

Optical observations of the solar chromosphere by NAO Rozhen

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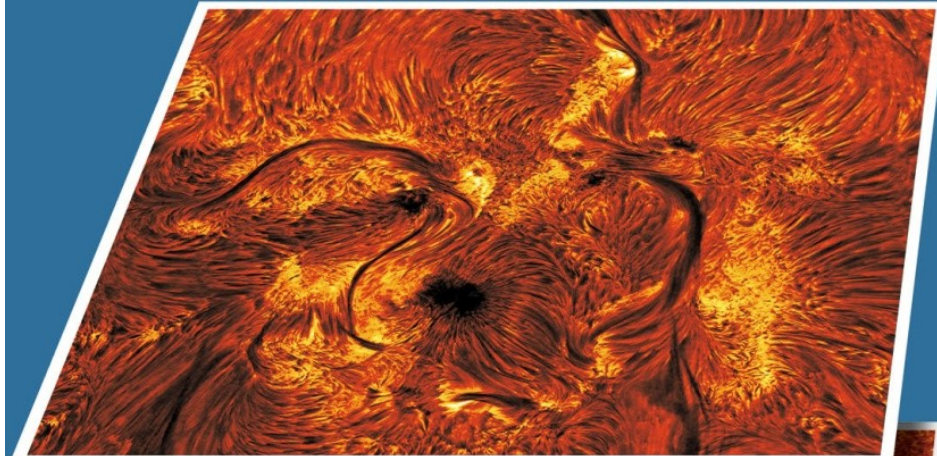


13 Bulgarian-Serbian Astronomical Conference
02 October – 07 October 2022, Velingrad, Bulgaria

designation	λ (Å)	width (Å)	type	tuning
blue continuum	4320	6	interference	fixed
red continuum	6563	3	interference	tiltable
G band	4305	10	interference	fixed
Ca II H	3968	1.35	interference	tiltable
H α	6563	0.25	Lyot	tunable
Ba II	4554	0.08	Lyot	tunable

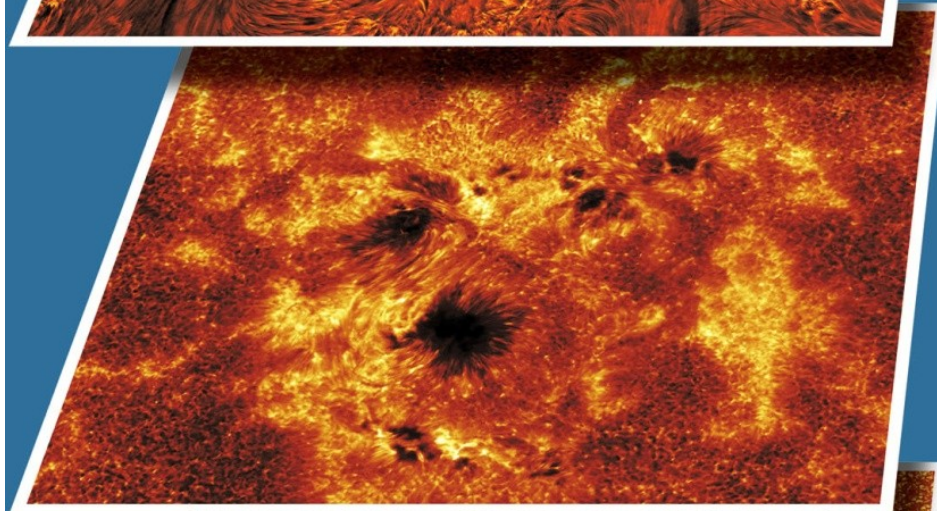
H α (656.3 nm)
chromosphere

2000 km



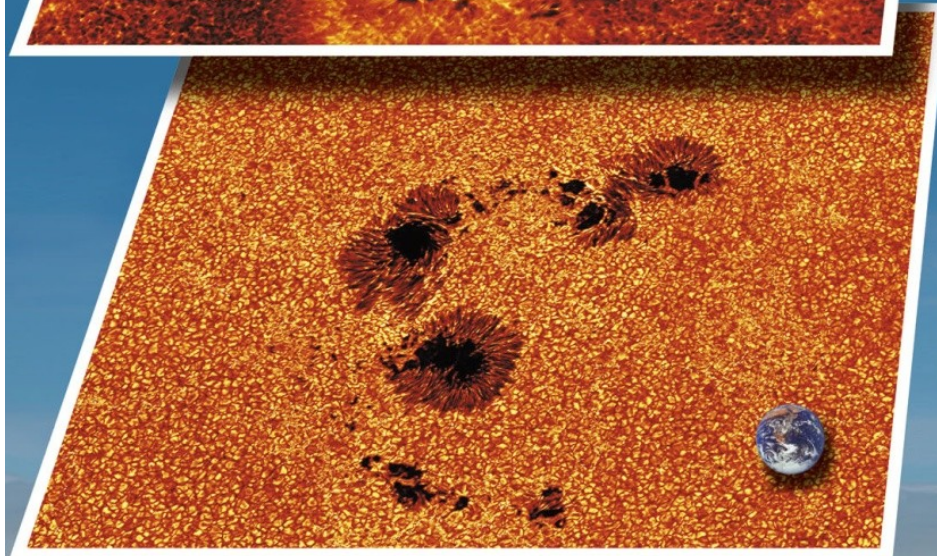
Ca II H (396.8 nm)
photosphere/chromosphere

500 km



G-band (430.5 nm)
(CH molecule)
photosphere

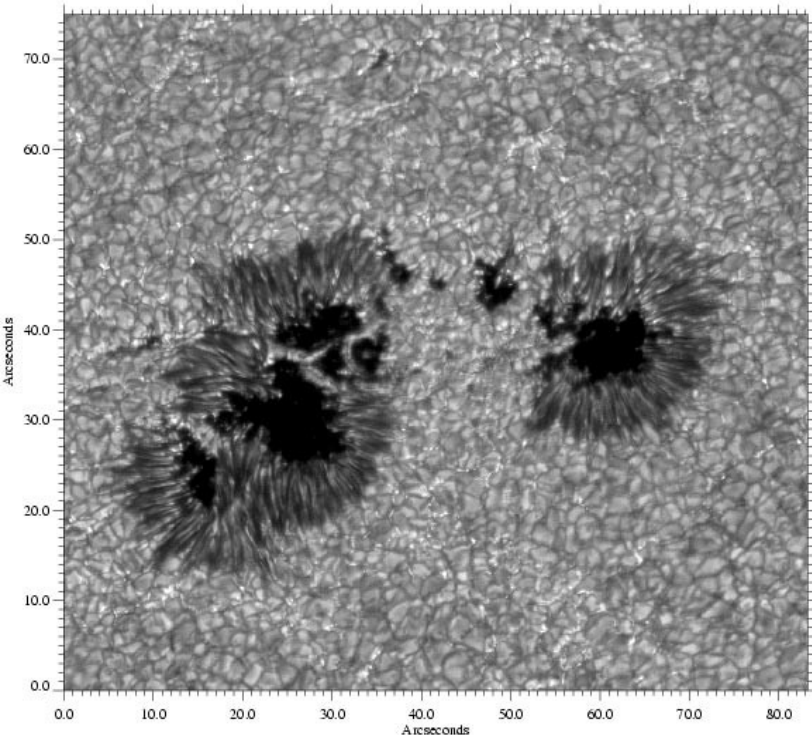
0 km



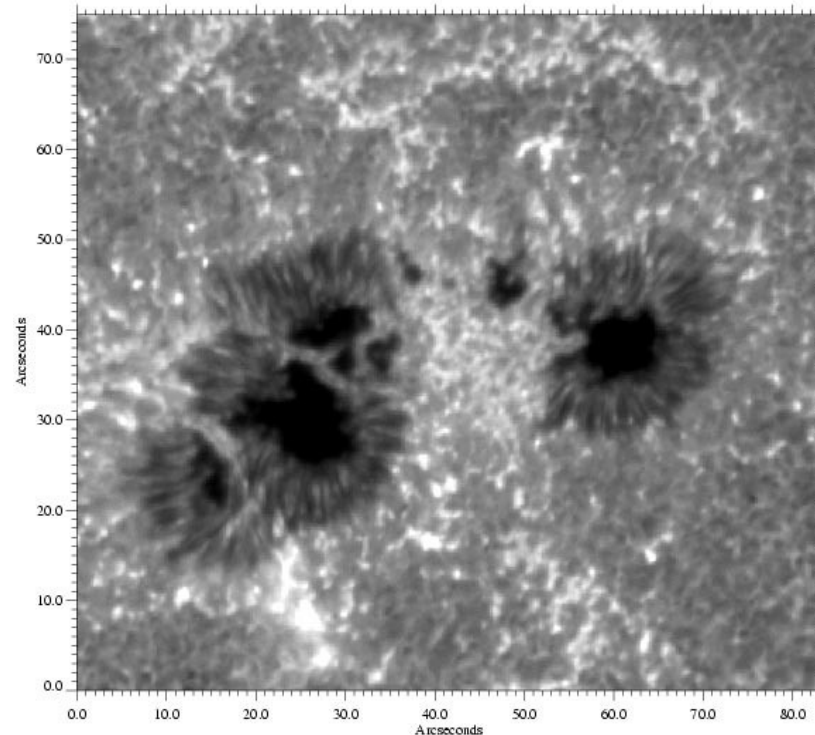
Dutch Open Telescope on La Palma

http://www.staff.science.uu.nl/~rutte101/dot/DOT_tomography.html

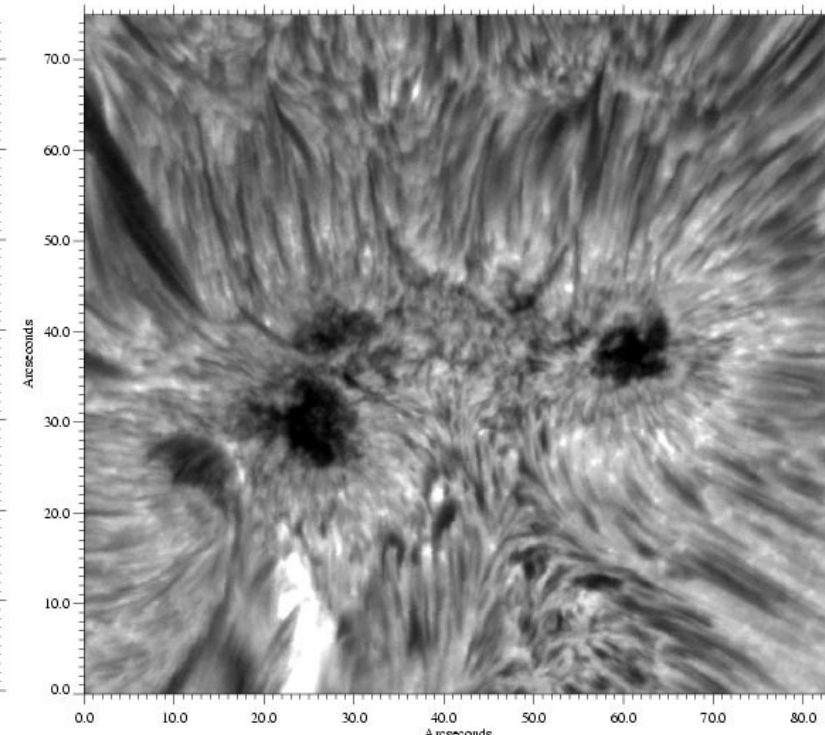
1999-2010r.



G band (4305.4Å)
T~6000 K



Ca IIK (3933.66Å)
T~4000 K



H_α (6562.81Å)
T~40000 K

- Solar photosphere imaged in the G band
- The Ca IIK shows the magnetic “network” made up by concentrations of the magnetic elements as bright due to magnetically induced heating
- The H_α line maps expanding fibrils in the transition to the corona, where the magnetic field lines constitute coronal loops sampled

October 7, 2001, DOT Team

- CO molecule (4.67 μm), lower hromosphere (T~4000 K); *H. Uitenbroek, 1999, NSO McMath-Pierce Telescope*

1. China

1.1 Multi-Tubes Solar Telescope MAX

Suggestion for BG solar observations from Weijun Mao:

Telescope will be consists of **four** tubes, aperture of tubes selected to meet the diffraction limits **better than 1 arc-second.**

1. Chromosphere observing tube:

Clear aperture 165mm.

Full-disc observing mode,

FOV: $\hat{\wedge}36'$

H α birefringence filter: will be mounted in collimating optical system.

Center wavelength: 6562.81Å.

Passband FWHM: 0.25Å.

Wavelength shift range: $\pm 2\text{\AA}$, controlled by PC , shifting duration between terminal wavelength position will be less than 30 seconds.

2. Calcium K line observing tube :

Clear aperture 100mm.

Full-disc observing mode,

FOV: $\hat{\wedge}36'$

K line birefringence filter: will be mounted in collimating optical system.

Center wavelength: 3933.66Å.

Passband FWHM: 2.0Å.

Wavelength shift range: $\pm 2\text{\AA}$, controlled by PC , shifting duration between terminal wavelength position will be less than 30 seconds.

3. G-BANG observing tube :

Clear aperture 120mm.

Full-disc observing mode,

FOV: $\hat{\wedge}36'$

g-band interference filter.

Center wavelength: 4305.4Å.

Passband FWHM: 8Å (it is ok for white light observation, but it depends on you.)

4. Fe I line observing Magnetic tube :

Clear aperture 120mm.

Full-disc observing mode,

FOV: $\hat{\wedge}36'$

Fe I line birefringence filter: will be mounted in collimating optical system.

Center wavelength: 6302.51 Å.

Passband FWHM: 0.10Å.

Wavelength shift range: $\pm 0.5\text{\AA}$, controlled by PC , shifting duration between terminal wavelength positions will be less than 30 seconds.

5. Four tubes will mounted on one equatorial telescope.

6. Functions will be equipped : auto-pointing, auto tracking, focusing by computer, cover of telescope controlled by computer etc.

1. China

1.2. Multi-Tubes Solar Telescope MIN

Suggestion for BG solar observations from Weijun Mao:

Telescope will be consists of **two** tubes, aperture of tubes selected to meet the diffraction **limits better than 1 arc-second**.

1. Chromosphere observing tube:

Clear aperture 165mm.

Full-disc observing mode,

FOV: $\approx 36'$

H α birefringence filter: will be mounted in collimating optical system.

Center wavelength: 6562.81Å.

Passband FWHM: 0.25Å.

Wavelength shift range: $\pm 2\text{Å}$, controlled by PC , shifting duration between terminal wavelength position will be less than 30 seconds.

2. G-BANG observing tube:

Clear aperture 120mm.

Full-disc observing mode,

FOV: $\approx 36'$

g-band interference filter.

Center wavelength: 4305.4Å.

Passband FWHM: 8Å

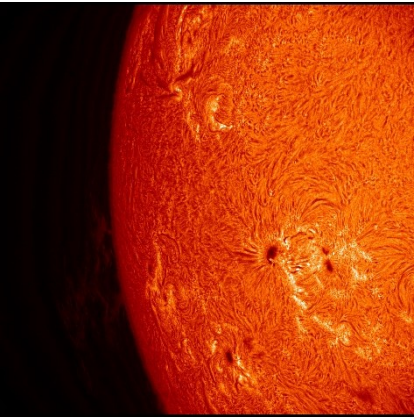
3. Two tubes will mounted on one equatorial telescope.

4. Functions will be equipped : auto-pointing, auto tracking, focusing by computer controll, cover of telescope controlled by computer etc.

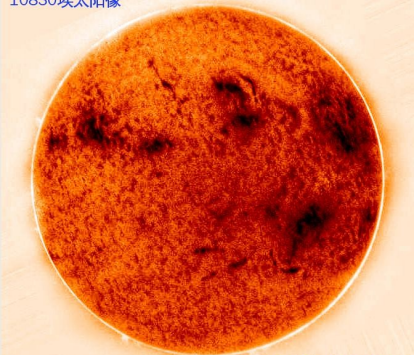
Introduction of some examples of Solar telescope made by Nanjing

1. Nanjing University Optical & NIR Solar Eruption Tracer (ONSET)

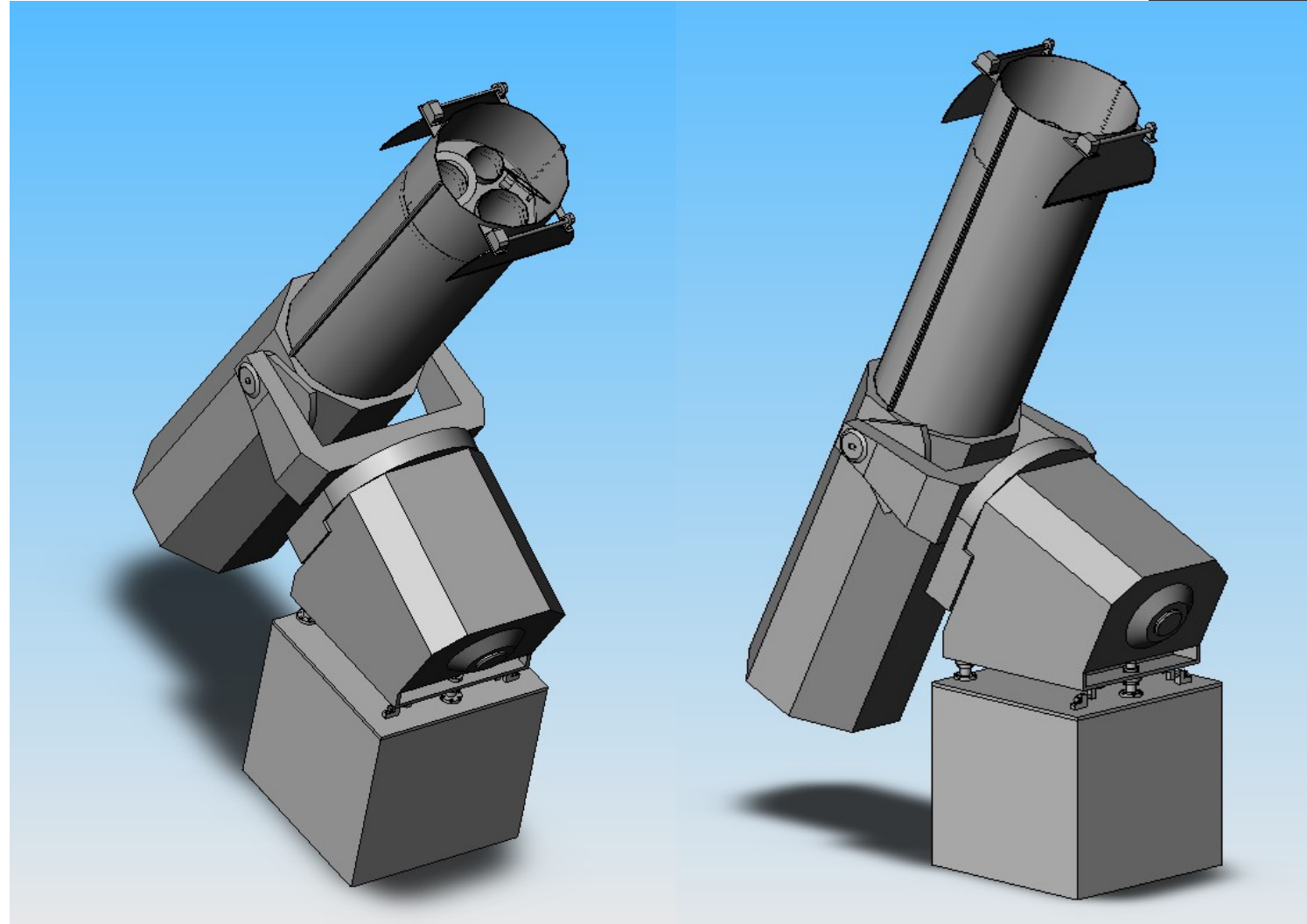
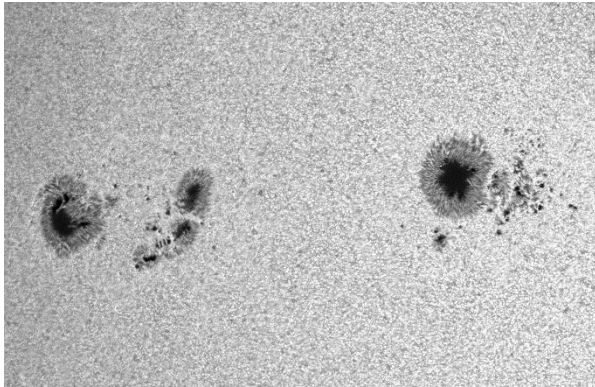
Consists of four tubes:
275mm Ha tube with, 0.25Å FWHM Lyot filter;
275mm 10830Å tube with, 0.5Å Lyot filter;
200mm white light tube;
140mm tracking tube.



10830埃太阳像



南京大学ONSET望远镜

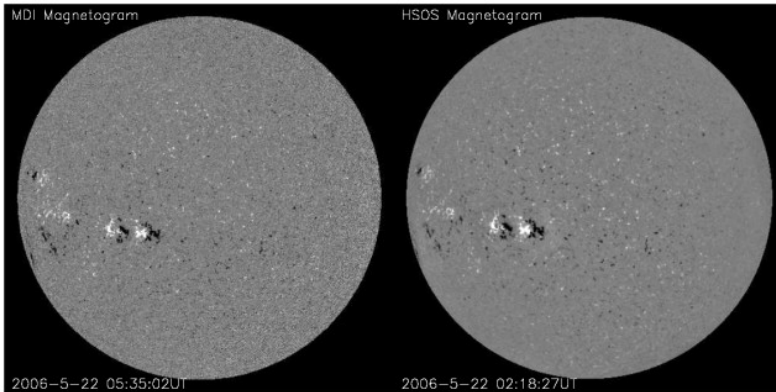


Introduction of some examples of Solar telescope made by Nanjing

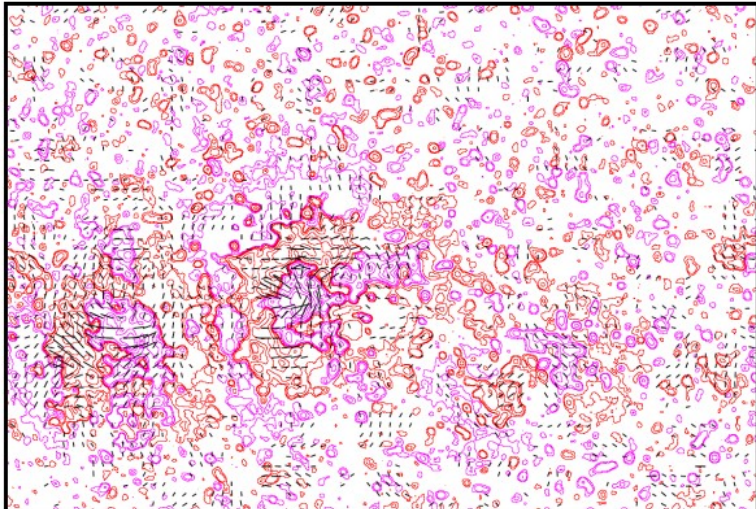
2.Full Solar Disk Ha / Vector Magnetograph Telescope, National hi-tech research and development program

magnetic vector field image

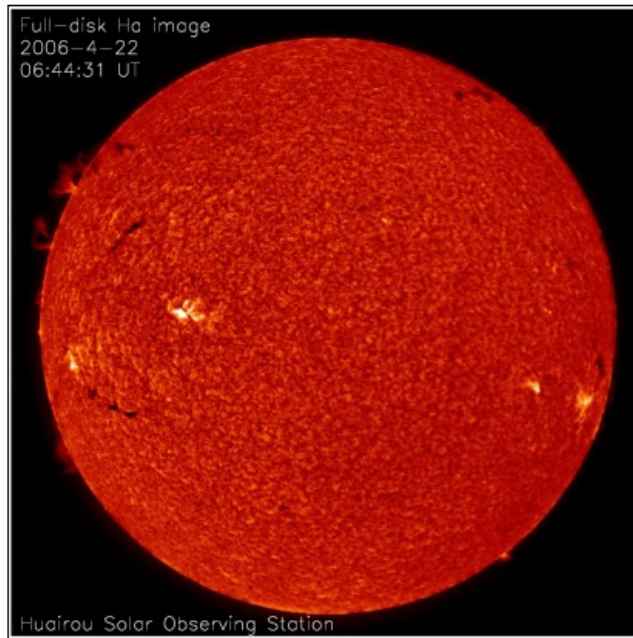
图：全日面太阳光学与磁场监测系统



图：全日面矢量磁图的纵向分量（右）和 SOHO 空间太阳卫星上的 MDI（左）磁图比较

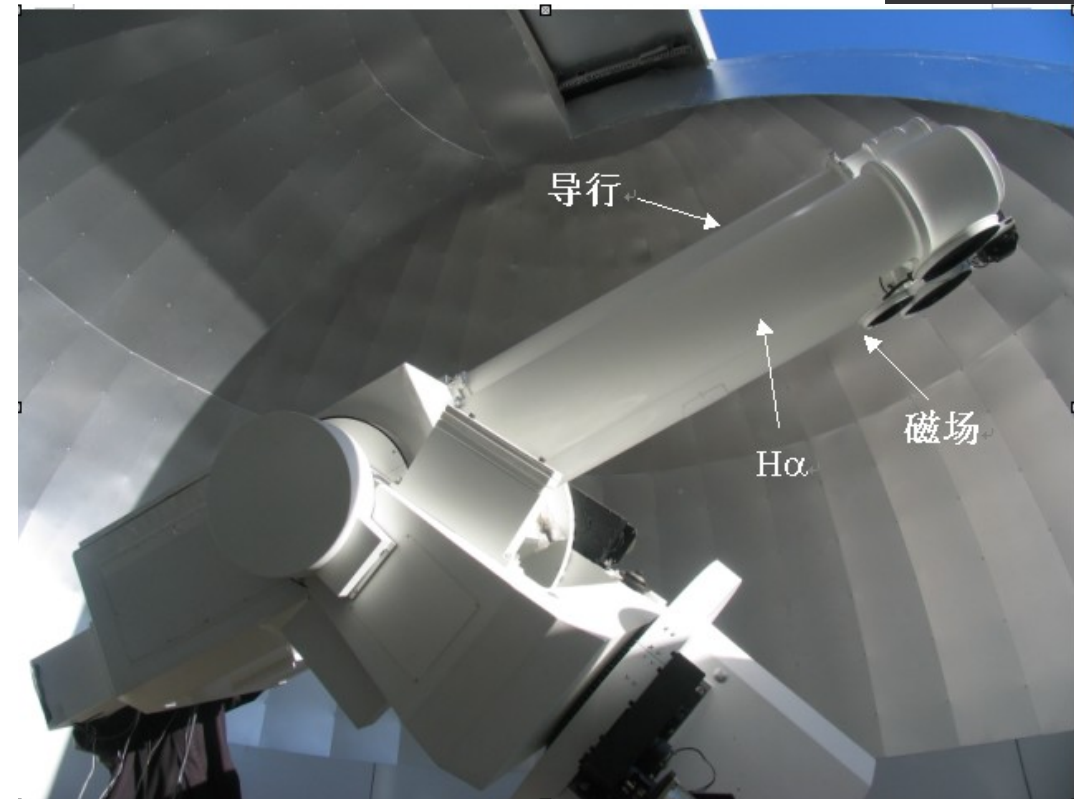


chromosphere image



图：观测的全日面 H α 色球单色像

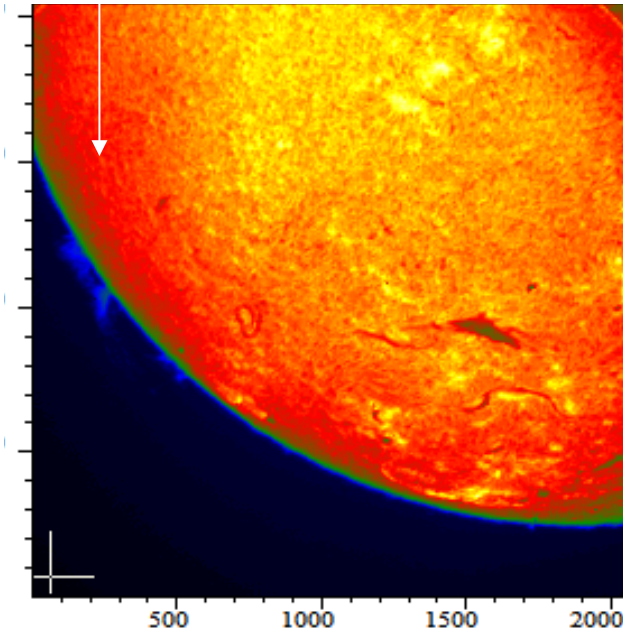
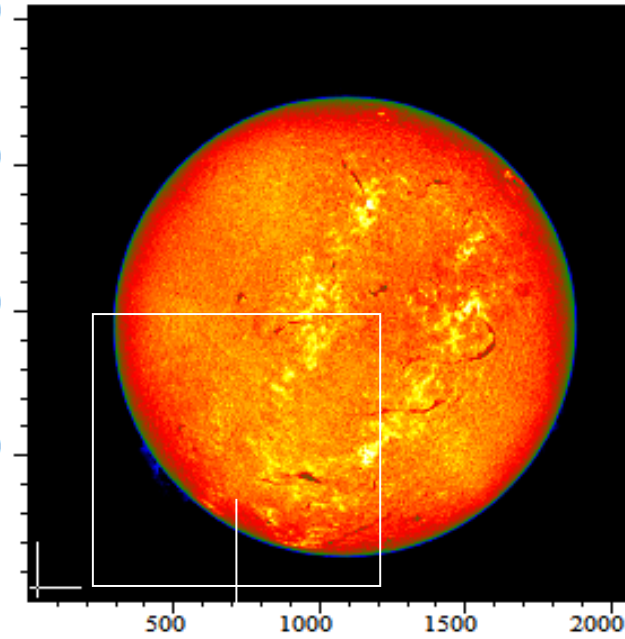
Tracking, Ha, Magnetic tube



Introduction of some examples of Solar telescope made by Nanjing

3. For IIAP(India)

Chromospheric Telescope 200mm aperture 0.4A Lyot filter



1. China

1.1 Multi-Tubes Solar Telescope MAX

No.	Items	Cost FOB Shanghai in USD
1	165mm Chromosphere observing tube	100,000
2	100mm Calcium K line observing tube	30,000
3	120mm G-BANG observing tube	30,000
4	120mm Fe I line observing Magnetic tube	50,000
5	Há birefringence filter	250,000
6	K line birefringence filter	180,000
7	Fe I line birefringence filter	350,000
4	Equatorial mount	220,000
5	Electric control system	160,000
Total		1,370,000

1.2 Multi-Tubes Solar Telescope MIN

No.	Items	Cost FOB Shanghai in USD
1	165mm Chromosphere observing tube	100,000
2	120mm G-BANG observing tube	30,000
3	Há birefringence filter	250,000
4	Equatorial mount	200,000
5	Electric control system	150,000
Total		730,000

+ value added tax (~13%), + duty

2. USA

Offer

2.1 Research Solar System Filter Wheel

DayStar: <http://www.daystarfilters.com/SolarSystem.shtml>

Telescope Manufacturer	Model / aperture	F/ratio	Focal Length	Price
Takahashi	TOA-130S	F/7.7	EFL: 1000	\$6,925.00 USD

Emission Line	Center Wavelength	FWHM	Price
G Band	4305.4 Å	8.0 Å (0.8nm)	
Ca II H-Line	3968.5 Å	2.0 Å (0.2nm)	
Ca II K-Line	3933.7 Å	2.0 Å (0.2nm)	
He D3 PE grade	5875.65Å	0.3 Å (0.03nm)	
			\$40,882.50 USD

CCD Camera Manufacturer	Series	Model	Sensor	Price
Point Grey	Grasshopper	GS3-U3-123S6M-C 30 Frames/sec	Sony IMX253 Chip: 14 x 10mm 4096 x 3000 pixel	\$3,995.00 USD

2. USA

Offer

2.1 Research Solar System Filter Wheel

DayStar: <http://www.daystarfilters.com/SolarSystem.shtml>

Adapters and Accessories		Price
UV/IR blocking	2" / 50.8mm Pre-filter	\$129.00 USD
Telecentric Barlow	Oversized Aperture, Likely a custom barlow	\$2445.00 USD
Female drawtube adapter	SCT-2"	\$50.00 USD
Dielectric Coated Diagonal	2"	\$149.00 USD
Imaging Focal reducer	Non-spherically aberrated Variable image reduction .5x, .33x	\$323.50 USD
remote/motor focuser	QuickSync FSQ Motor for the Takahashi MEF focuser	\$335.00 USD
Focus Lynx focuser Controlling Hub	Focus controller capable of controlling two separate stepper driven focusers with Cat5 Ethernet, Wireless 802.11, and serial /USB computer input. Includes built-in step driver board for Focuser 1, universal power supply, and 7-ft. Cat-5e network cable.	\$325.00 USD
	Total Adapters and Accessories	\$3,756.50 USD

APO telescope, Filter Wheel, CCD Camera and all Adapters	Total Price: \$55,559.00 USD
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Total	~56,000 USD
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+ value added tax (~20%), + duty

2. USA

Offer

2.2 DayStar DUAL BANDPASS TELESCOPE

DayStar: <http://www.daystarfilters.com/SolarSystem.shtml>

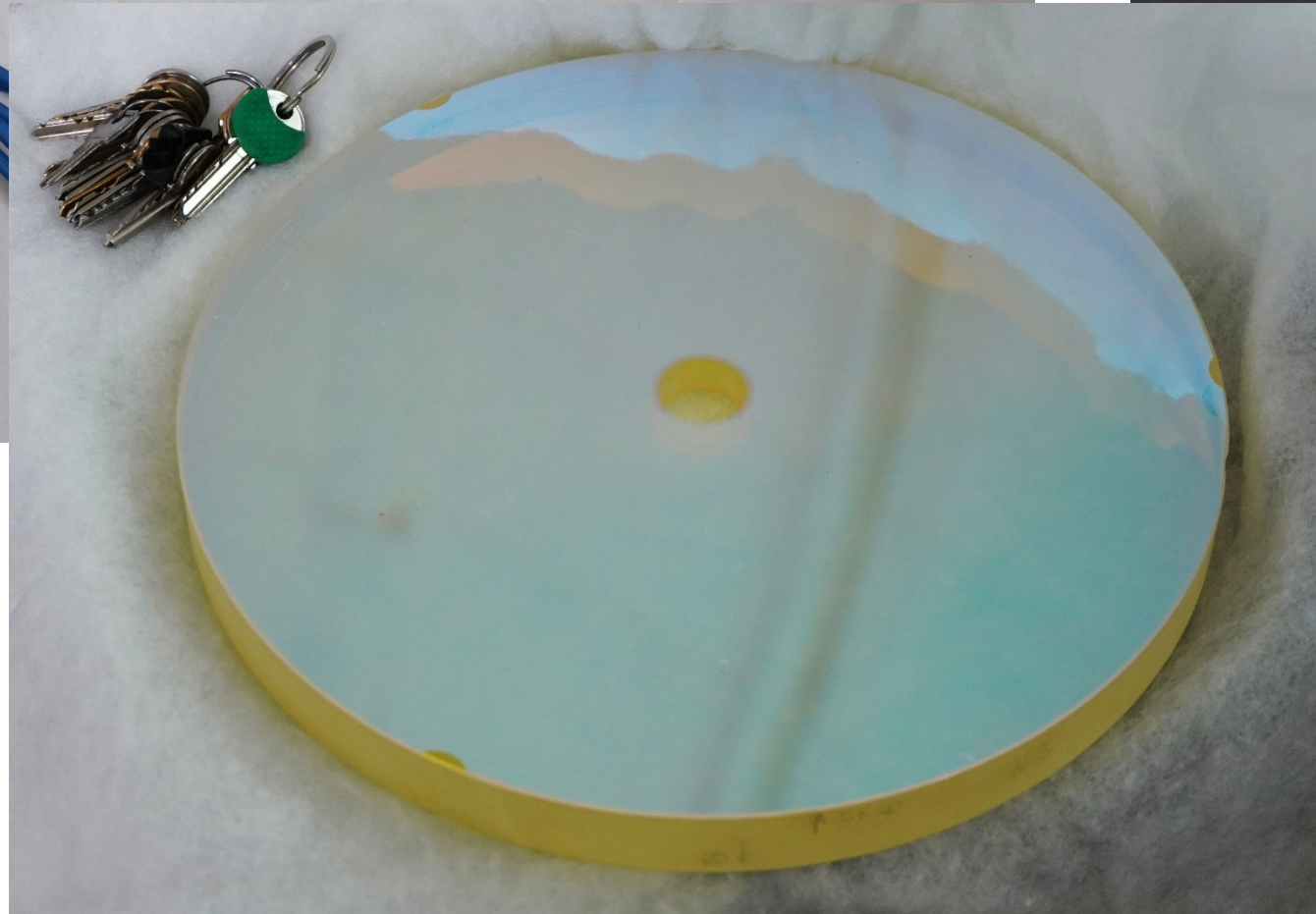


DayStar 127mm DUAL BANDPASS TELESCOPE:				
Suggested Emission Line		Center Wavelength	FWHM	Price
Hydrogen Alpha Line		6562.82 Å	0.2 Å (0.02nm) PE grade	\$41,400.00 USD
Wing shift of fast moving chromosphere			Polarizing Beamsplitter & Mountings	\$ 849.00 USD
Focus Lynx motor				\$375.00 USD
Focus Lynx motor controller				\$325.00 USD
			Total	\$42,949.00 USD
			(note: in 0.3Å, the dual bandpass telescope is \$33,769.00 USD)	
CCD Camera Manufacturer	Series	Model	Sensor	Price
Point Grey (Recommended)	Grasshopper	GS3-U3-123S6M-C 30 Frames/sec	Sony IMX253 Chip: 14 x 10mm 4096 x 3000 pixel	\$3,995.00 USD x 2
				\$7,990.00 USD
2 Dual Bandpass Telescope with 2 CCD cameras & adapters:			Total Price: \$50,939.00	

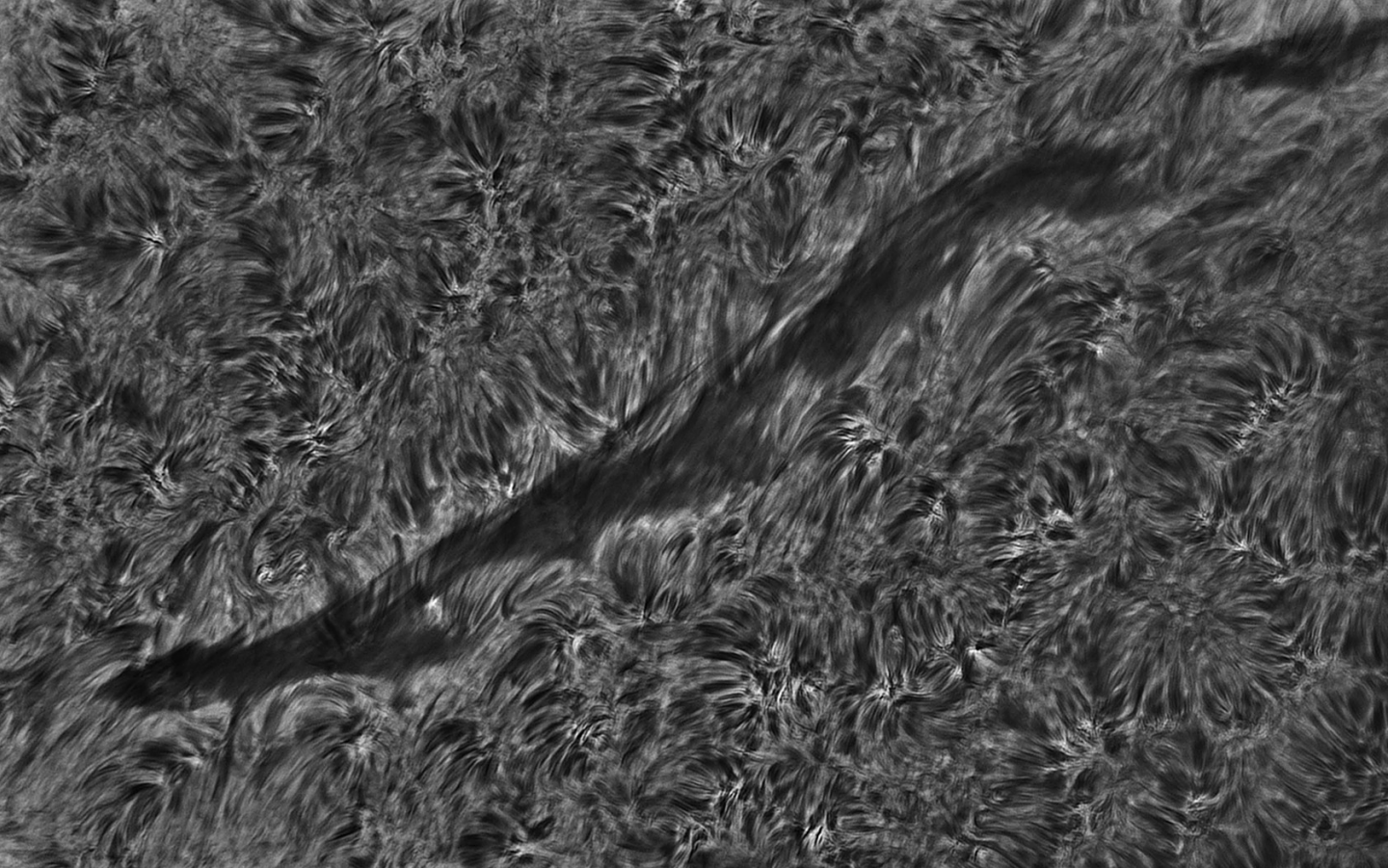
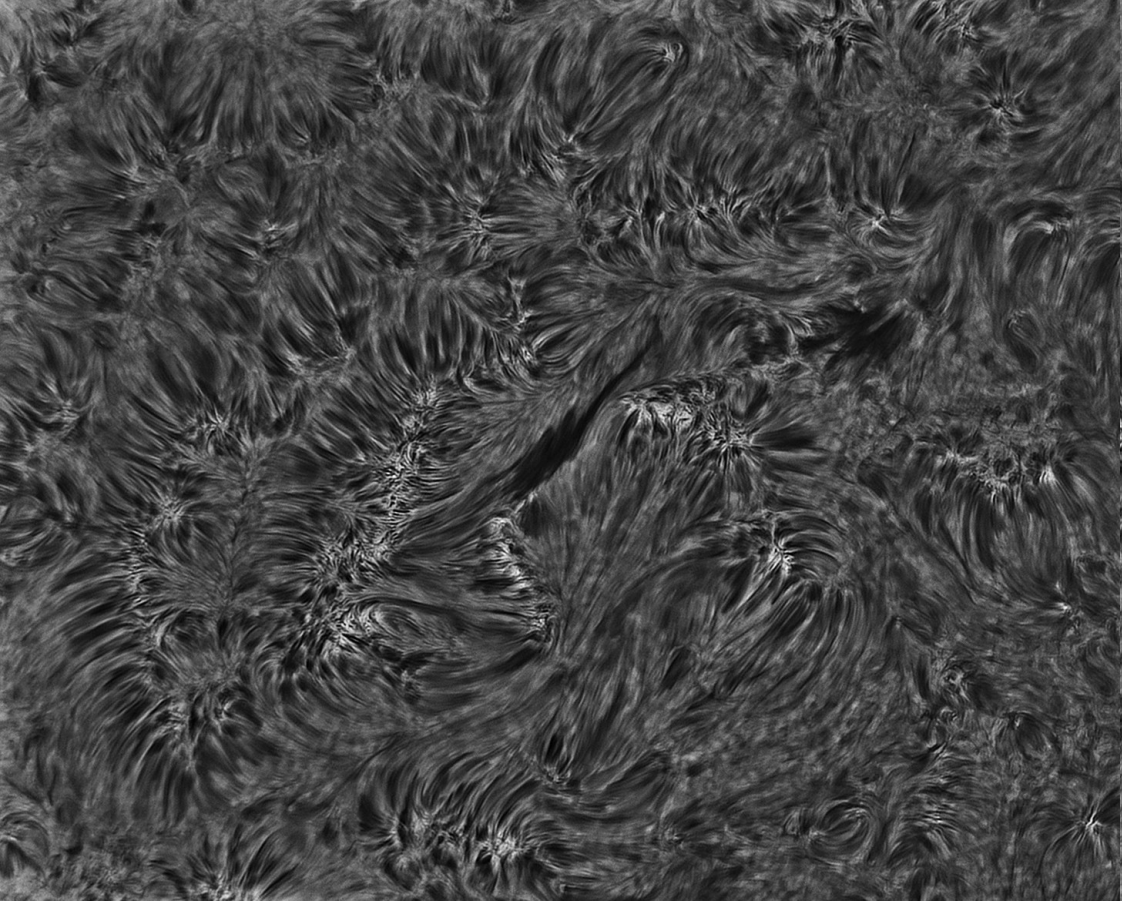
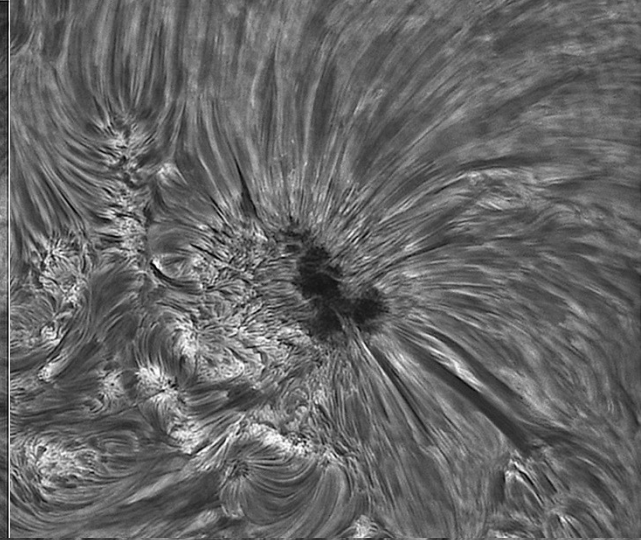
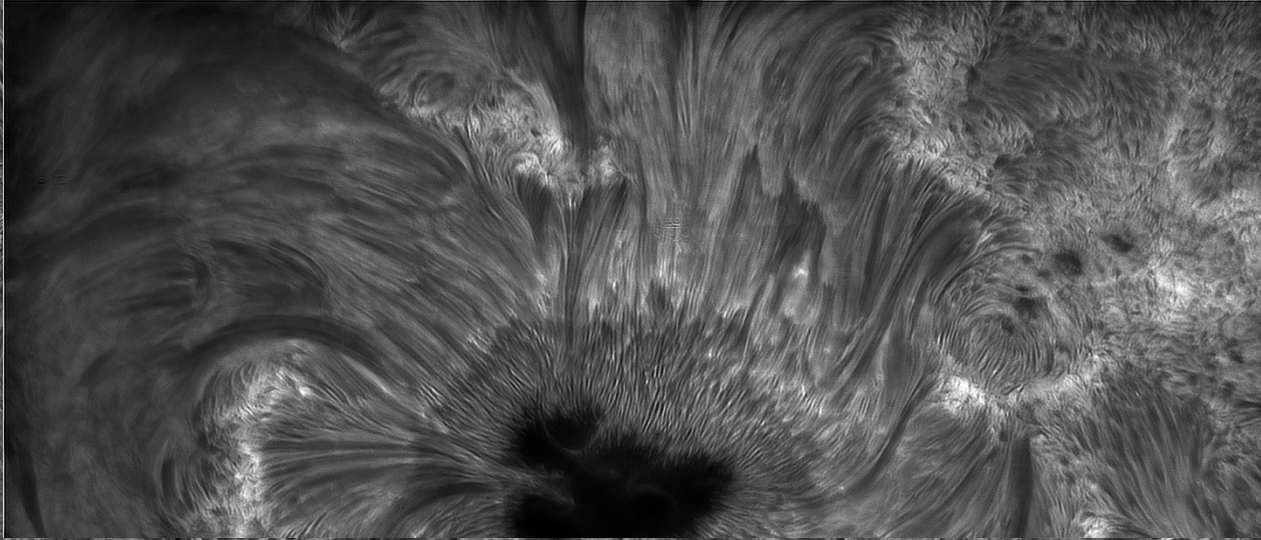
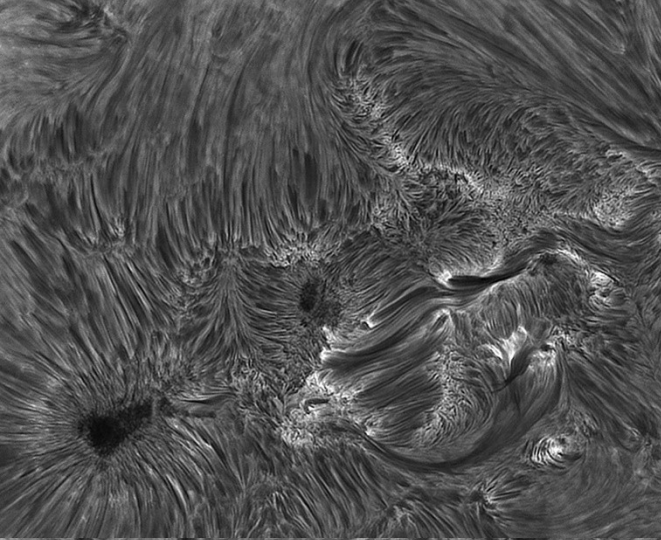
3. Ukraine

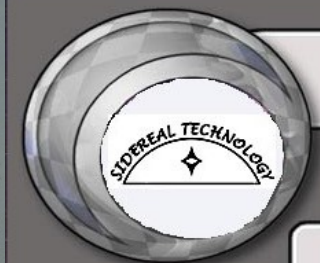
Offer

3.1. Chromosphere solar telescope



Total: 25, 000.00 Euro
+ value added tax (~20%), + duty





Sidereal Technology
You have choices



\$895 - Dual Servo Telescope Controller II

Febuary, 2012!!!! Finally, SiTechExe version 0.90A is released! [Go to the download page to read about it!](#)

Thank you for attention

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