

**Kuinka aurinko kesytetään? - Katsaus
auringon kuvauksen välineisiin ja
tekniikkaan käytännössä**

*Petrus Kurppa
Cygnus 2023, Houtskari
29.7.2023*

VAROITUS

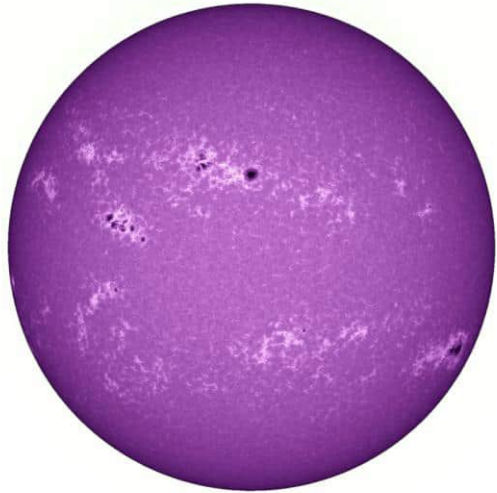


Aurinkoa ei saa milloinkaan katsoa tai kuvata ilman asianmukaista aurinkosuodatinta kaukoputkella, kiikareilla tai paljain silmin.

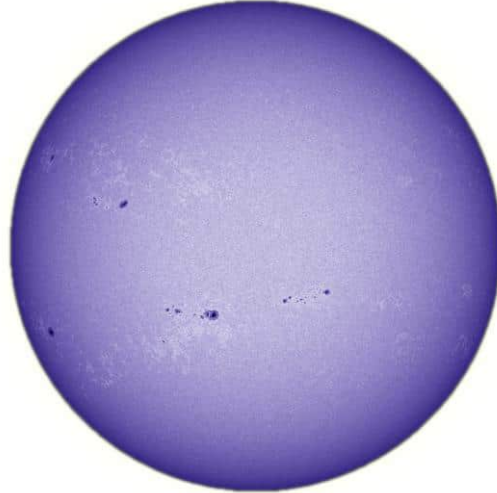
Auringon valokuvaukseen käytetyt laitteet eivät sovellu visuaalikatseluun!



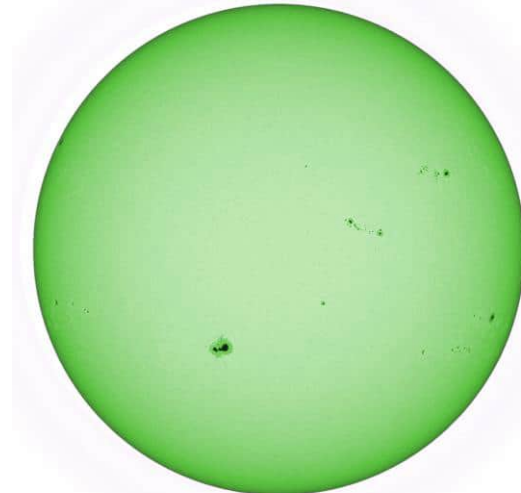
Auringonvaloa eri aallonpituuksilla



Kalsium II K **393.4nm**



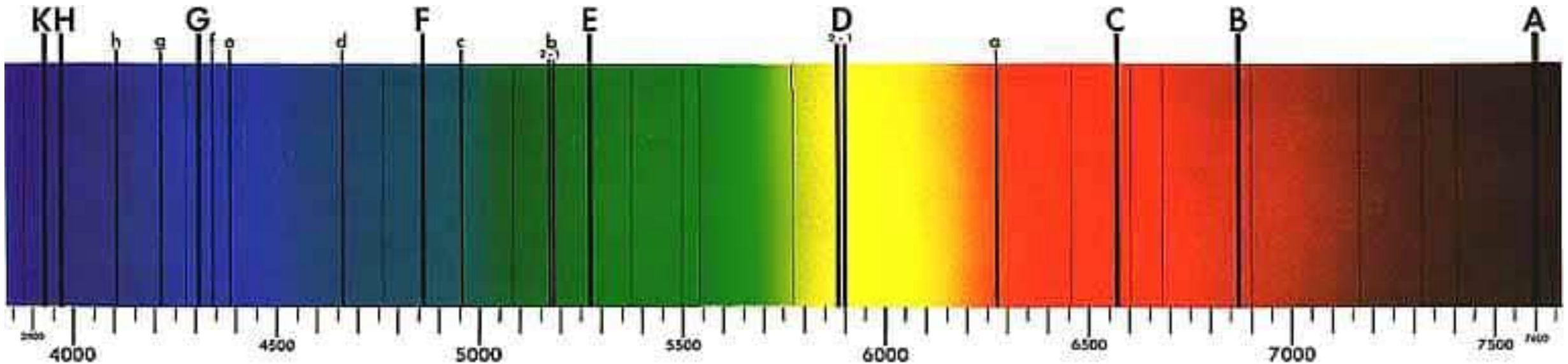
G-Band **430.3nm**



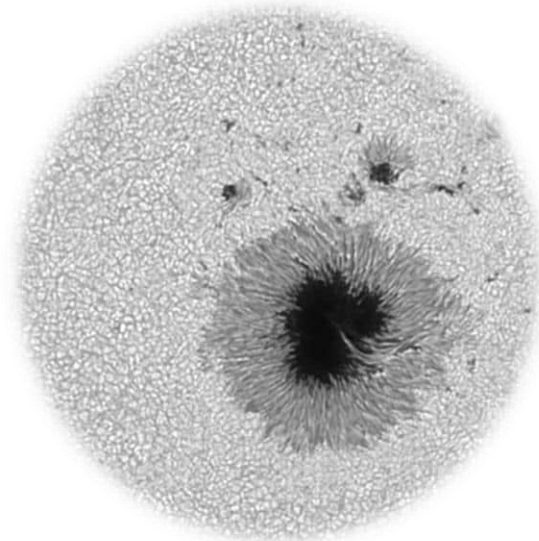
(Continuum **540nm**)



Vetyalfa **565.3nm**



CMOS-kamera aurinkokuvaukseen

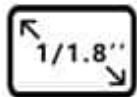


Suosituksset

- 1 Mono eli mustavalkoinen kamerakenno (imx120, **imx290**, **imx178**, **imx174**, imx432)
- 2 Kaukoputken polttovälille sopiva pikselikoko
Pieni polttoväli = pienet pikselit
Iso polttoväli = suuret pikselit
- 3 Nopea FPS (frames per second)
Nopea = 100+ fps
- 4 Kennon koko suhteessa käytettyyn kuvauskokoonpanoon
- 5 Kennon herkkyys eri aallonpituuksilla; suljin



Sensor
IMX178



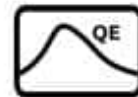
1/1.8''
7.4*5.0mm



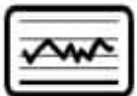
Resolution
3096*2080



ADC
14bit



QE
81%



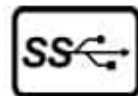
Read Noise
1.4e



FPS
60



Full well
15000e

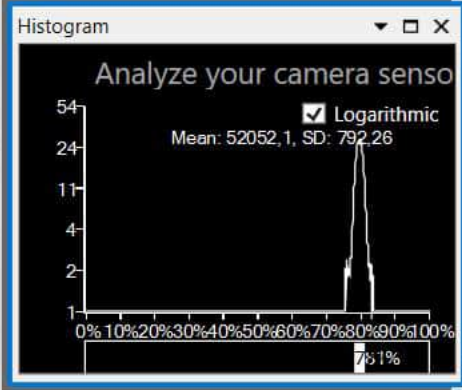
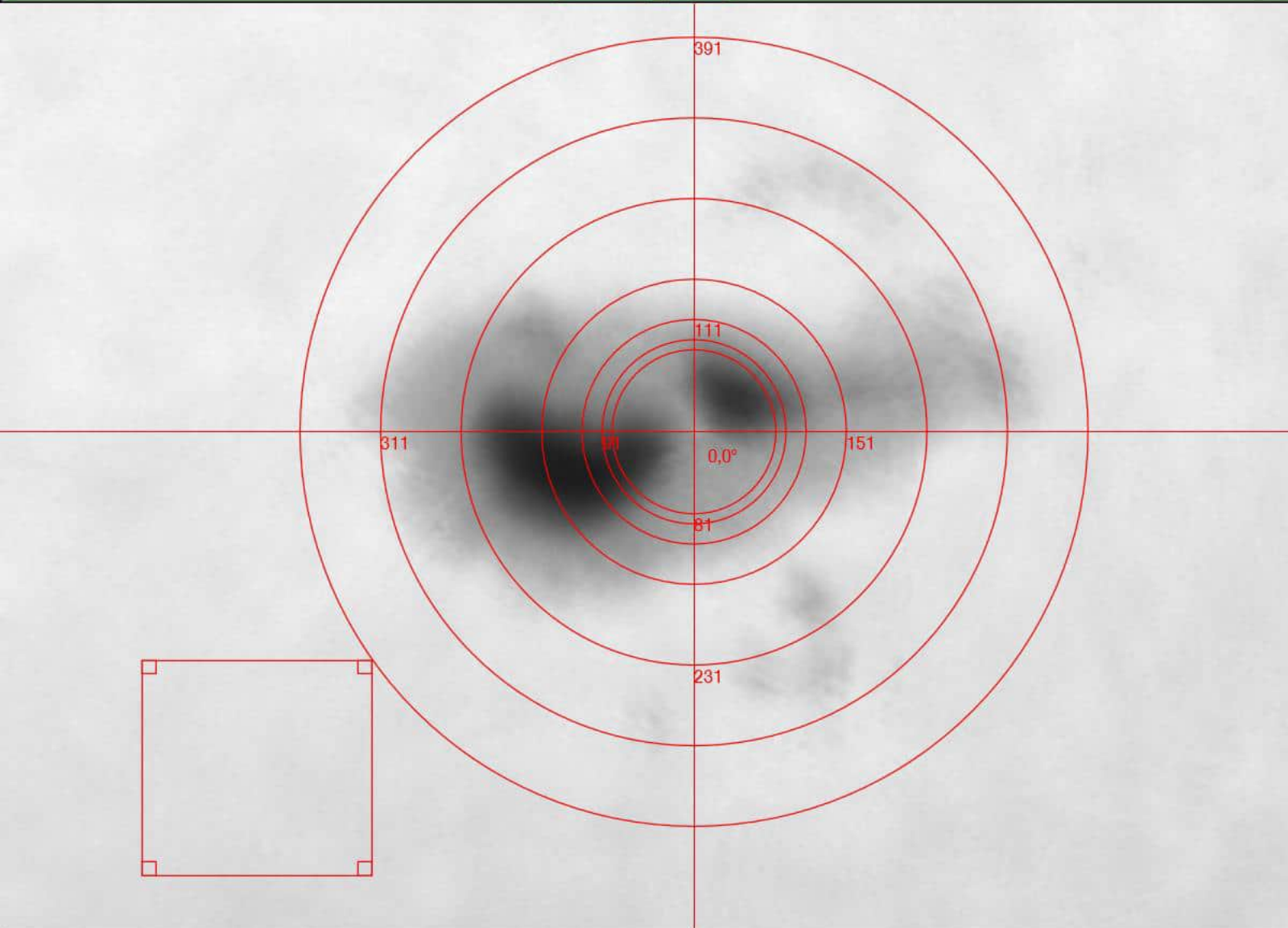


USB
3.0



Pixel Size
2.4µm

Capture Sequence Running, 198 remaining, 00:00:03 until next capture. Don't Wait Cancel



USB Speed 100

Temperature 35,5

Flip None

Image Controls

Timestamp Frames Off

Preprocessing

Subtract Dark Browse... None

Apply Flat Browse... C:\Users\petru\D...

Banding Suppression 0

Planet/Disk Stabilization Off

Background Subtraction Off

Remove Satellite Trails Off

Display Histogram Stretch

Scope Controls

ZWO Focuser (1) Connected

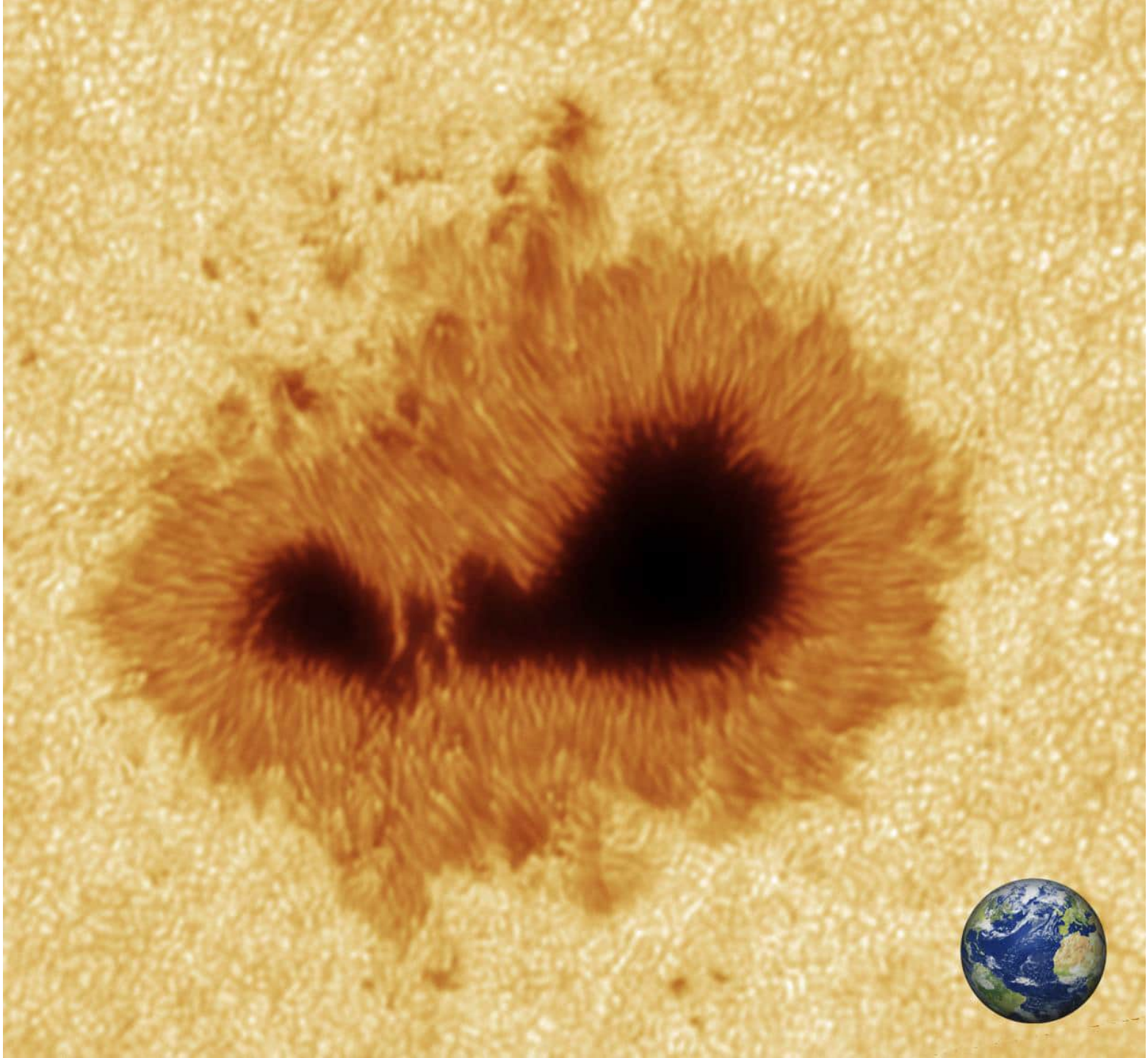
32,98°C Coarse Fine Position

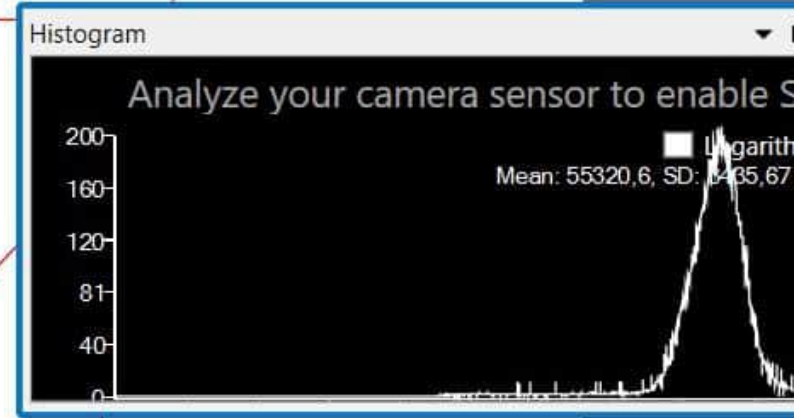
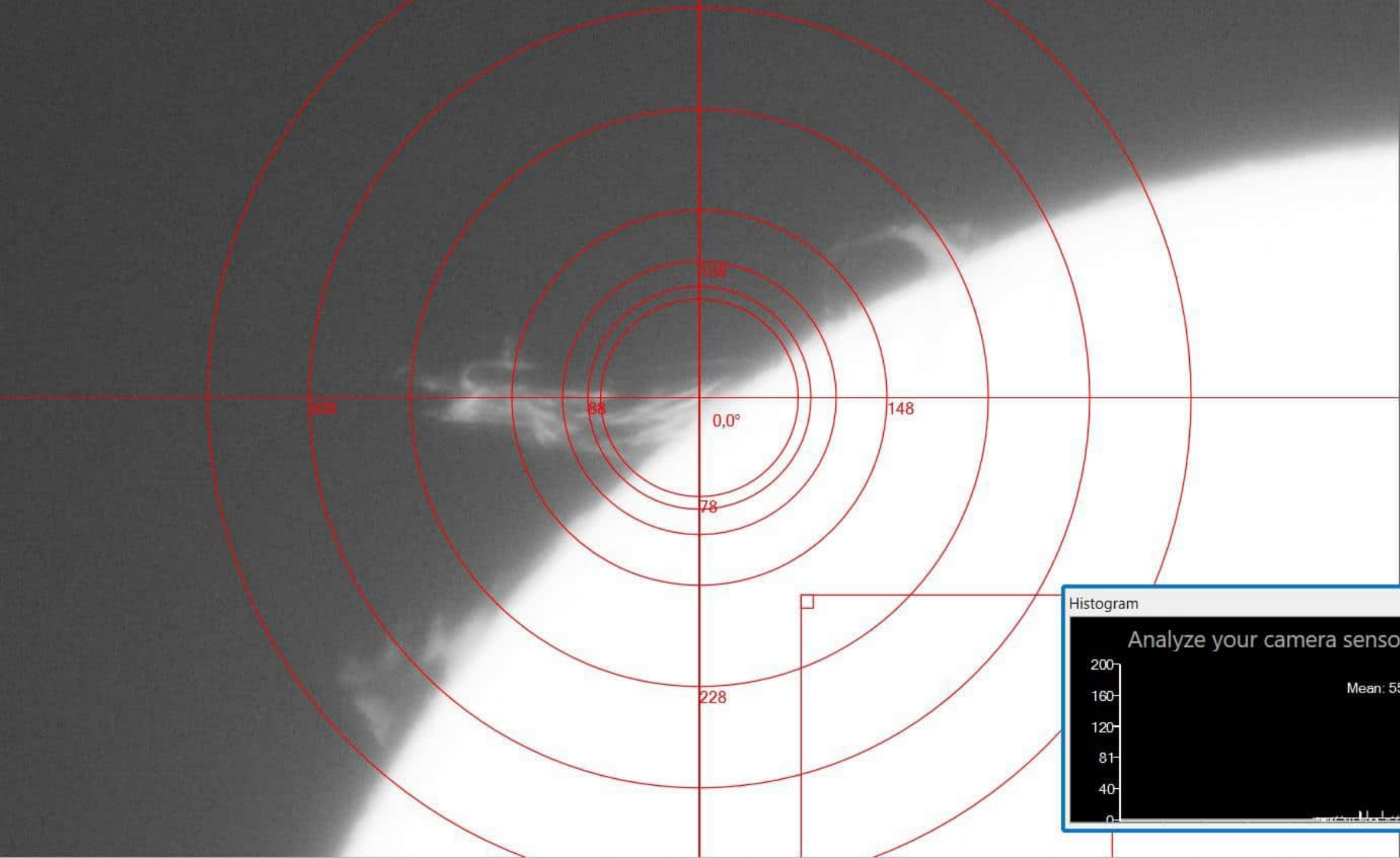
T. Com In In 3315

Step Size 999 9 Stop

Reverse Out Out Setup

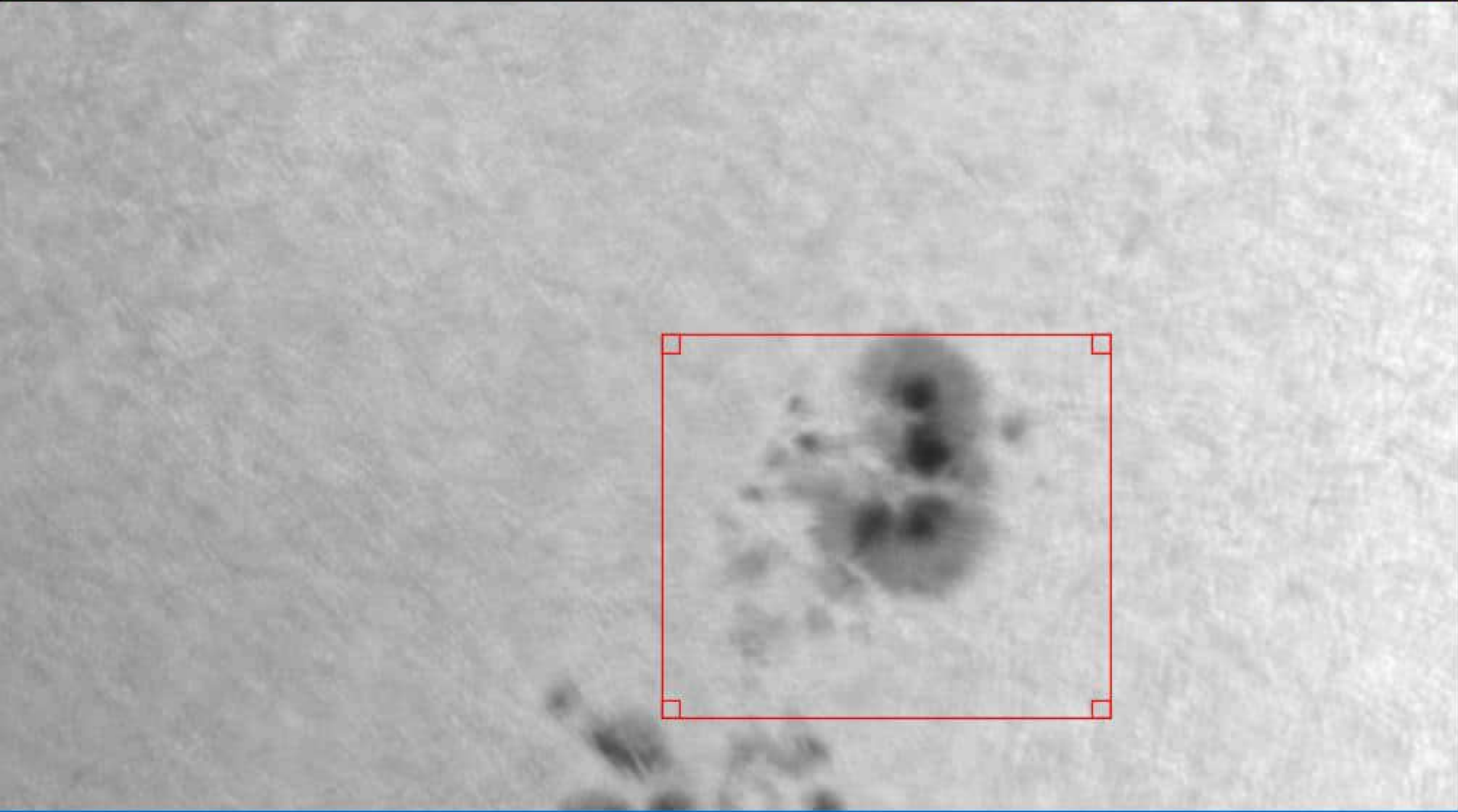
Notes







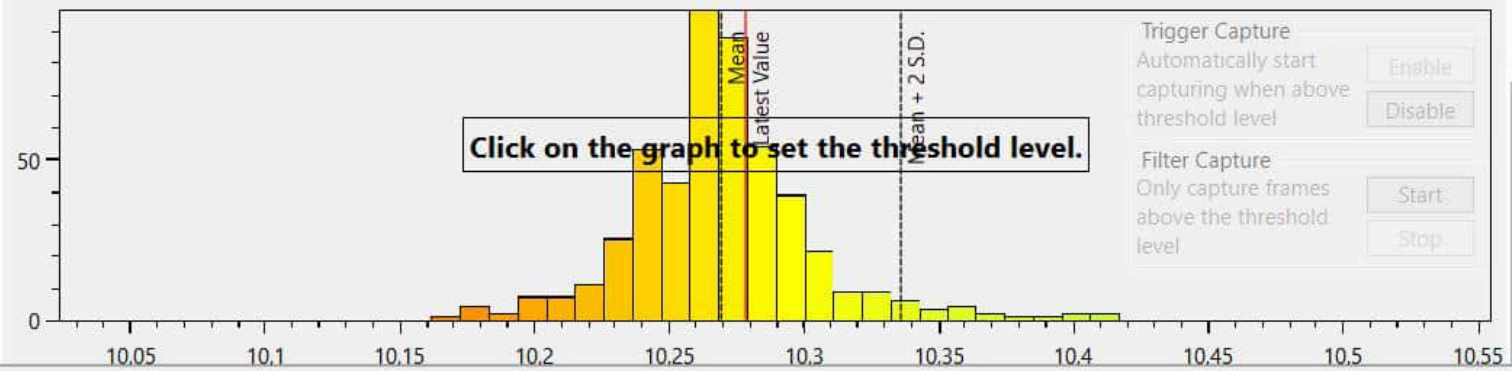
Capture complete. Captured : 1000 frames (8 dropped) in 0:00:09,4 at 106,9 fps -> C:\Users\petru\Desktop\SharpCap Captures\22.7.2023\Capture 07_23_25Z.ser



Seeing Monitor

Seeing
Controls

Sample Rate: 106,9fps
Average Over: 10 frames
Capture Length
Capture 1000 Frames



Trigger Capture
Automatically start capturing when above threshold level
Enable Disable

Filter Capture
Only capture frames above the threshold level
Start Stop

History

Scores

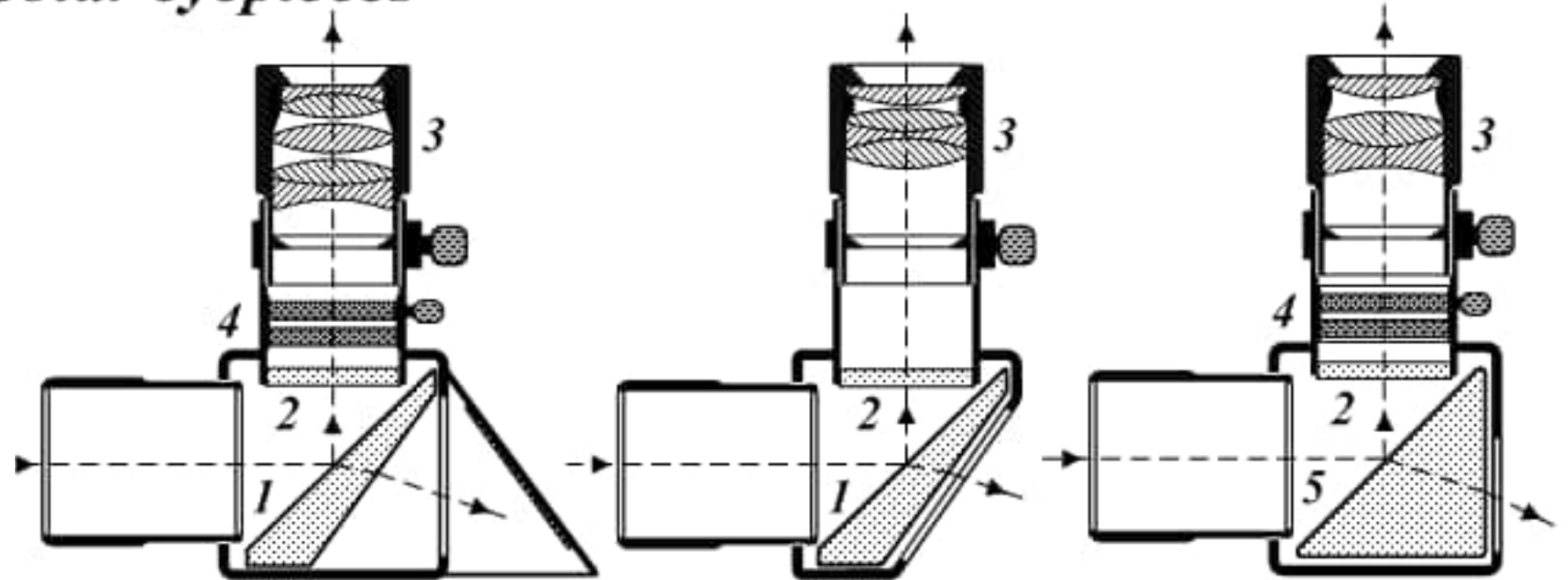
Now 10,329
Best 10,492
+/- -0,163

Reset

Show Best Frame

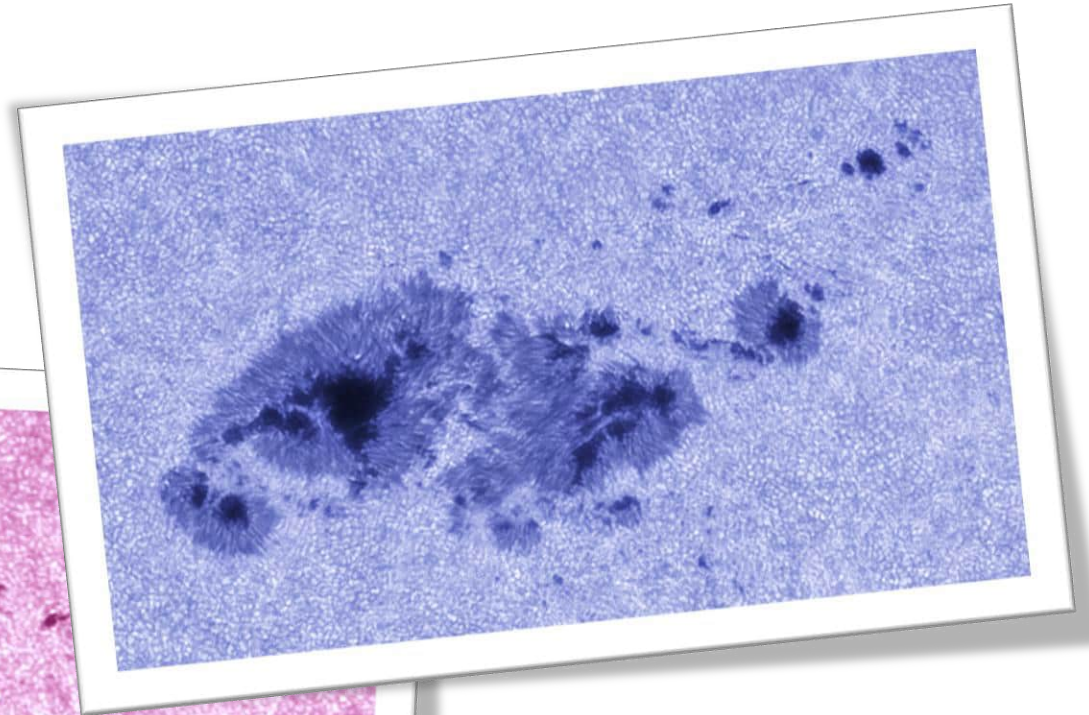
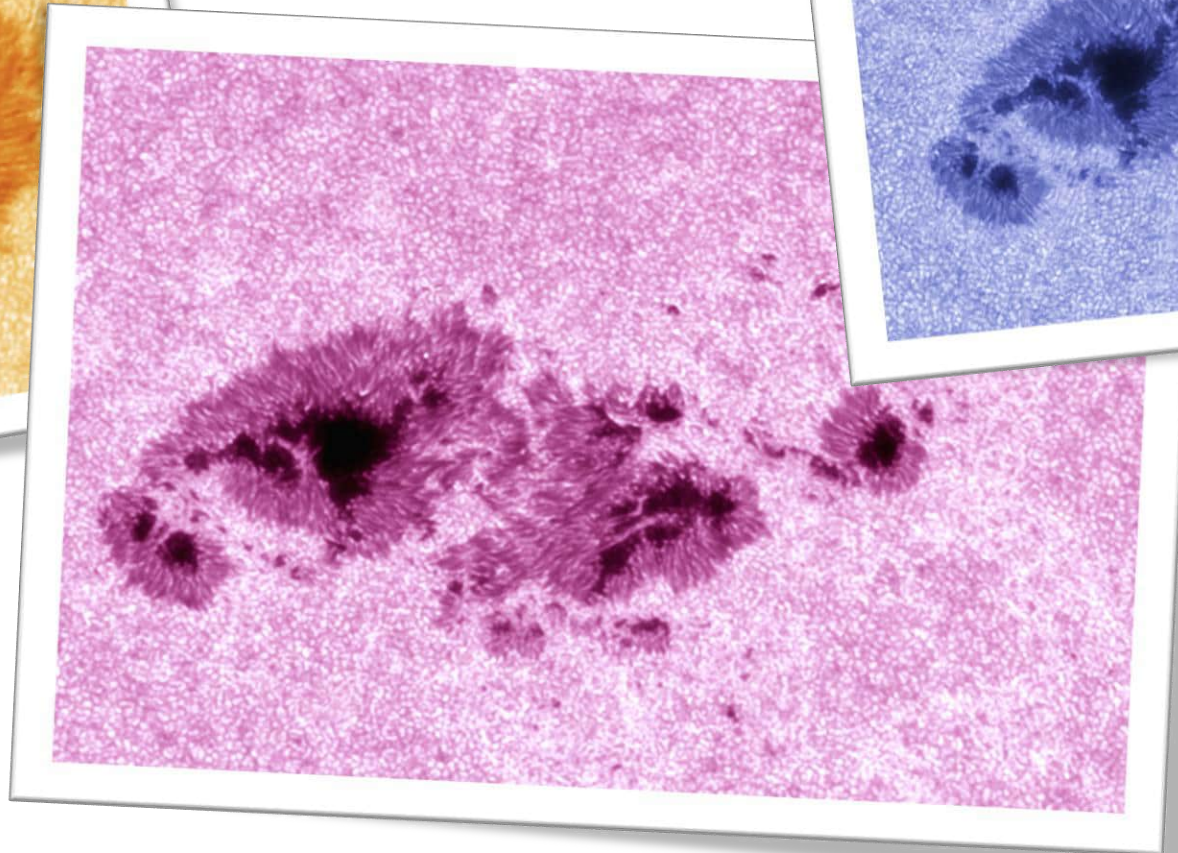
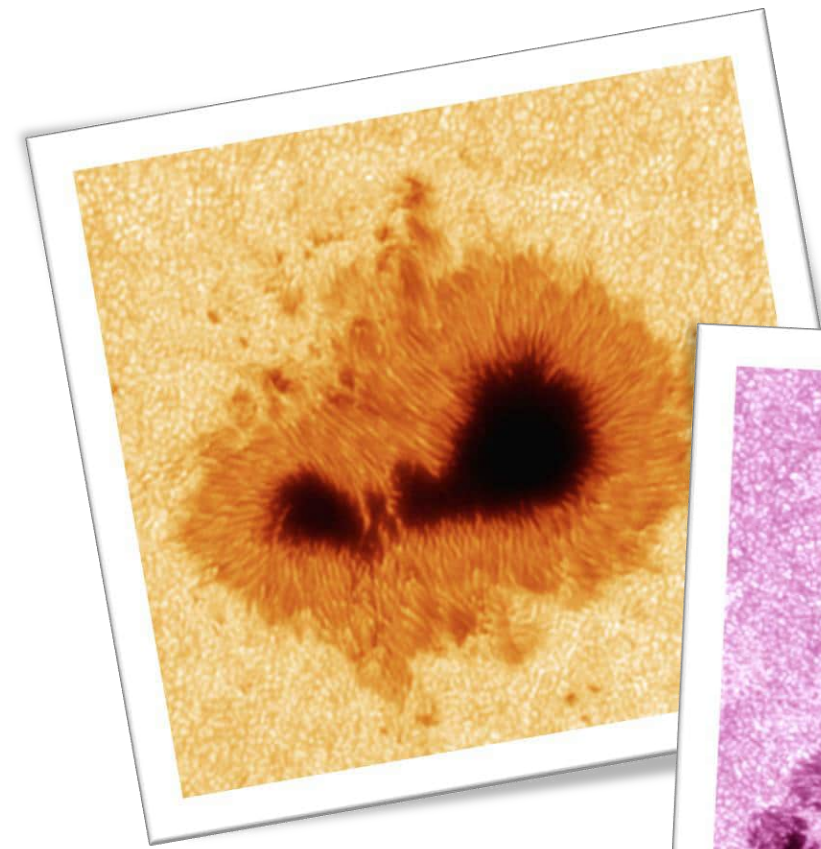
Aurinkoprisma: periaate ja käyttö

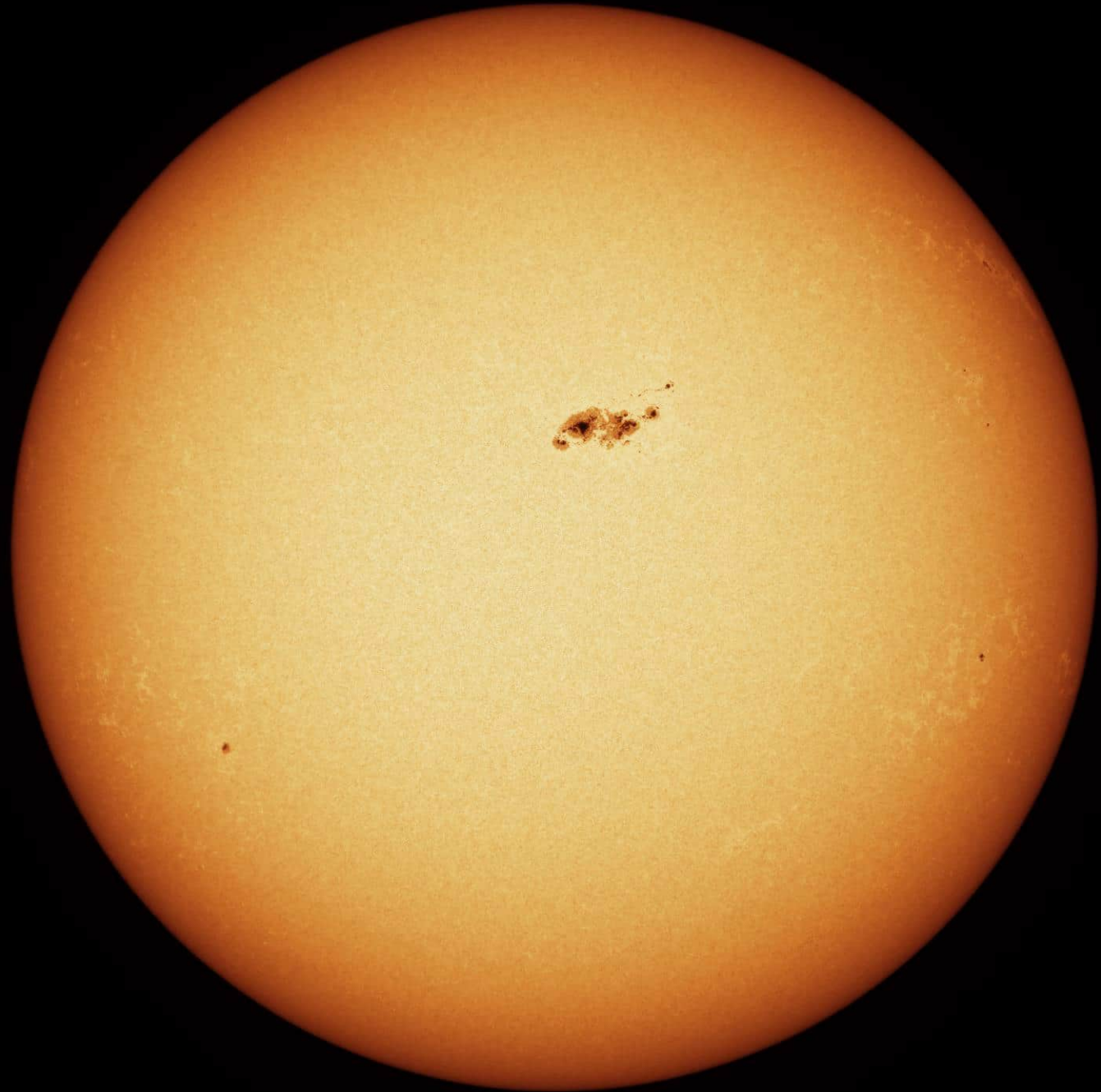
Solar eyepieces

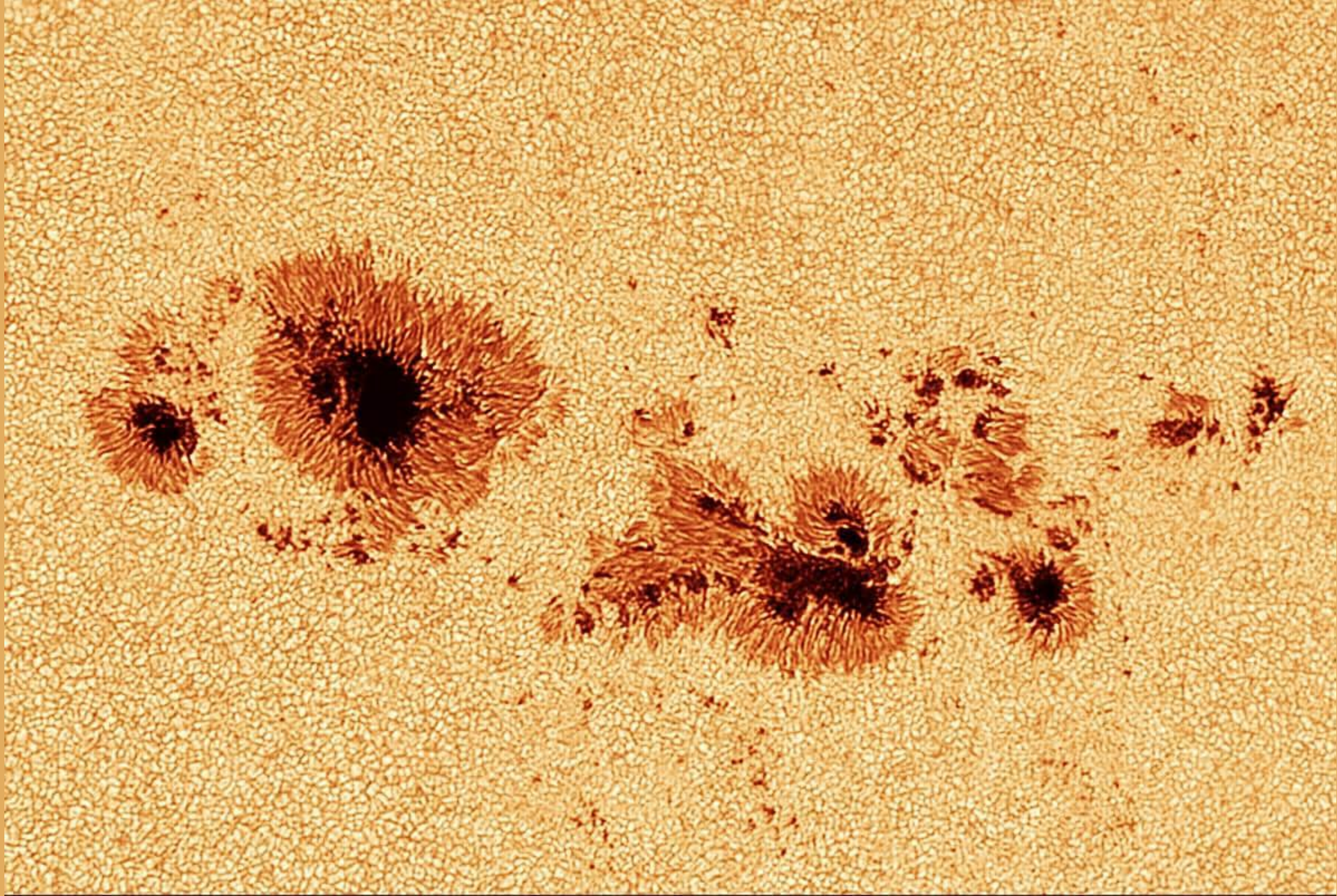


*1 - Herschel wedge 2 - Neutral density filter 3 - Eyepiece
4 - Variable transmission polarizing filter 5 - Right angle prism*

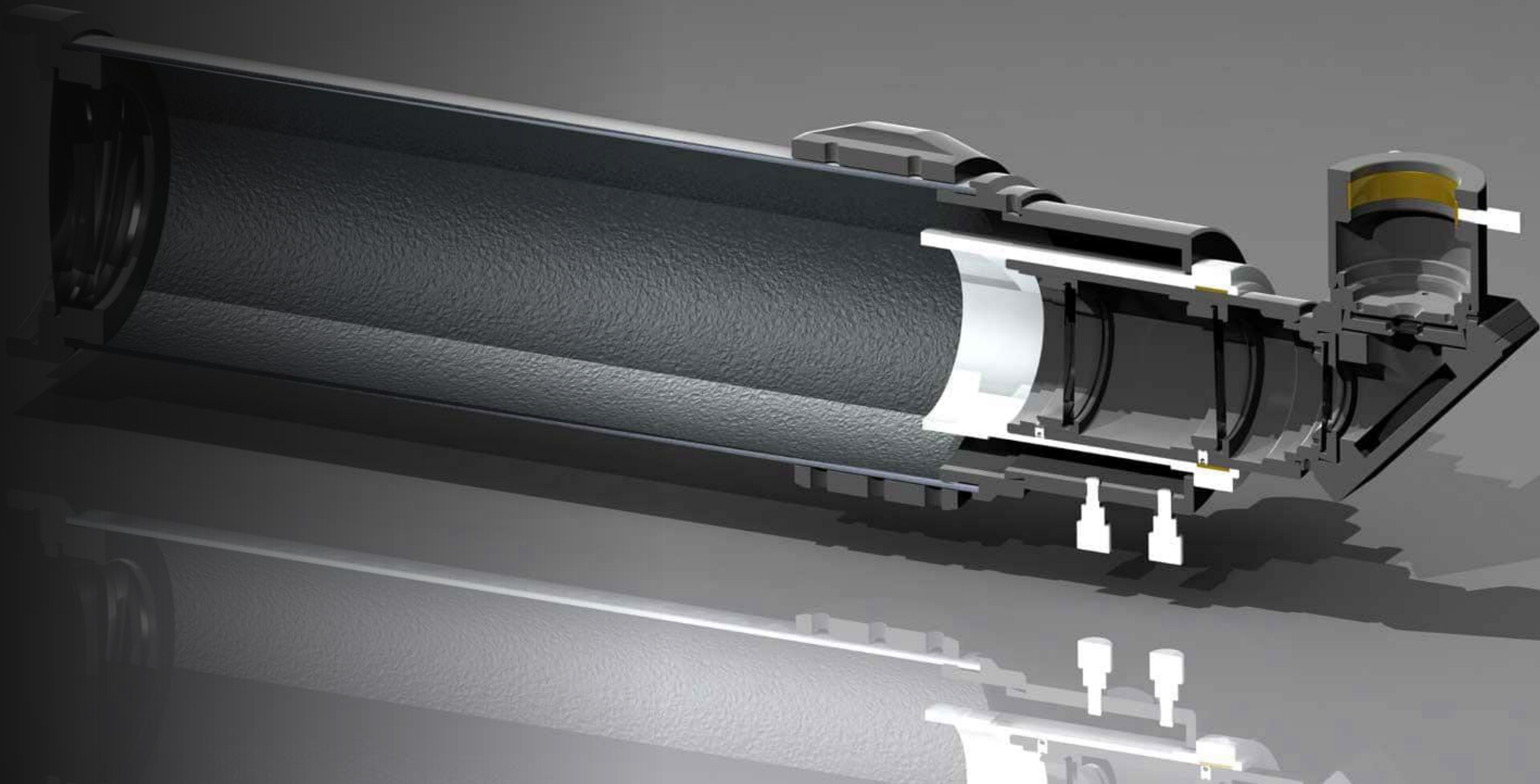
Aurinkoprisma: Valkoinen valo, K-line, G-Band







Kalsium II K kaukoputki/moduuli

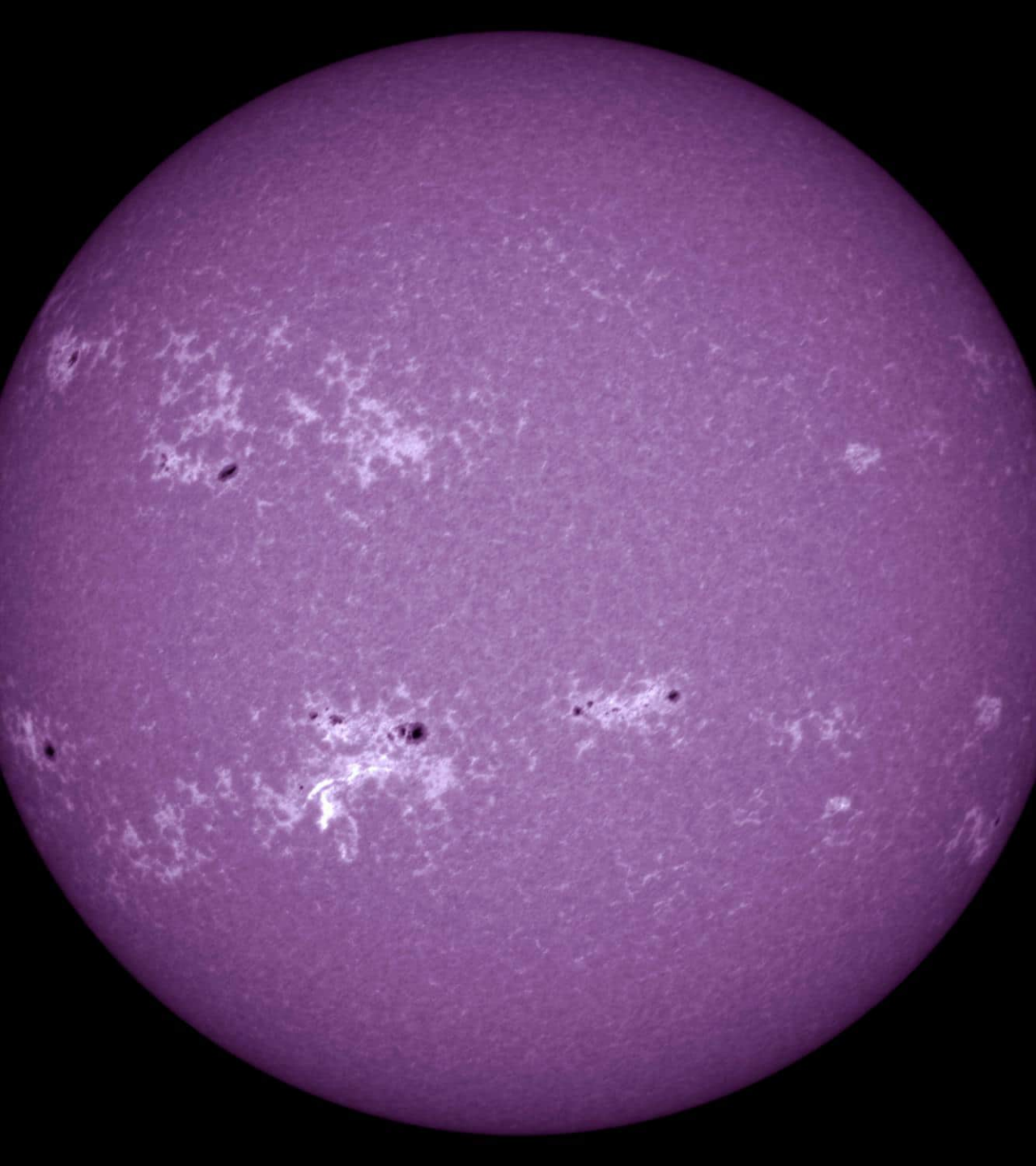
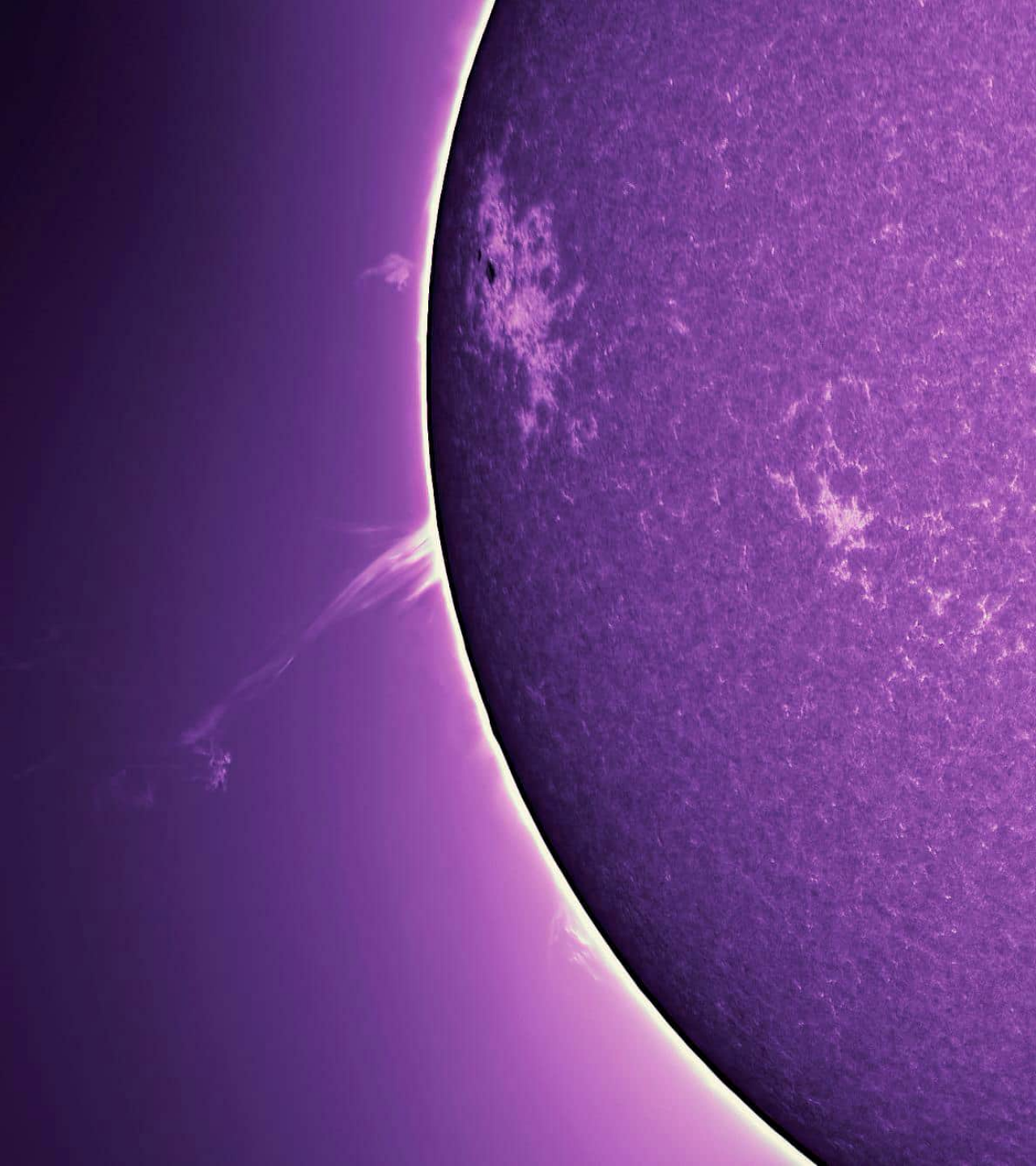


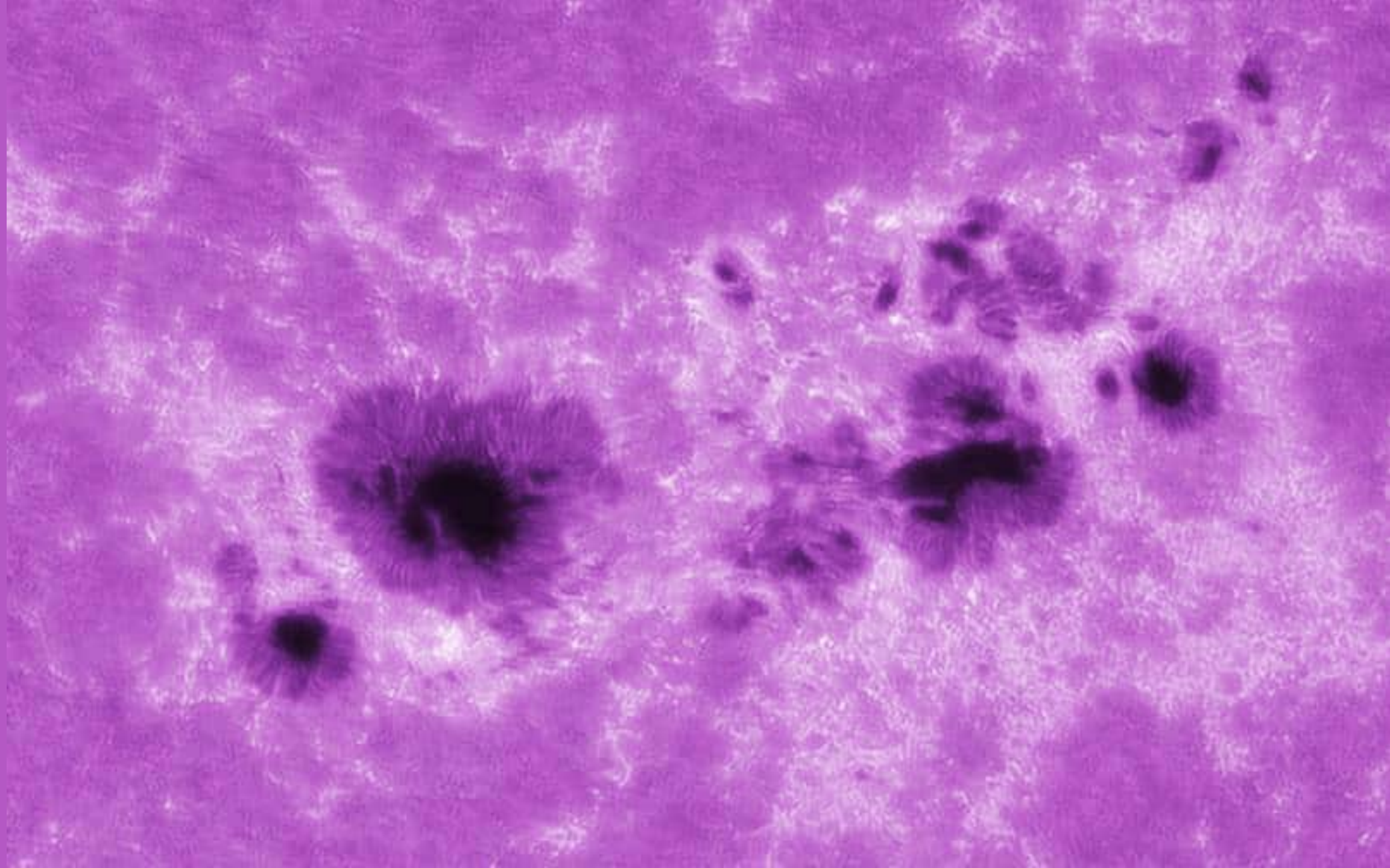


The winter is coming



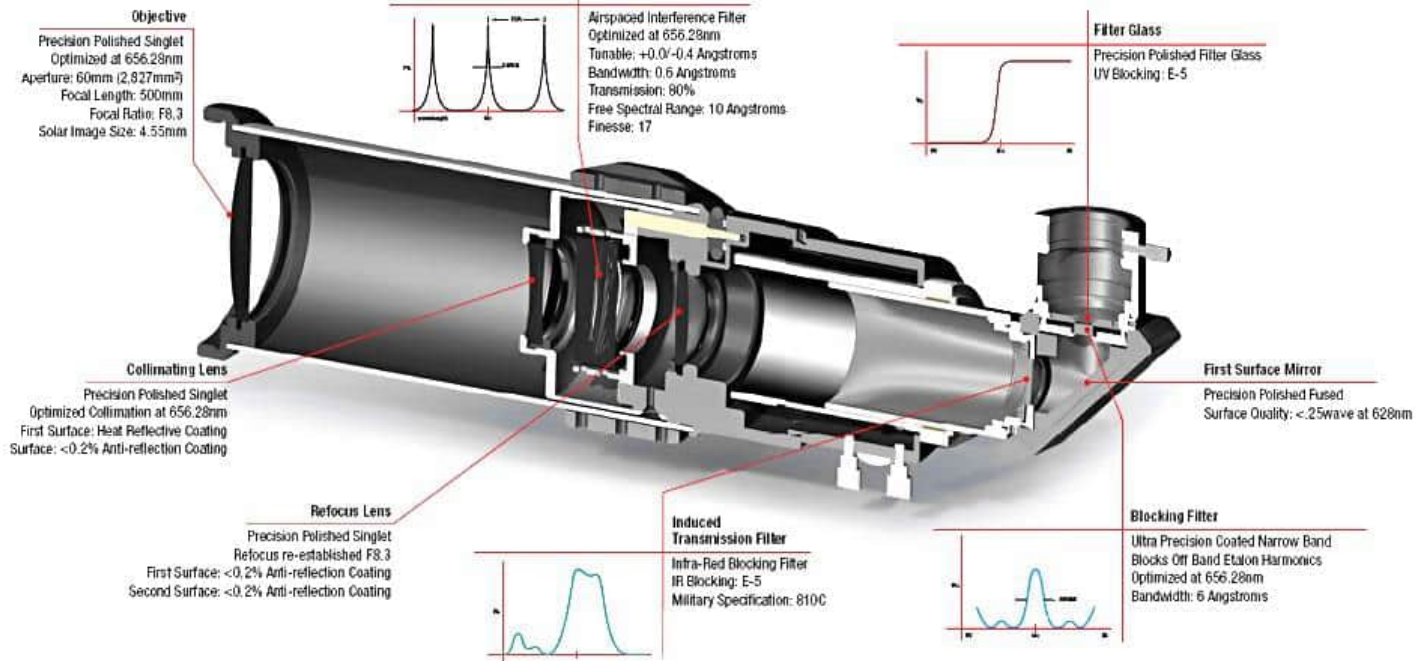
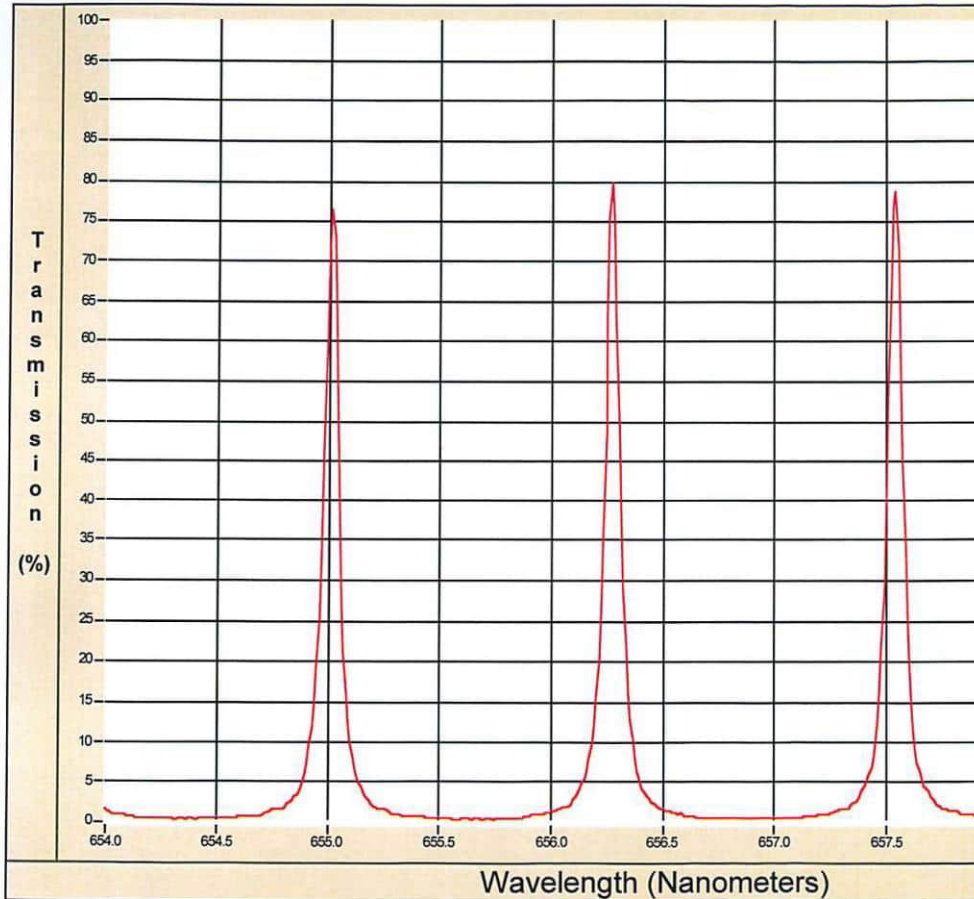
700_20221004_214029





Aurinkokaukoptki

(dedikoitu vetyalfa,
Modulaarinen, Quark Chromosphere)



Vetyalfan siivet & keskikaista

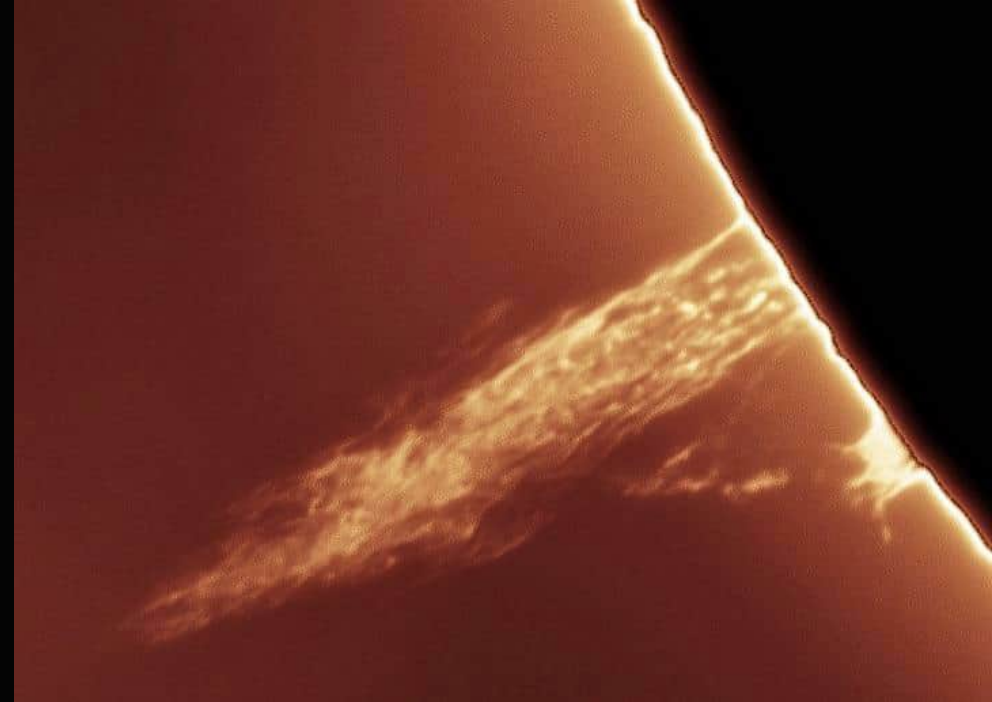
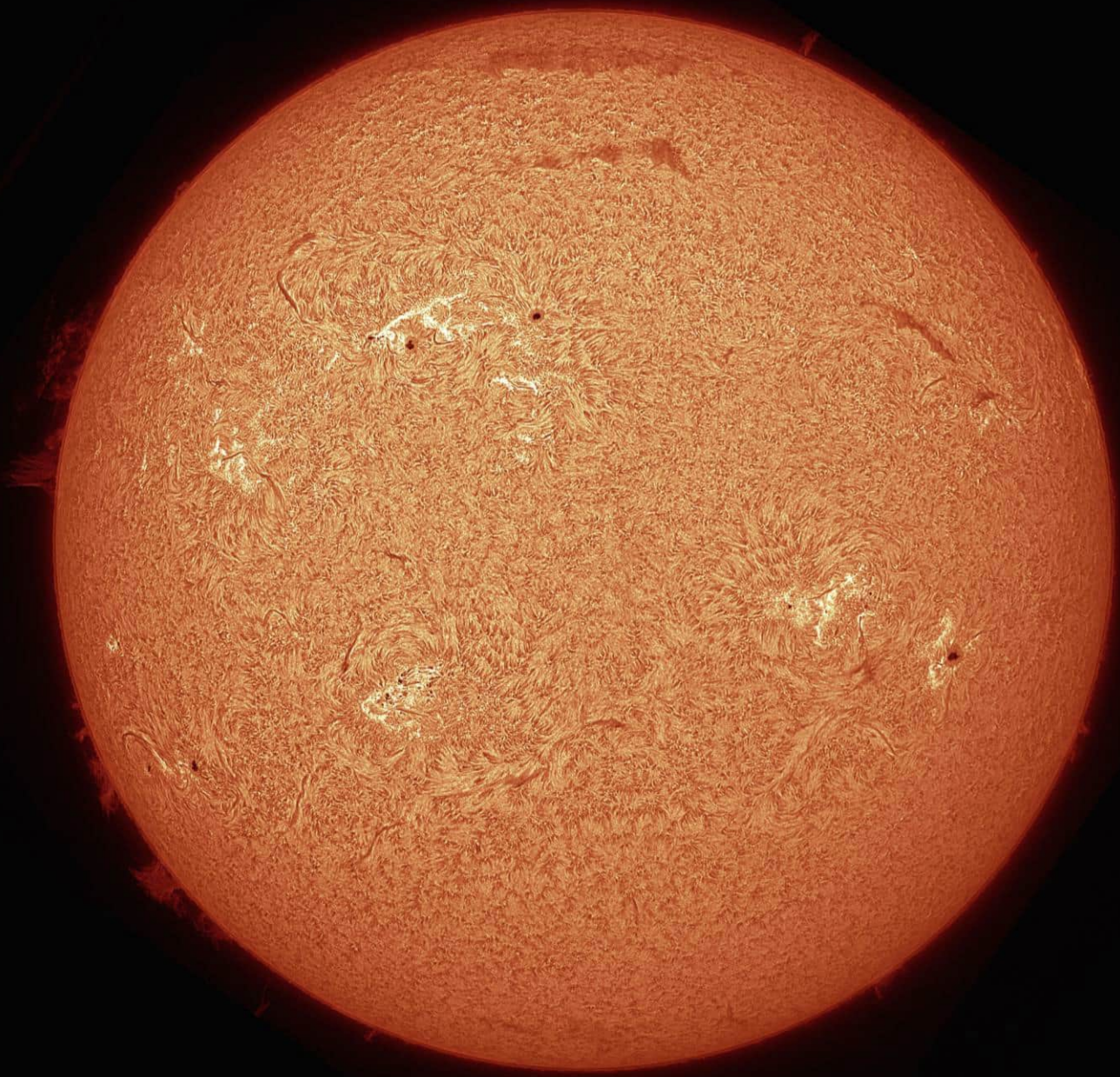


Siirtymä fotosfääristä kromosfääriin.

Animaatio: Harri Kiiskinen, Jyväskylän Sirius

Newtonin renkaat





Auringon timelapsekuvaus

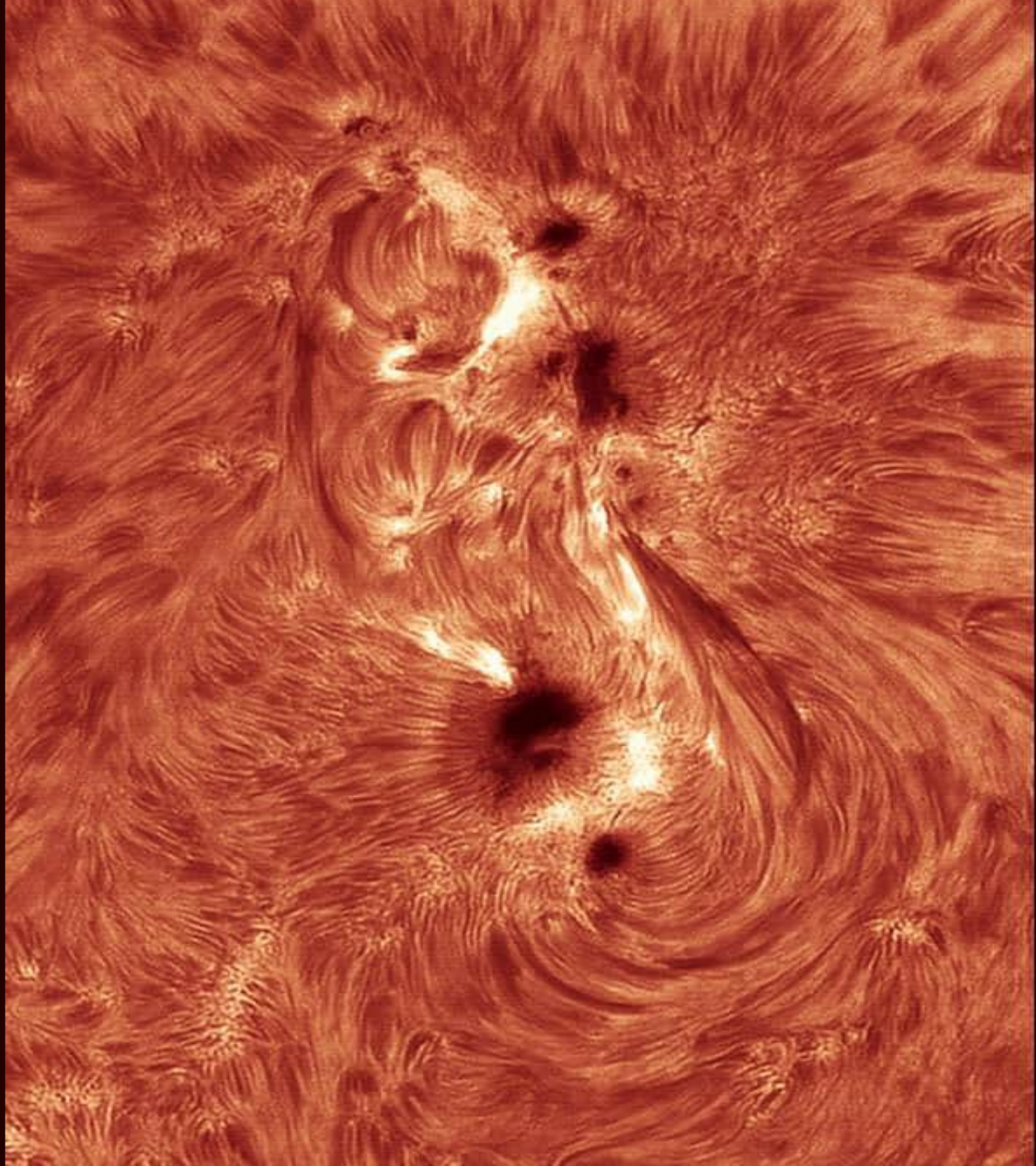
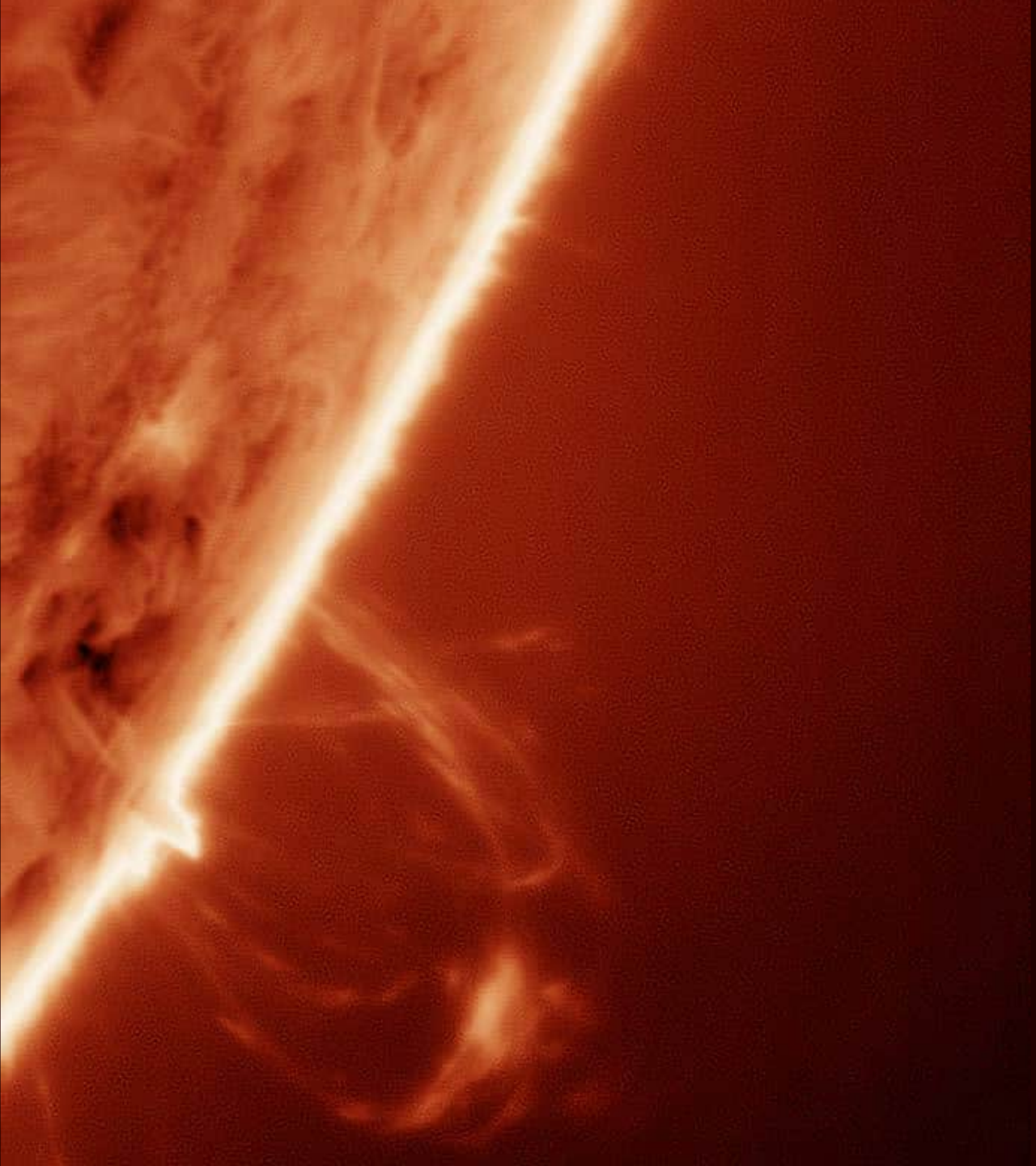
Esimerkkiarvoja

15 sekuntia/1000 ruutua
2-300 videota
15-75 sekunnin intervalli

Nopeat purkaukset ja
roihut:
10-20 sekunnin intervalli
20-50 videota

Koko kiekko, aktiiviset
alueet, auringonpilkut
45-75 sekunnin intervalli
80-120 videota







Lucy-Richardson deconvolution

Sigma: 1,3000

Iterations: 0

Prevent ringing

reset disable

Unsharp masking

Sigma: 1,1183

Amount min: 1,0000

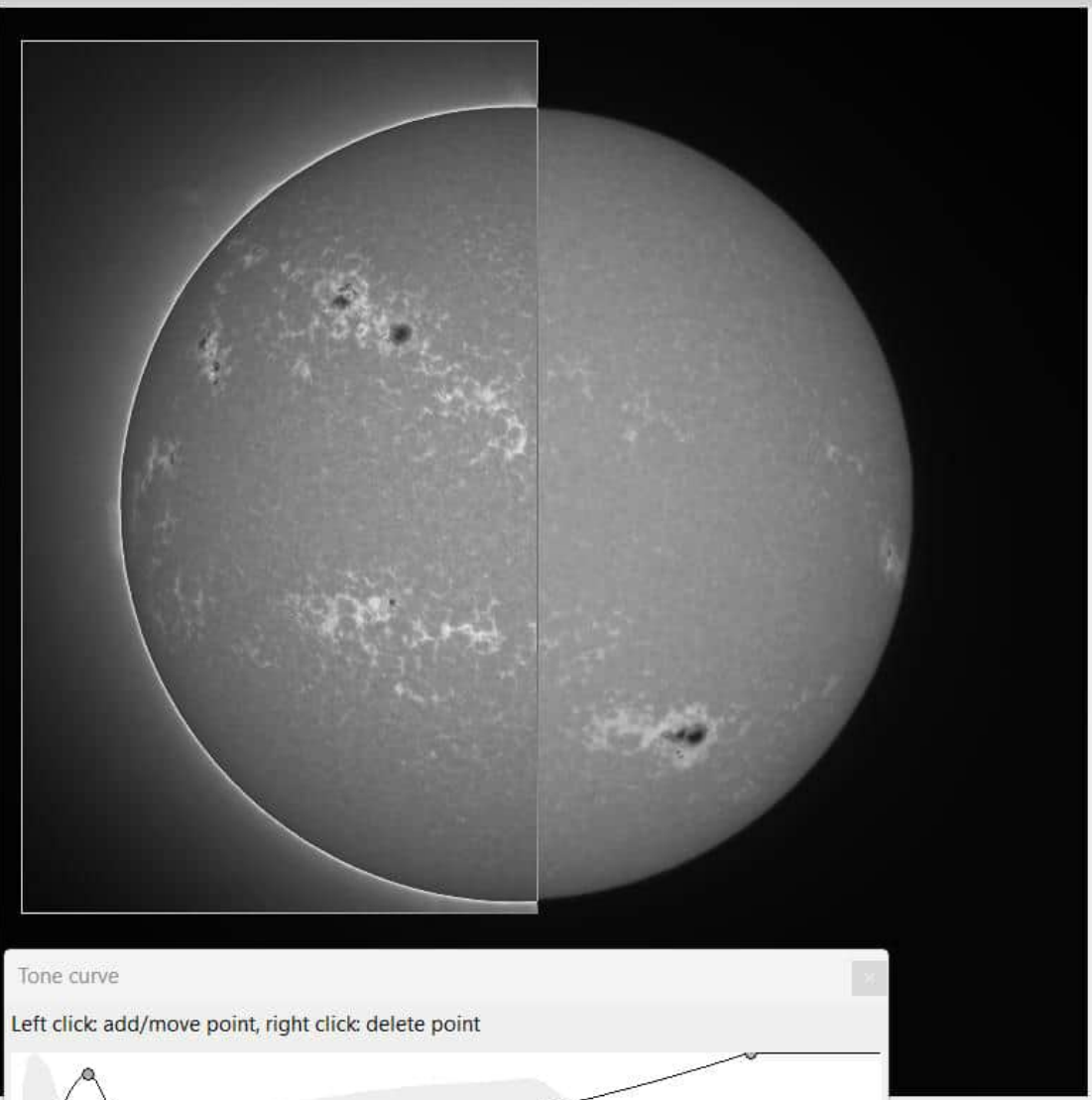
Amount max: 2,1462

Threshold: 0,0100

Transition width: 0,0100

Adaptive

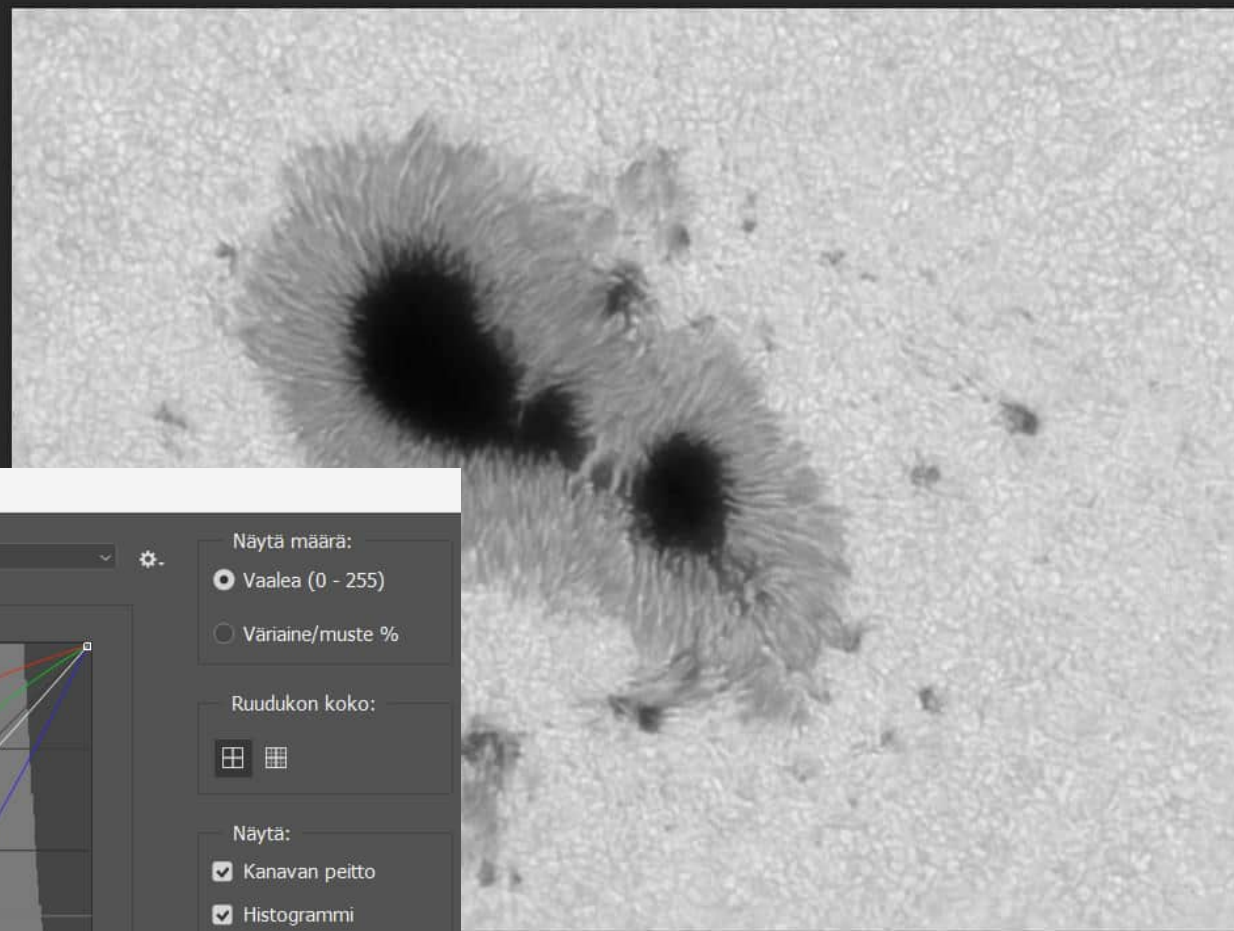
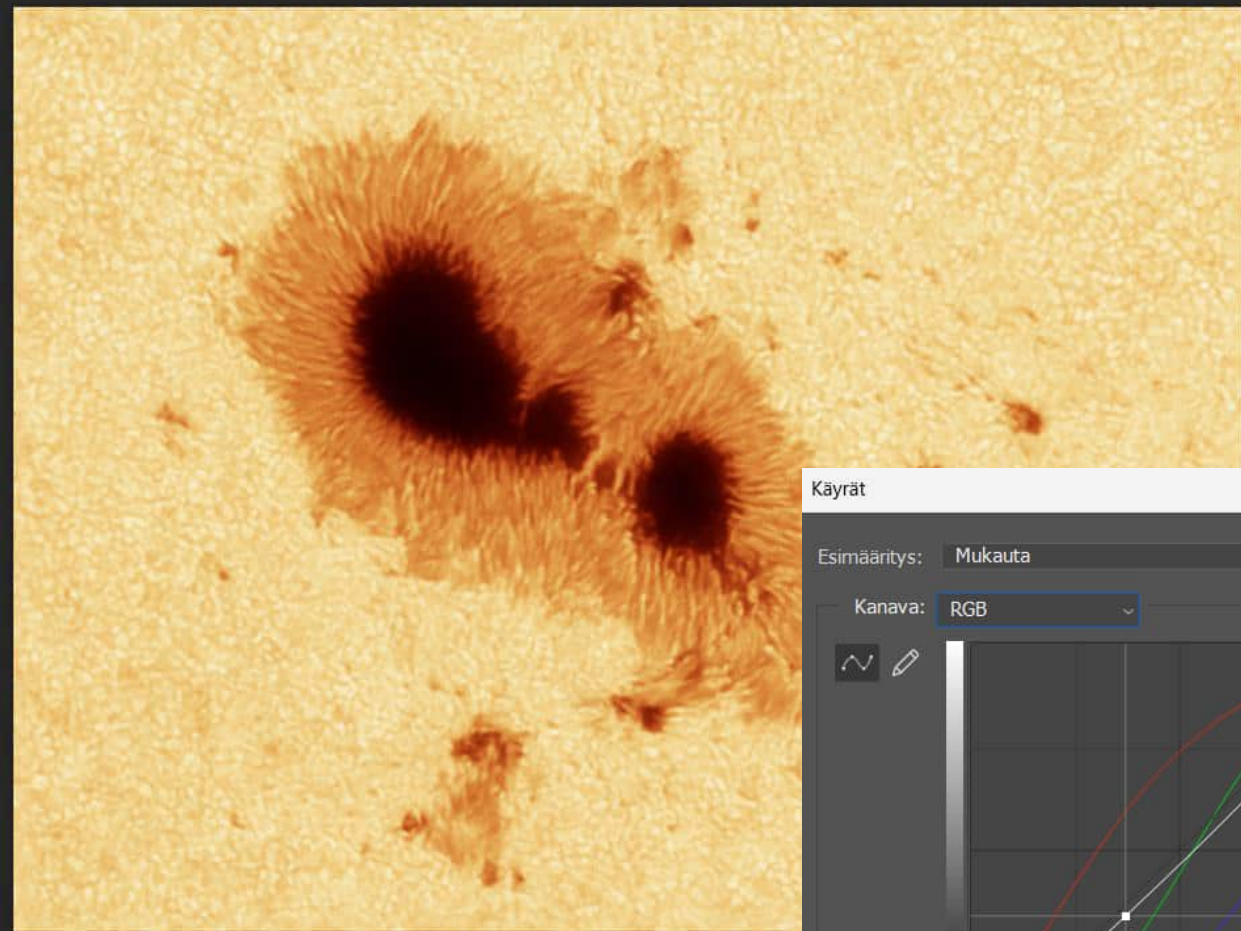
reset



Tone curve

Left click: add/move point, right click: delete point

log reset inv stretch smooth gamma 1,00 conf



Käyrät

Esimäärittäminen: Mukauta

Kanava: RGB

Tulostus: 87

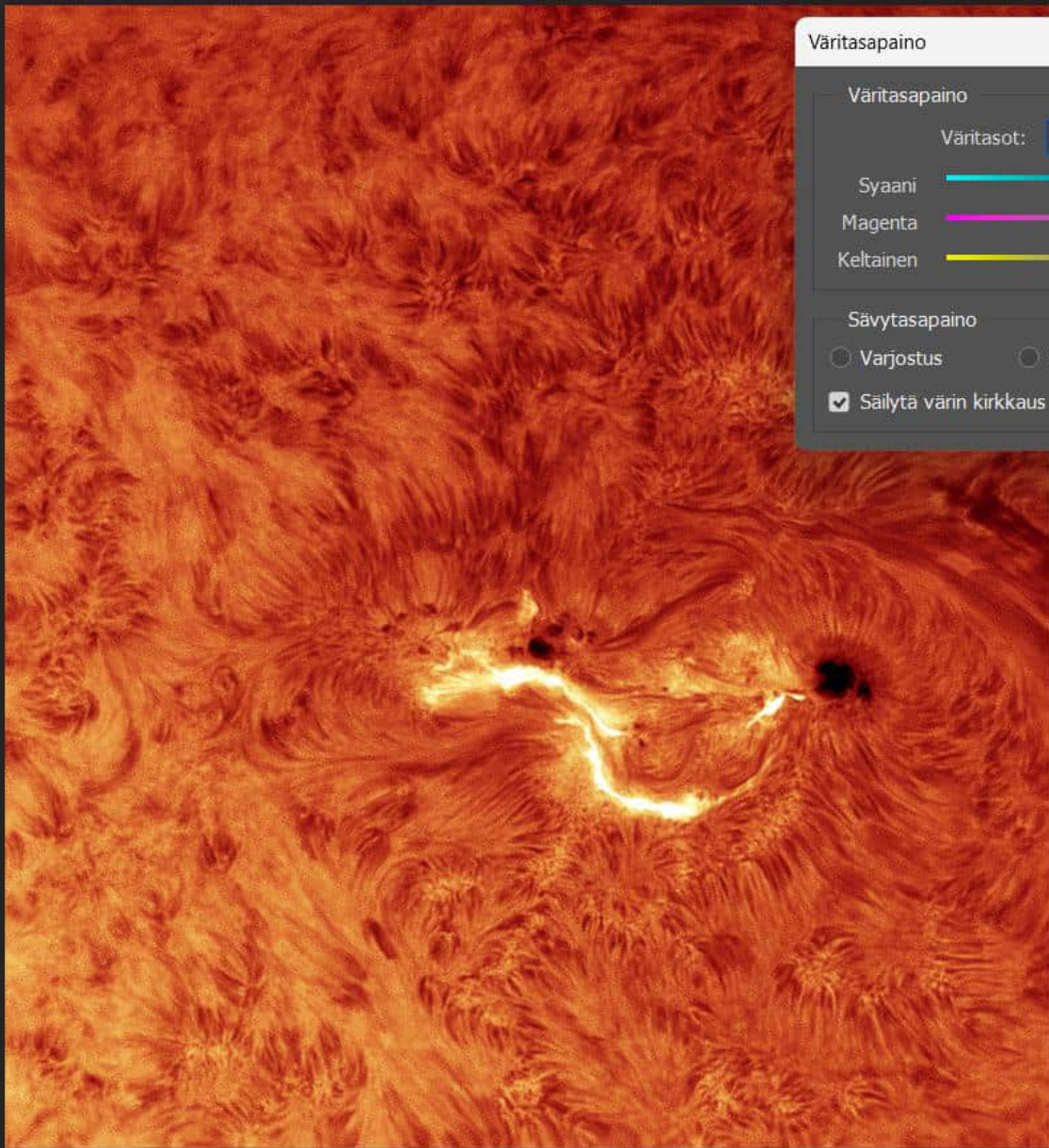
Syöttö: 94

Näytä määrä:
 Vaalea (0 - 255)
 Väriaine/muste %

Ruudukon koko:

Näytä:
 Kanavan peitto
 Histogrammi
 Peruslinja
 Leikkausviiva

Näytä ylitys



Väritasapaino

Väritasapaino

Väritasot: 0 -14

Syaani Punainen

Magenta Vihreä

Keltainen Sininen

Sävytasapaino

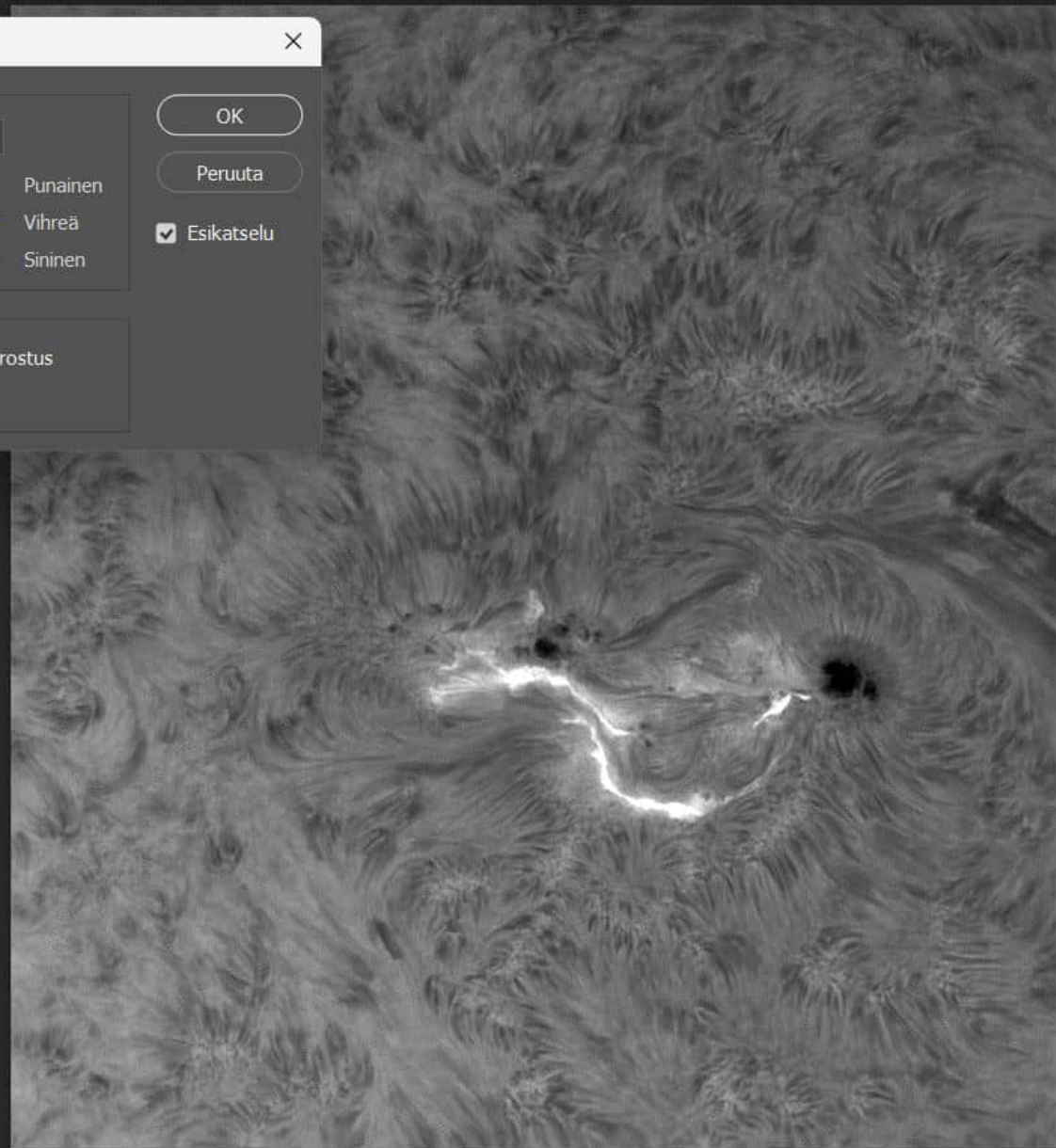
Varjostus Keskisävyt Korostus

Säilytä värin kirkkaus

OK

Peruuta

Esikatselu



Kiitos
kuulijoille ja
katselijoille!

