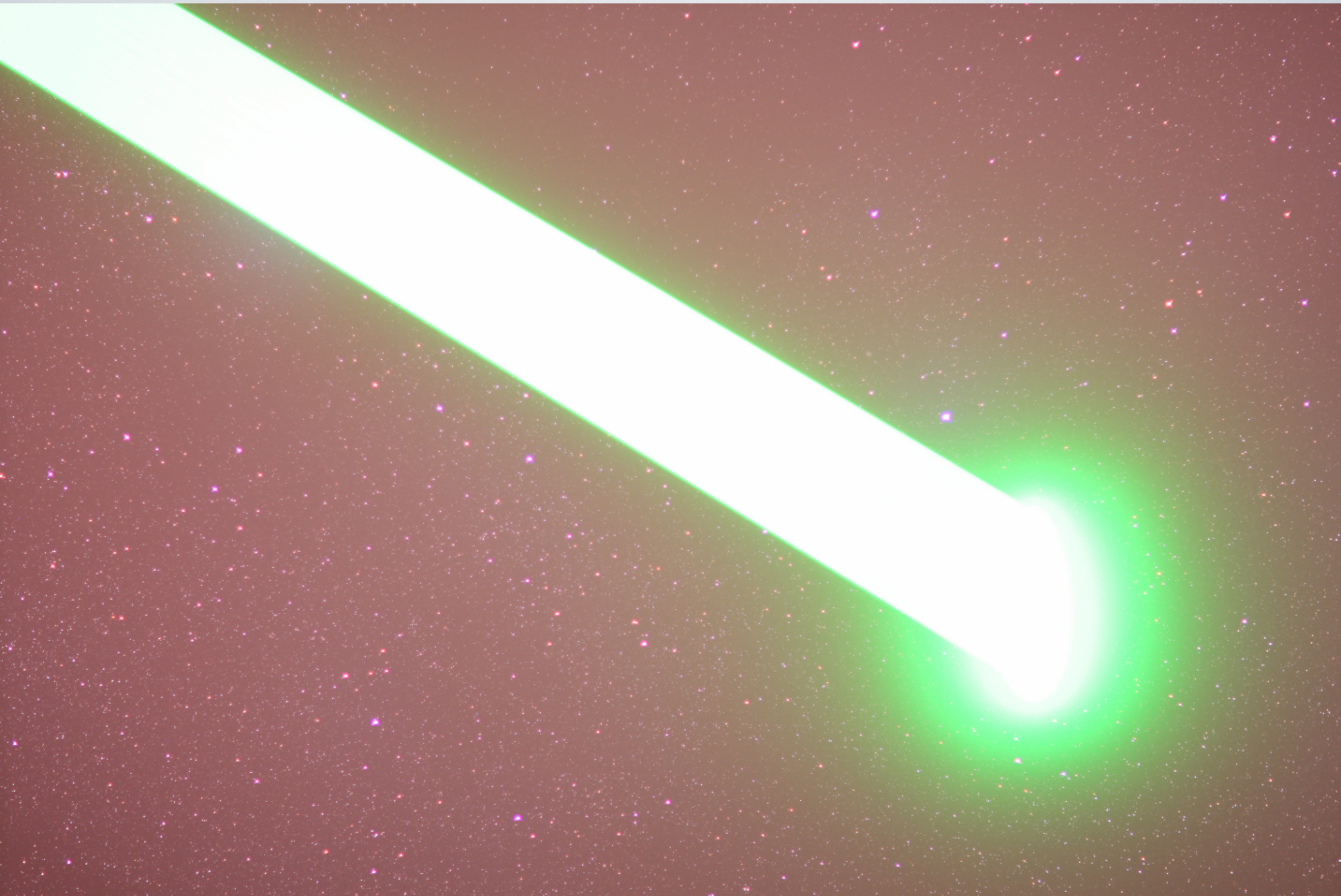


Comet Lovejoy and Geminid meteor - single 10 minute exposure















## More info, how to join PANOPTES

Project website: [www.projectpanoptes.org](http://www.projectpanoptes.org)

Software: <https://github.com/panoptes>

Joining request: [info@projectpanoptes.org](mailto:info@projectpanoptes.org)

