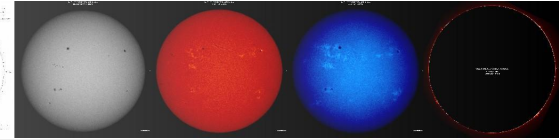
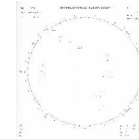
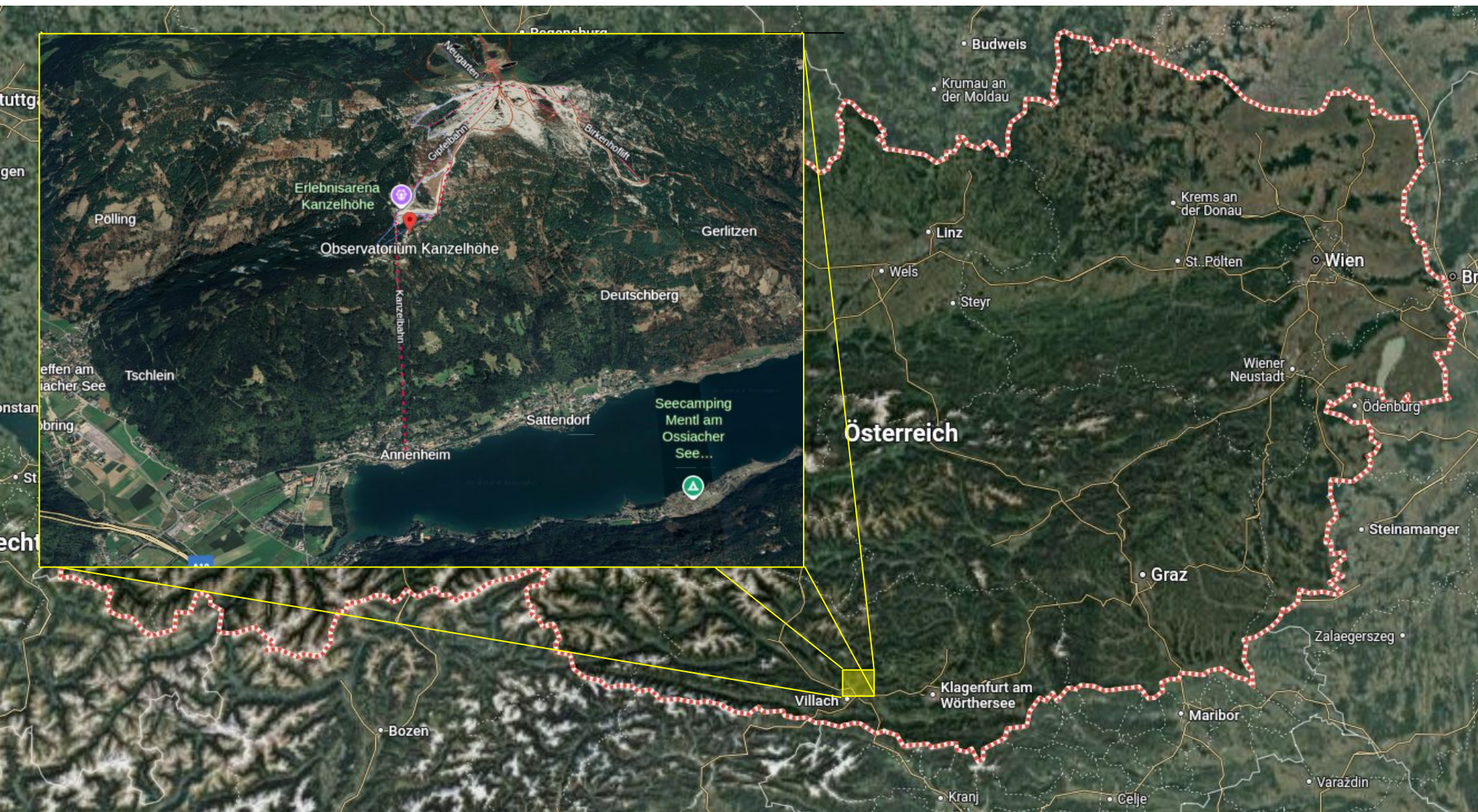


Kanzelhöhe Spaceweather data products and possible future contributions of NAO Bulgaria

BNSF KP-06-Austria/5 (14-08-2023) and OeAD BG 04/2023



Location



Instruments

1) H-alpha:

F/L = 2000/82mm

Lyot Filter: 0.4\AA @ 6562.8\AA

2) White-Light:

F/L = 2000/120mm

Filter: 100\AA @ 5450\AA

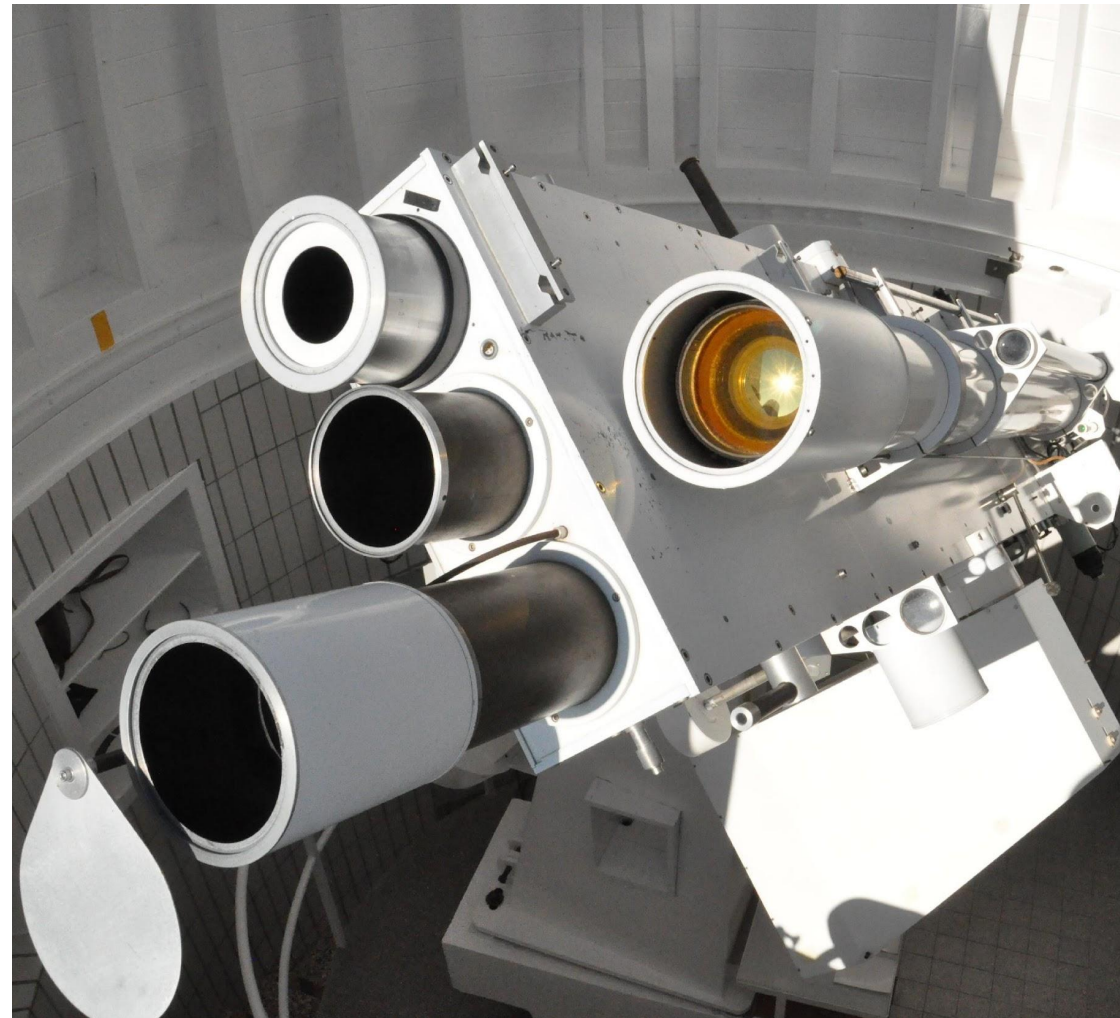
3) CaIIK:

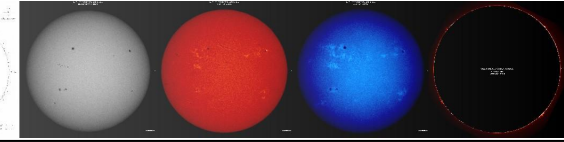
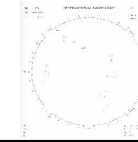
F/L = 1650/70mm

Lunt Filter: 3\AA @ 3933.7\AA

10 images/min

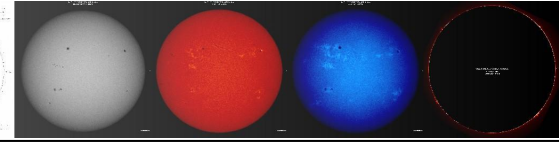
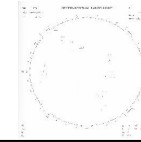
2048x2048 Pixel/12bit



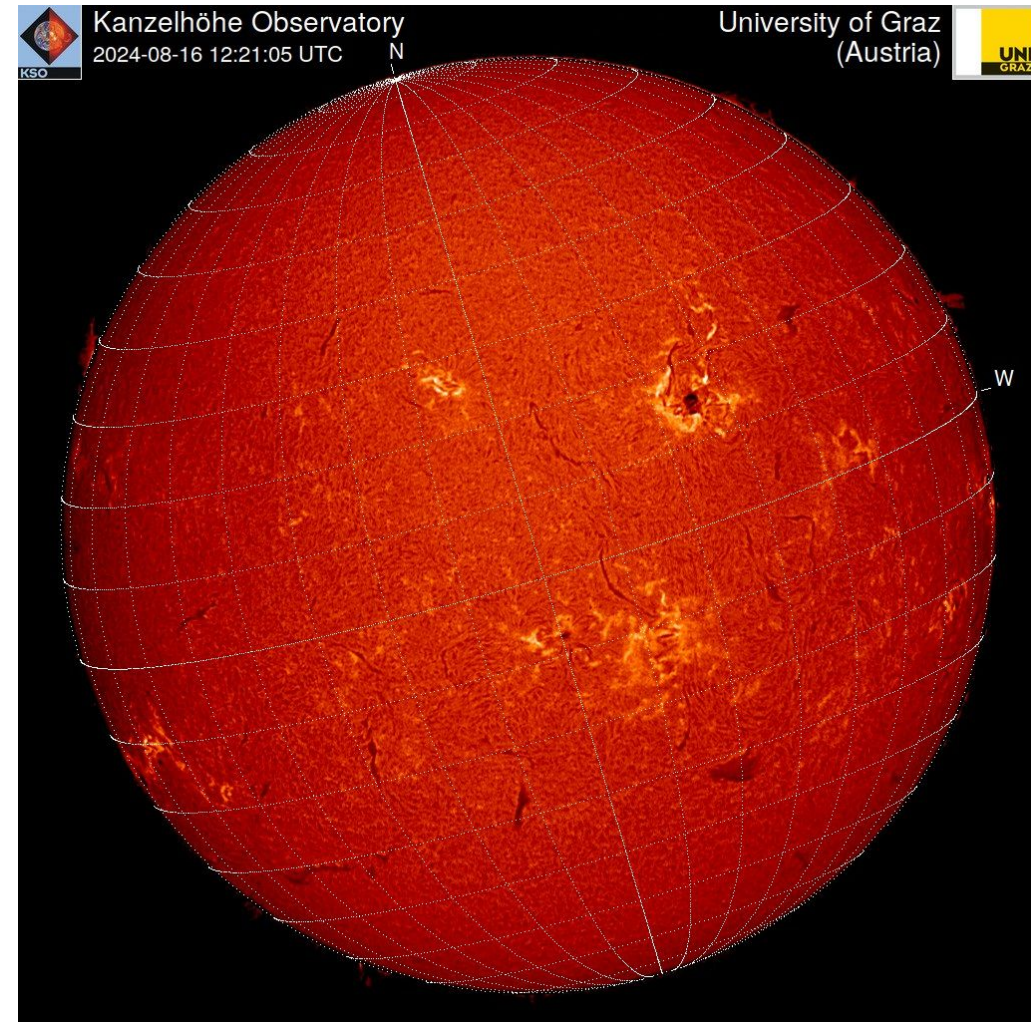
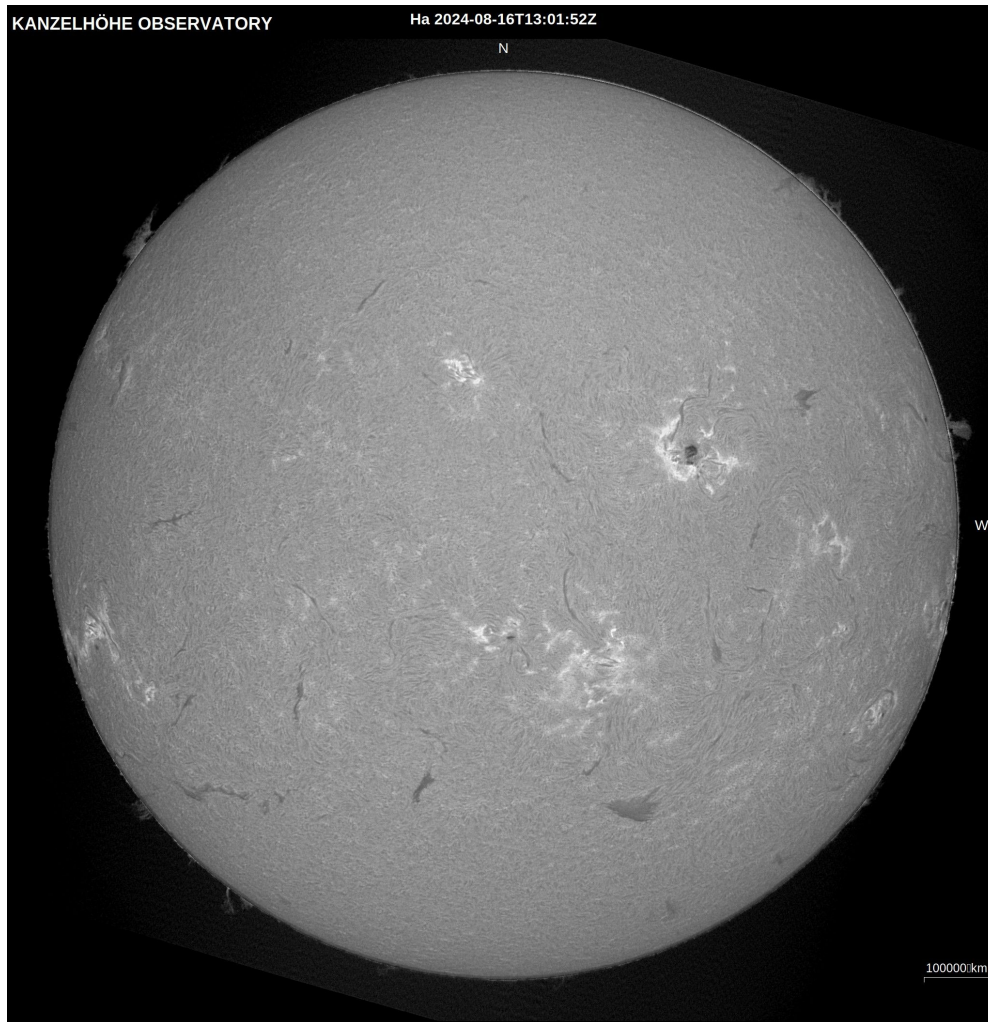


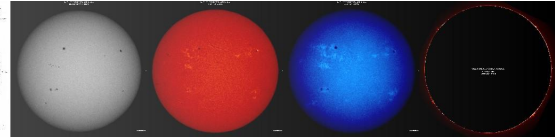
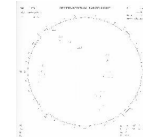
Data products

- Images: H-alpha, White-light, CaIIK
raw FITS, processed JPEGs (with/without grid, grey/
coloured, derotated (N up), CLV-corrected)
- Flares: automatically detected, visually detected
- Filaments: automatically detected
- Prominences: by overexposing H-alpha images
- Sunspot numbers: from drawings



H-alpha images





Werner Pötzi → THE EUROPEAN SPACE AGENCY

CURRENT SPACE WEATHER

SPACE WEATHER SERVICES

SPACE WEATHER AT ESA

EXPERT SERVICE CENTRES

- ESC Solar Weather
- ESC Heliospheric Weather
- ESC Space Radiation
- ESC Ionospheric Weather
- ESC Geomagnetic Conditions

INFORMATION FOR USERS

USER FEEDBACK

CONTACT THE HELPDESK

TERMS OF USE

Welcome to the ESA Space Weather Service Network

H-alpha ESA Spaceweather

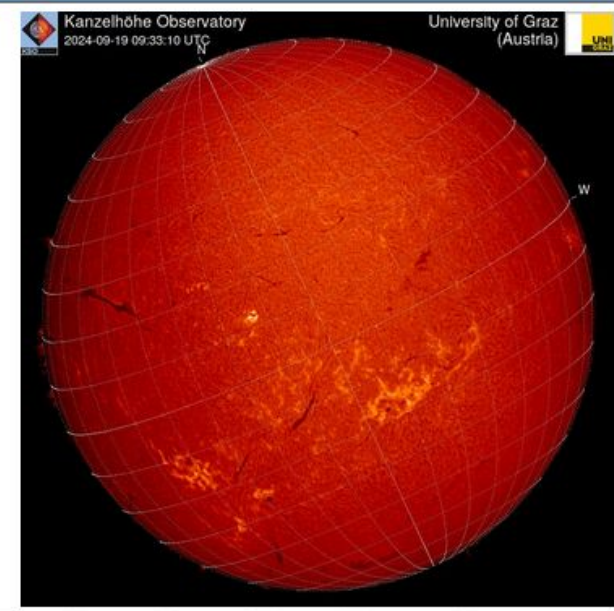
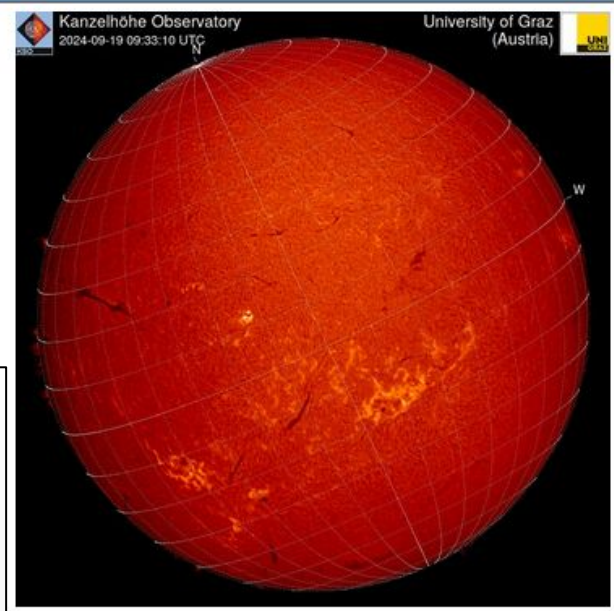
Federated products from the Kanzelhöhe Observatory for Solar and Environmental Research (UNIGRAZ)



[Help](#) [Similar products](#) [Related products](#) [Latest](#) [Query](#)

H α images and movie - Latest

At Kanzelhöhe Observatory, the chromosphere is observed in H α every day from about 8:00 to 16:00 CET/CEST (when the weather is sufficiently clear). The images are processed immediately and available in near real-time as coloured JPEGs with a heliographic grid overlaid. Additionally images with removed large scale variations like limb darkening are made available as high contrast images. These images and the raw FITS data is transferred to the archive every five minutes. The 360-degree panoramic view shows the real-time weather conditions at the observatory.



Hourly images: [05](#) [06](#) [07](#) [08](#) [09](#) [10](#) [11](#) [12](#) [13](#) [14](#) [15](#) [16](#) [17](#)

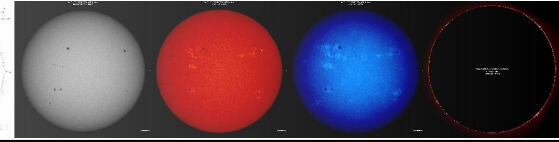
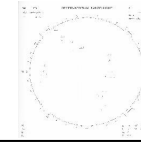
[Show Contrast Viewing Mode](#)

Start Faster Slower Step Reverse Swing Mode Off

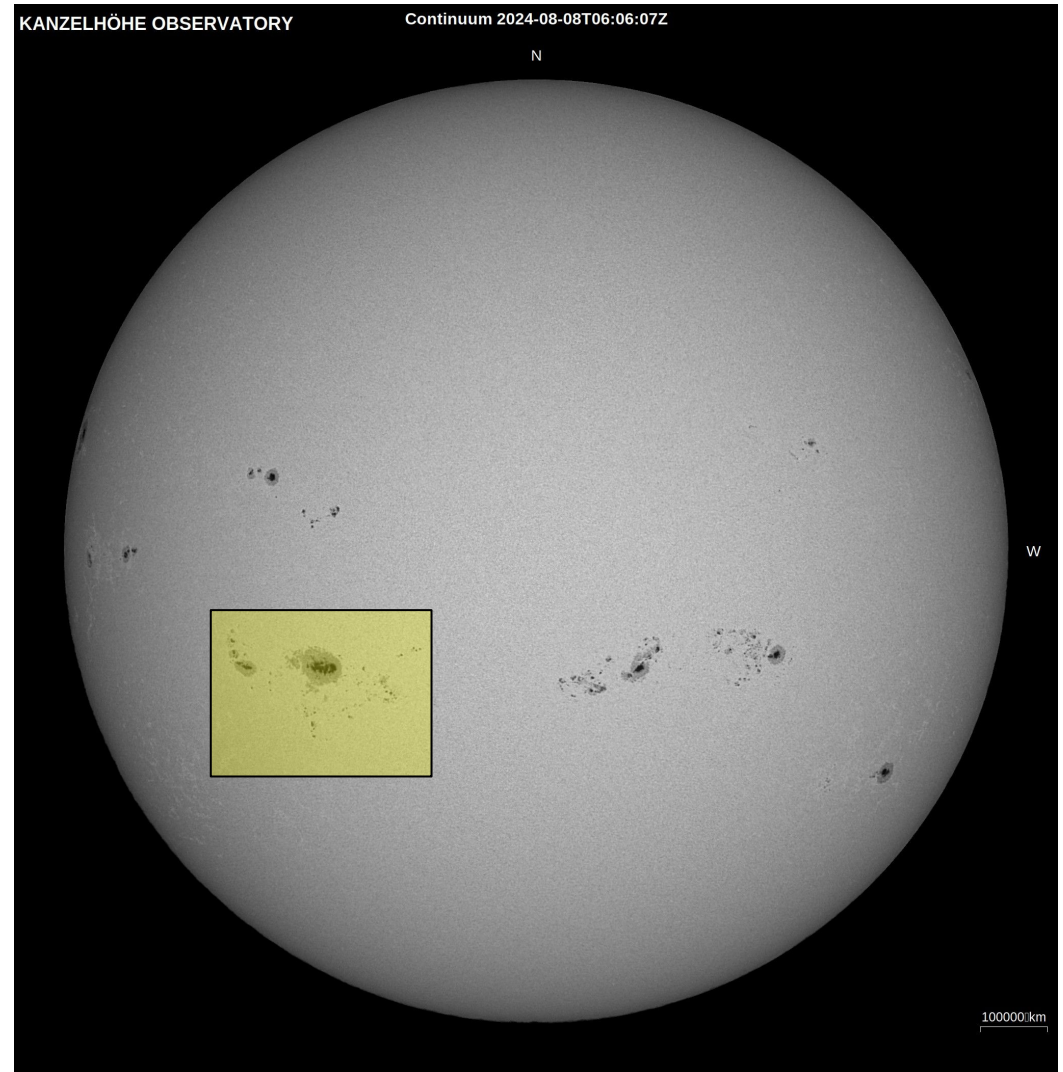
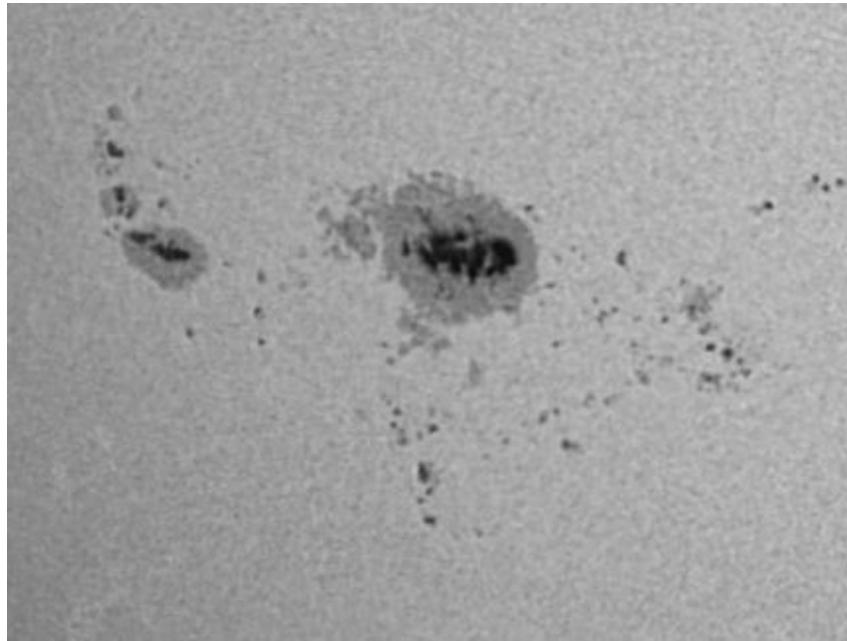
Pause 5 /sec Frame 10 of 10 Download Files

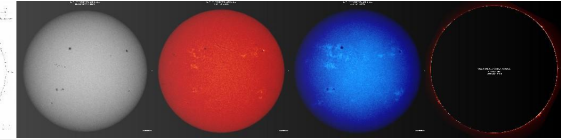
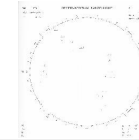


- every minute
- live archive
- uncorrected
- CLV-corrected
- grid



White-light images





White-light ESA Spaceweather



CURRENT SPACE WEATHER

SPACE WEATHER SERVICES

SPACE WEATHER AT ESA

EXPERT SERVICE CENTRES

ESC Solar Weather

ESC Heliospheric Weather

ESC Space Radiation

ESC Ionospheric Weather

ESC Geomagnetic Conditions

INFORMATION FOR USERS

USER FEEDBACK

CONTACT THE HELPDESK

TERMS OF USE

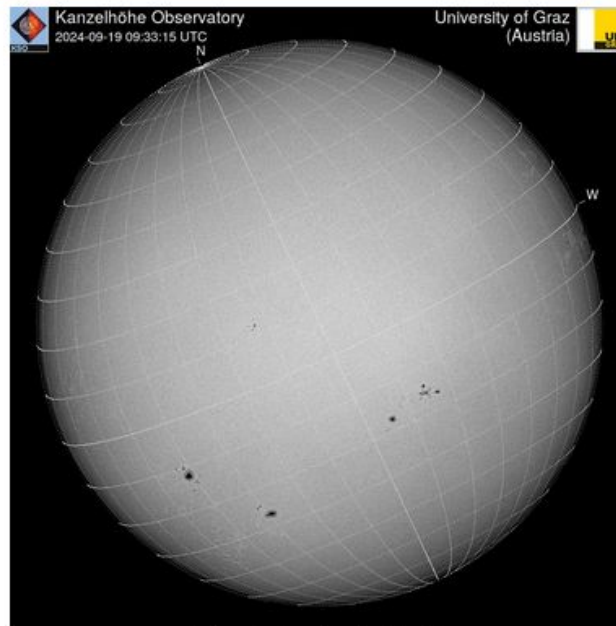
Federated products from the Kanzelhöhe Observatory for Solar and Environmental Research (UNIGRAZ)



[Help](#) [Similar products](#) [Related products](#) [Latest](#) [Query](#)

Whitelight images - Latest

At Kanzelhöhe Observatory the photosphere is observed in Whitelight every day from about 8:00 to 16:00 CET/CEST (when the weather is sufficiently clear). The images are processed immediately and available in near real-time as JPEGs with a heliographic grid overlaid. Additionally, images with removed large scale variations like limb darkening are made available as high contrast images. These images and the raw FITS data is transferred to the archive every five minutes. The 360-degree panoramic view shows the real-time weather conditions at the observatory.



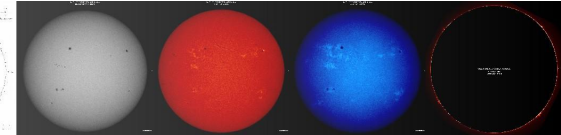
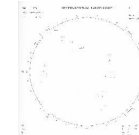
Show Contrast Viewing Mode

Hourly images:

04 UT no image	05 UT no image	06 UT no image	07 UT no image
		10 UT no image	11 UT no image
12 UT no image	13 UT no image	14 UT no image	15 UT no image
16 UT no image	17 UT no image	18 UT no image	19 UT no image



- every minute
- live archive
- uncorrected
- CLV-corrected
- grid



Flaredetection

Flare detection - Archive

All detected flares during a given time period are displayed in a list and a link to the flare movie is provided.
The selected date marks the end date of the desired period, that can range from one day up to the complete data set (back to 2000).
The alert archive is updated at the end of the observation day.

End date	Year	»														Month	1	2	3				
		2024				2023		2022		2021		2020		»									
	Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Coverage		1 day				1 week		1 month		1 year		same month											

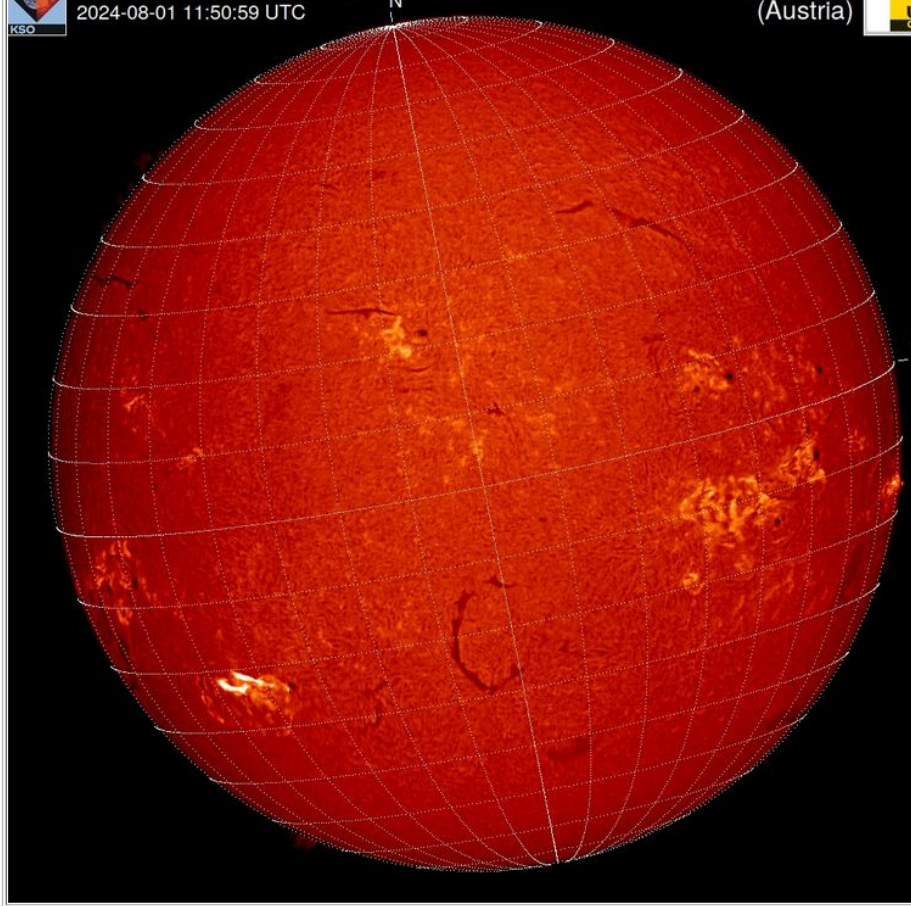
44 database entries found

Date	Start	Peak	End	Position	Type	Area	AR	Zürich Class	Magn. Class	Link to Movie
2024-08-25	06:05:00	06:07:00	06:12:00	S27/E05	SF	69	13800	E-16	Beta-Gamma	»Flare Movie
2024-08-25	11:43:00	11:44:00	11:50:00	S26/E00	SF	49	13800	E-16	Beta-Gamma	»Flare Movie
2024-08-25	12:14:00	12:16:00	12:23:00	S26/W01	SF	56	13800	E-16	Beta-Gamma	»Flare Movie
2024-08-25	12:54:00	12:55:00	13:02:00	S03/W19	SF	22	13796	D-18	Beta-Gamma	»Flare Movie
2024-08-25	12:52:00	12:53:00	12:57:00	S27/E01	SF	29	13800	E-16	Beta-Gamma	»Flare Movie
2024-08-25	13:10:00	13:10:00	13:11:00	S12/E10	SF	37	13799	D-18	Beta-Gamma	»Flare Movie
2024-08-25	13:23:00	13:29:00	13:33:00	S26/E00	SF	37	13800	E-16	Beta-Gamma	»Flare Movie
2024-08-25	13:43:00	13:44:00	13:50:00	S27/W00	SF	40	13800	E-16	Beta-Gamma	»Flare Movie
2024-08-25	13:46:00	13:51:00	14:00:00	S04/W19	SF	29	13796	D-18	Beta-Gamma	»Flare Movie
2024-08-25	11:23:00	11:27:00	11:33:00	S26/E00	SF	53	13800	E-16	Beta-Gamma	»Flare Movie
2024-08-25	10:16:00	10:18:00	10:31:00	S26/E00	SF	66	13800	E-16	Beta-Gamma	»Flare Movie
2024-08-25	10:04:00	10:06:00	10:07:00	N19/W62	SF	38	13794	C-05	Beta	»Flare Movie
2024-08-25	06:20:00	06:22:00	06:31:00	S26/E04	SF	48	13800	E-16	Beta-Gamma	»Flare Movie
2024-08-25	06:48:00	06:53:00	07:32:00	S26/E05	1N	100	13800	E-16	Beta-Gamma	»Flare Movie
2024-08-25	07:08:00	07:09:00	07:10:00	S11/W02	SF	37	n/a	n/a	n/a	»Flare Movie
2024-08-25	07:42:00	07:45:00	08:00:00	S26/E04	SF	90	13800	E-16	Beta-Gamma	»Flare Movie
2024-08-25	08:52:00	08:53:00	09:00:00	S26/E02	SF	39	13800	E-16	Beta-Gamma	»Flare Movie
2024-08-25	08:49:00	08:49:00	08:52:00	S14/E13	SF	25	13799	D-18	Beta-Gamma	»Flare Movie
2024-08-25	09:36:00	09:42:00	09:45:00	S26/E02	SF	43	13800	E-16	Beta-Gamma	»Flare Movie
2024-08-25	09:52:00	10:08:00	10:15:00	S04/W18	SF	53	13796	D-18	Beta-Gamma	»Flare Movie
2024-08-26	11:17:00	11:35:00	11:38:00	S06/W30	SF	55	13796	D-12	Beta-Gamma	»Flare Movie
2024-08-27	10:26:00	10:27:00	10:31:00	N08/E11	SF	22	13801	D-11	Beta-Gamma	»Flare Movie
2024-08-28	08:41:00	08:45:00	08:53:00	N08/W02	SF	67	13801	C-05	Beta	»Flare Movie
2024-08-28	08:30:00	08:31:00	08:32:00	S28/W45	SF	22	13800	E-15	Beta-Gamma	»Flare Movie
2024-08-28	08:21:00	08:22:00	08:25:00	N08/W01	SF	29	13801	C-05	Beta	»Flare Movie
2024-08-30	14:03:00	14:05:00	14:05:00	S16/E01	SF	54	n/a	n/a	n/a	»Flare Movie
2024-08-30	13:23:00	13:24:00	13:31:00	S16/E02	SF	34	n/a	n/a	n/a	»Flare Movie

H-alpha Flare movie for 20240801 1104-1218 Type:1N Pos:S22E42

Kanzelhöhe Observatory
2024-08-01 11:50:59 UTC

University of Graz
(Austria)



Start

Pause

Faster

Slower

Step

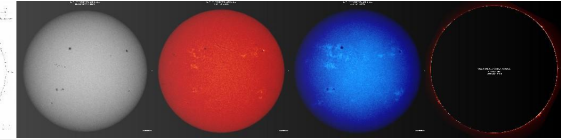
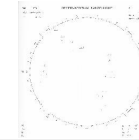
Reverse

Swing Mode Off

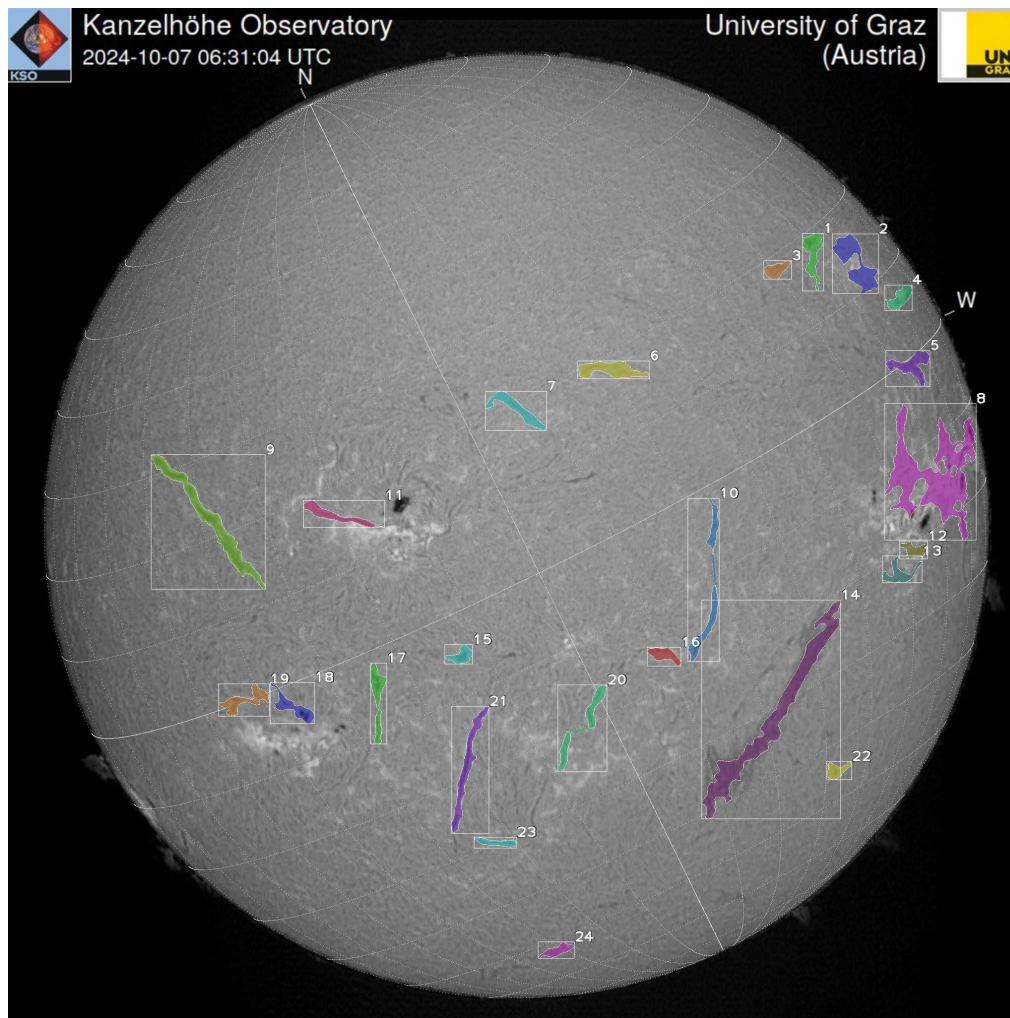
Frame: 201 of 293

15 frames/sec

Close



Filament detection/tracking



Filament Tracking

Detected by the feature recognition algorithm are combined to a single filament image. For each filament the position, the area, the length, and the width extends are calculated.

Clicking via the table on the right or from the filament map on the left. The interface will change to filament tracking mode, to go back for filament selection click to "Filament Selection" button. The tracked filament data can be downloaded.

Filament tracking for Filament Nr. 16 of 2024-10-06T06:00:00

14 2024-10-06 08UT S30W08 3299μHem 596arcsec

Selection Play Faster Slower Stop Frame: 2 of 14 Download csv data

Telescope in Белоградчик

- Celeston 11"
- 280 mm aperture
- 2800 mm focal/length
- $f/l = 1/10$

For filter use $f/l = 1/30$ is needed \Rightarrow

- 1) reduce aperture
- 2) enlarge focal length



Enlarge focal length

focal length enlargement by telecentric system leads to a very large solar image in focus:

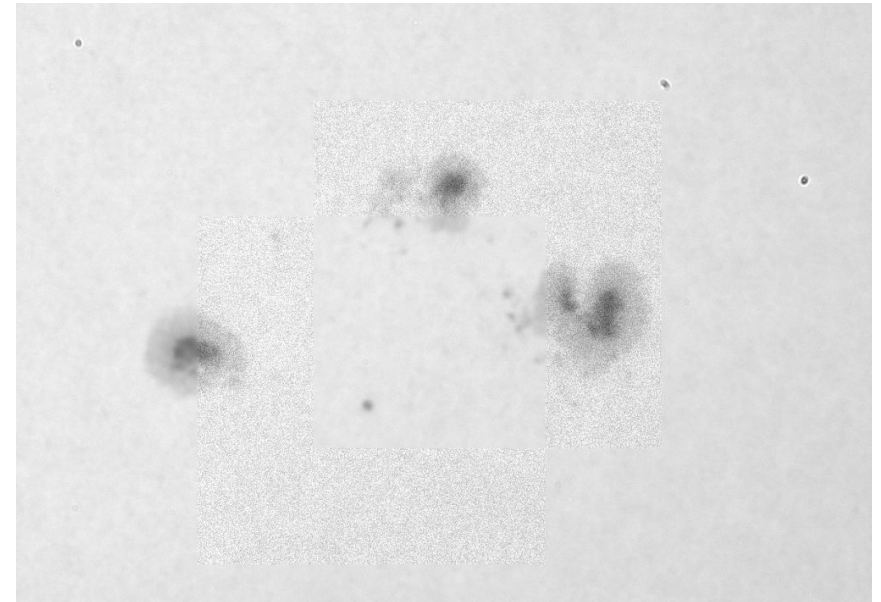
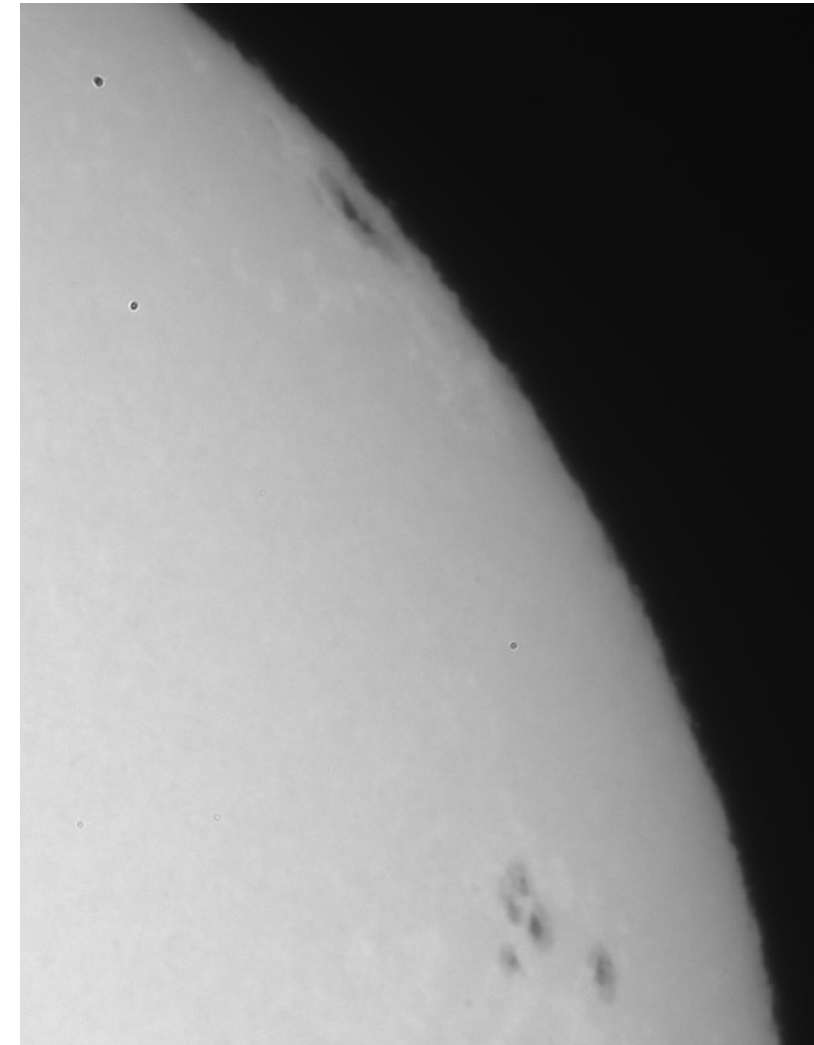
- 1) focal length of 2800 results in 26mm solar image
- 2) camera sizes are much smaller (5 to 10 mm)
- 3) only small part of Sun visible
- 4) high resolution leads to high noise level due to seeing
- 5) maybe to little light?
- 6) guiding more difficult
- 7) position on Sun not very clear
- 8) filter directly before camera – heat has to be removed at front side

Reduce Aperture

- 1) less heat
- 2) less light – camera exposure time still very short
- 3) cheaper optical components
- 4) f/l for filter is better
- 5) resolution still large enough for seeing conditions
- 6) less pixels per image



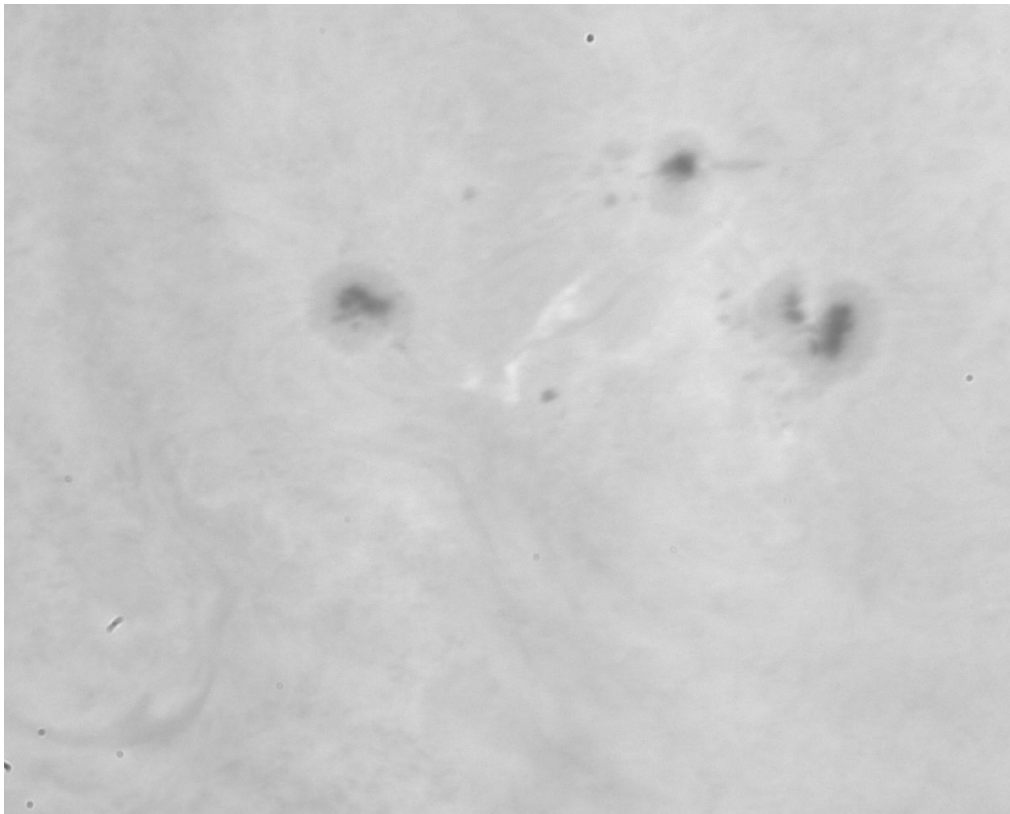
First tests in Белоградчик White-light



resolution is sufficient to resolve details

seeing conditions were bad (wiggly limb), but umbra and penumbra well separated

First tests in Белоградчик H-alpha



filter not in center of line
(temperature too low/high)
therefore contrast is low

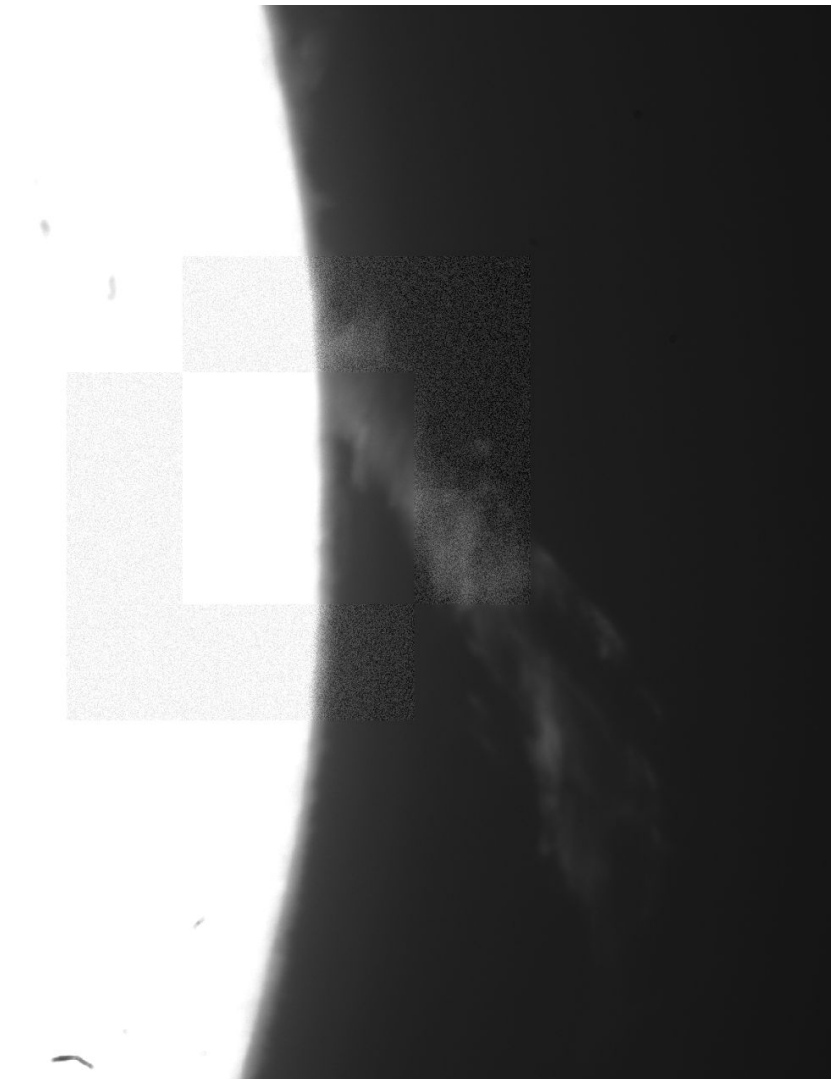
but:

small flare is visible

filament is visible

chromospheric network is
visible

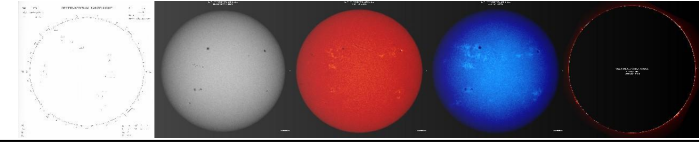
First tests in Белоградчик H-alpha



overexposed image shows
prominence at limb

structures are visible

relatively good contrast



What can Bulgaria contribute to the community?

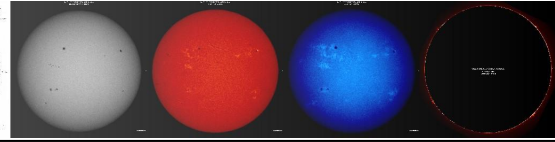
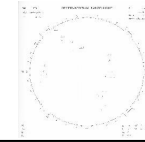
Two main possibilities:

1) **Do what all the others do:**

Patrol observations of Chromosphere and Photosphere
Just serve as an additional station to overcome gaps due to weather situation and day/night cycle.

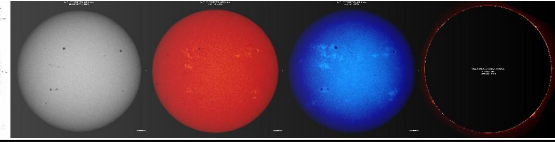
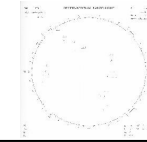
2) **Don't do what all the others do:**

Focus on event observations, i.e. high resolution and maybe high cadence observations of solar flares in H-alpha or Whitelight.



Patrol observations

- Observations should be done as often as possible – staff problem!
- Complete data pipeline has to be established.
- Smaller telescope necessary!
- Almost real-time processing shall be done!
- Programs, scripts are available and not everything has to be ‚invented again‘.



Event observations

- Mostly during high solar activity.
- The existing telescope fits well for White-light observations
- Data can be processed afterwards.
- Forecast of events is not really available!
- In combination with satellite data (magnetic field) the observations gain in value.