Lessons learnt by analysing LASCO images

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LASCO-C2 instrument
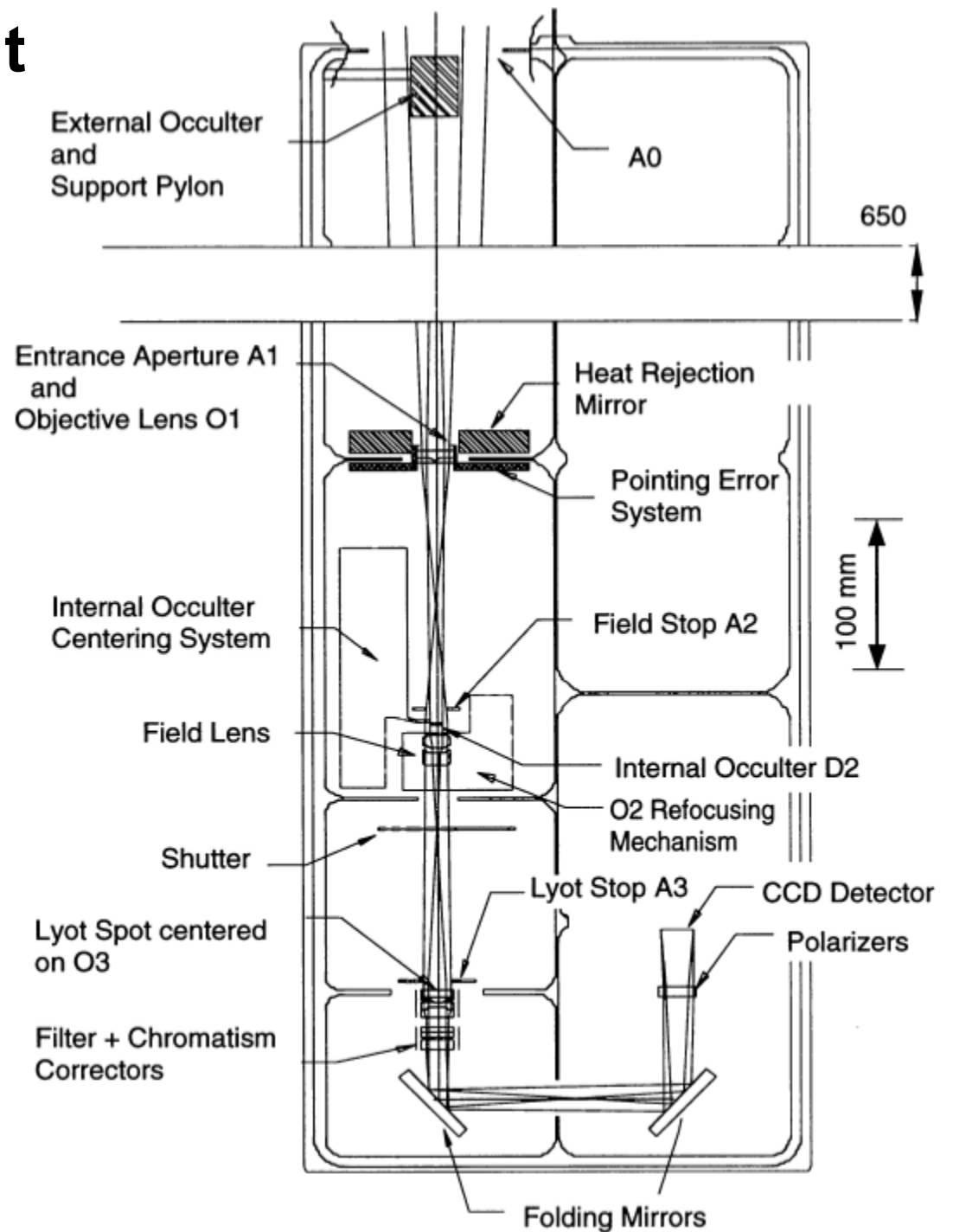

External Occulter and Support Pylon

A0

650

Entrance Aperture A1 and Objective Lens O1

Heat Rejection Mirror

Pointing Error System

100 mm

Internal Occulter Centering System

Field Stop A2

Field Lens

Internal Occulter D2

O2 Refocusing Mechanism

Shutter

Lyot Stop A3

CCD Detector

Polarizers

Lyot Spot centered on O3

Filter + Chromatism Correctors

Folding Mirrors

Fig. 10. The optical layout of the C2 coronagraph

LASCO Filters

Color Filters for C2 and C3

Filter	Coronagraph	Nominal Bandpass (nm)
Blue	C2 and C3	420 - 520
Orange	C2 and C3	540 - 640
Light Red	C2	620 - 780
Deep Red	C2 and C3	730 - 835
Hα	C2 and C3	2.0 nm at 656.3 nm
Infrared	C3	860 - 1050
Clear	C3	400 - 850
3 Polarizers at 0°,±60°	C2 and C3	400 - 850

LASCO-C2, July 2002

SeqPW sequence:

512 # 512 pixel images, orange filter.

	Polarizer:			
	0 degree,	100s exposure time,	580 images in total
	+ 60 degrees,	100s exposure time,	578 images in total
	- 60 degrees,	100s exposure time,	579 images in total
	clear,	25s exposure time,	576 images in total

Normal sequence:

1024 # 1024 pixel images, orange filter.

Polarizer: clear,   25s exposure time, 1376 images in total

LASCO-C2, July 2002 - backgrounds
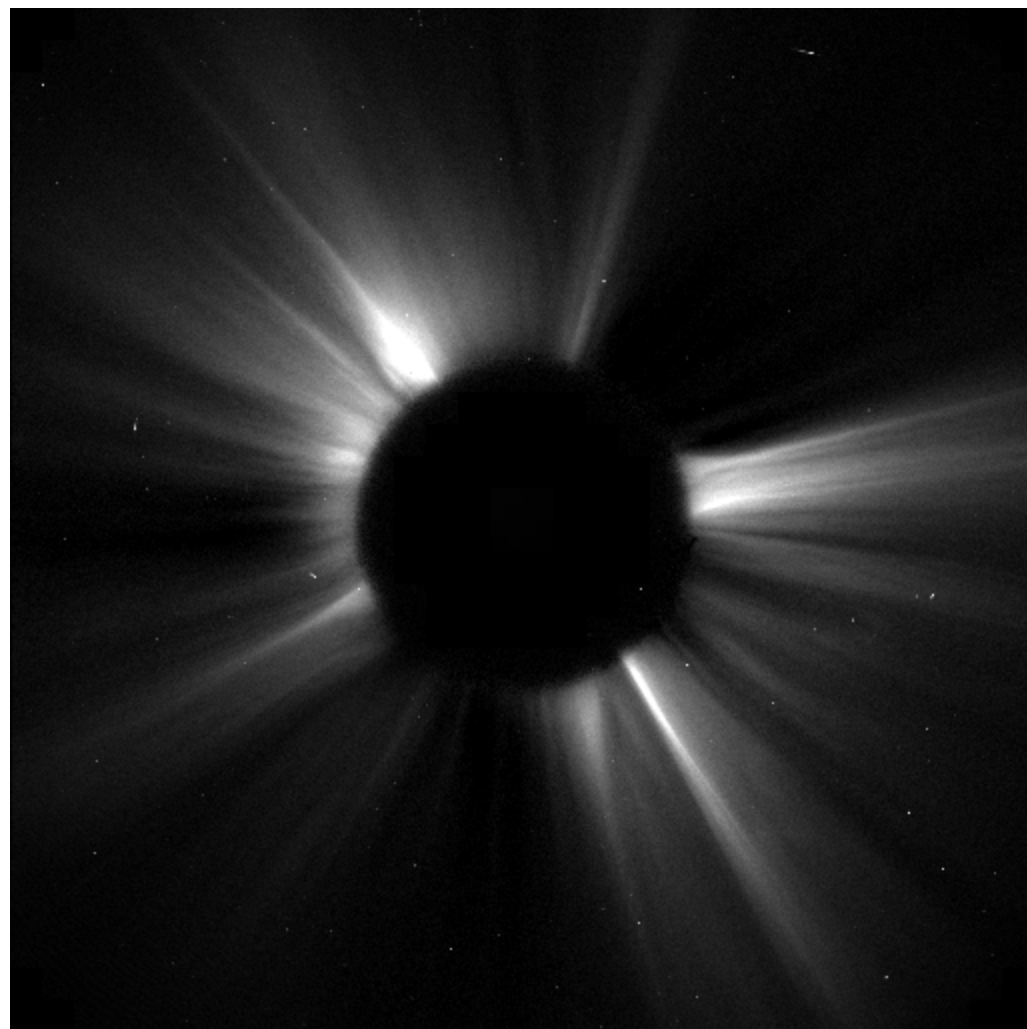
My backgrounds (for each filter – 5 BKGs in total):

➔ subtract the bias from each image.

➔ divide by the exposure time.

➔ take the median per day in each pixel,

➔ and then the minimum per month of the daily medians.

Monthly background of July 16, 2002, available on SolarSoftDatabase.
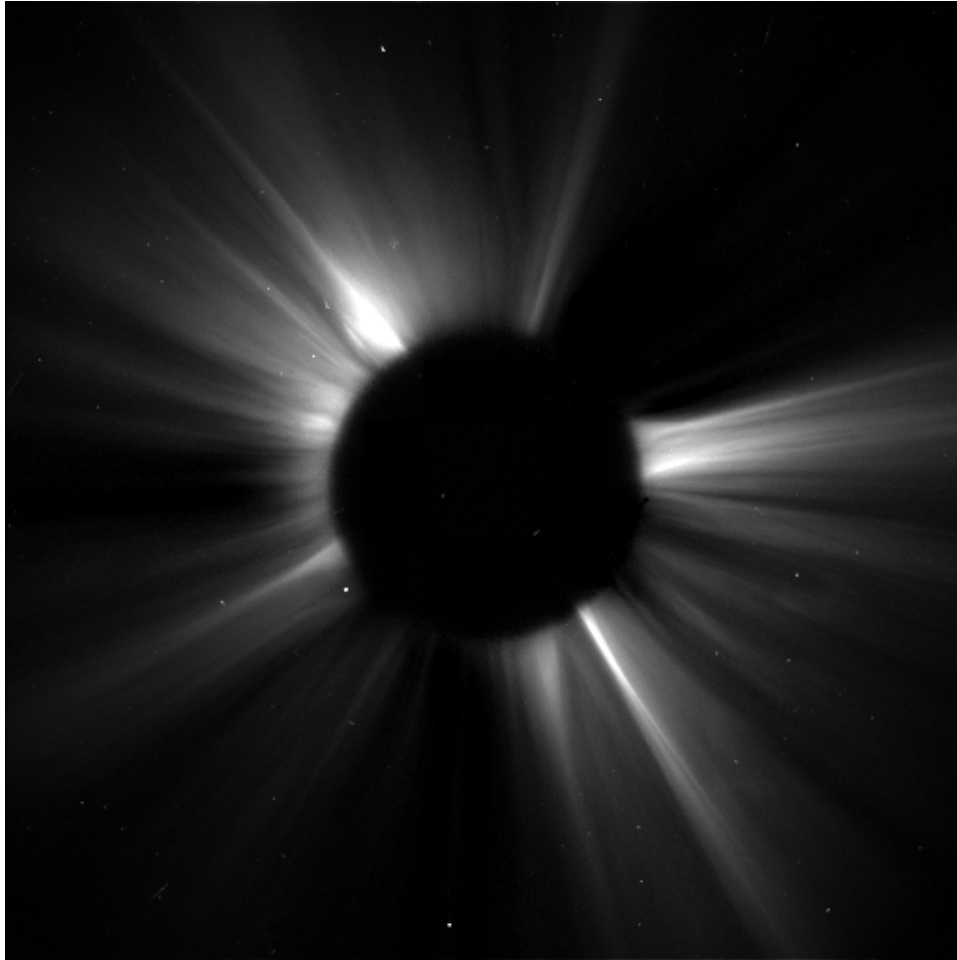
LASCO-C2, July 2002 - images
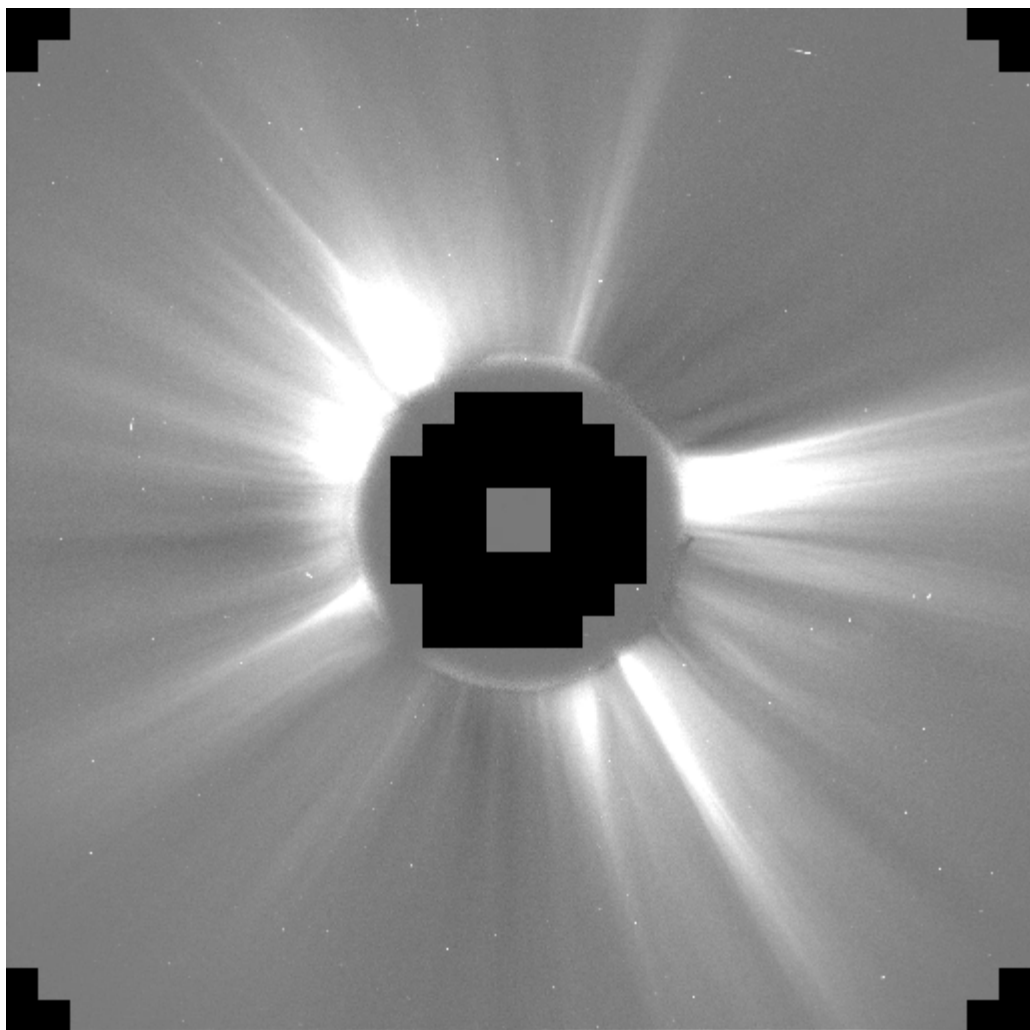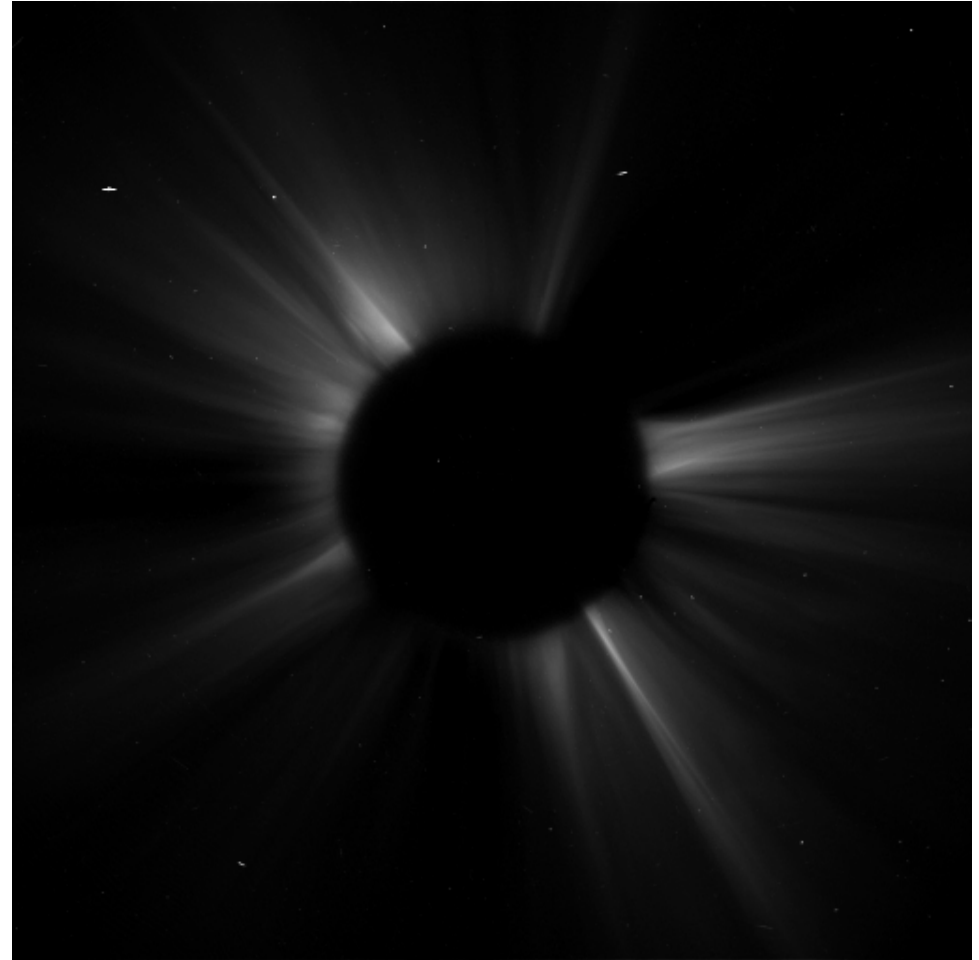

14 July 2002, 00:30 UT.
Normal Seq, Monthly BKG.

14 July 2002, 00:30 UT.
Normal Seq, My BKG.

LASCO-C2, July 2002 - images
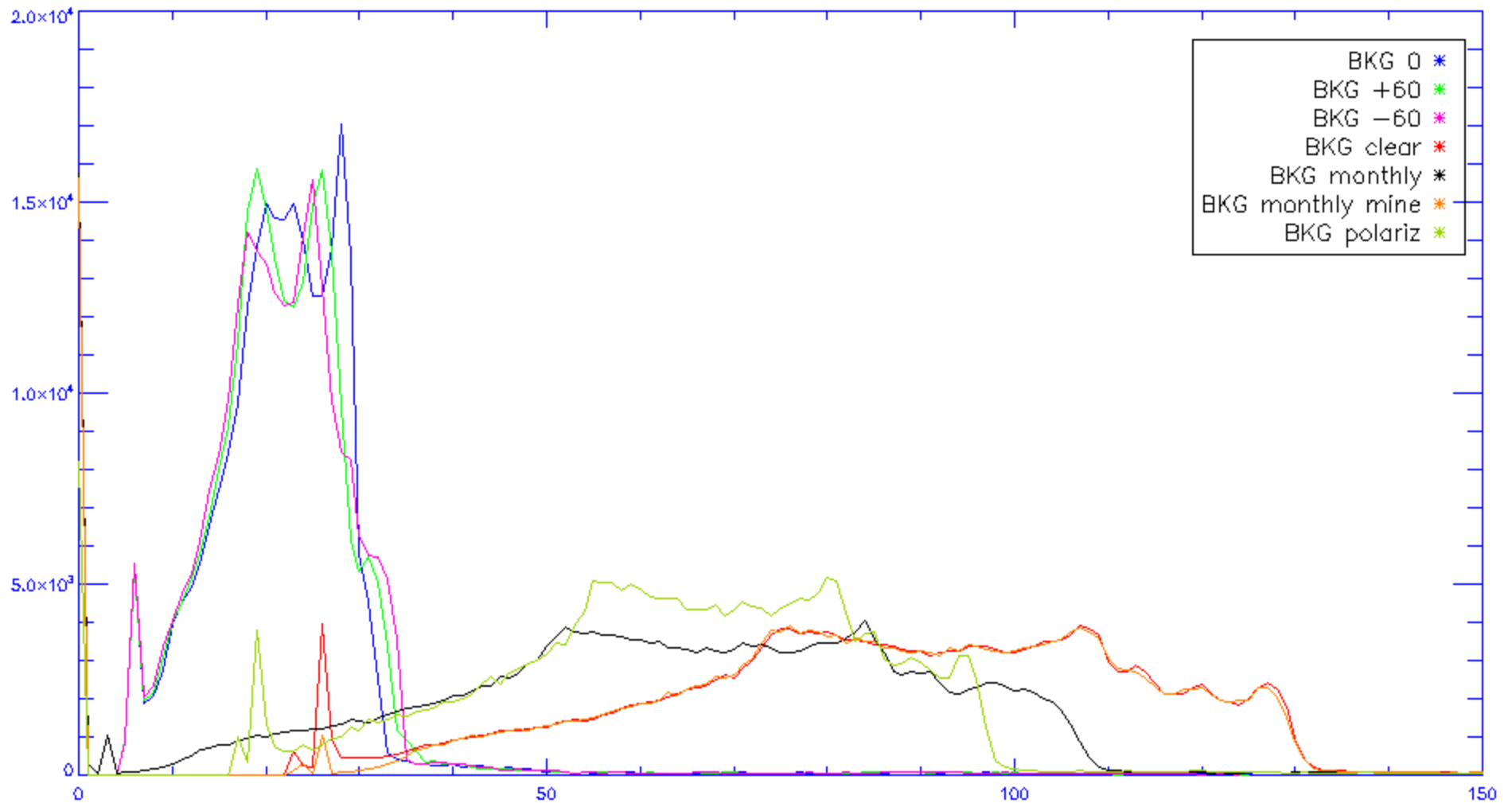
$$TotB = 2/3 * (I_0 + I_{+60} + I_{-60})$$

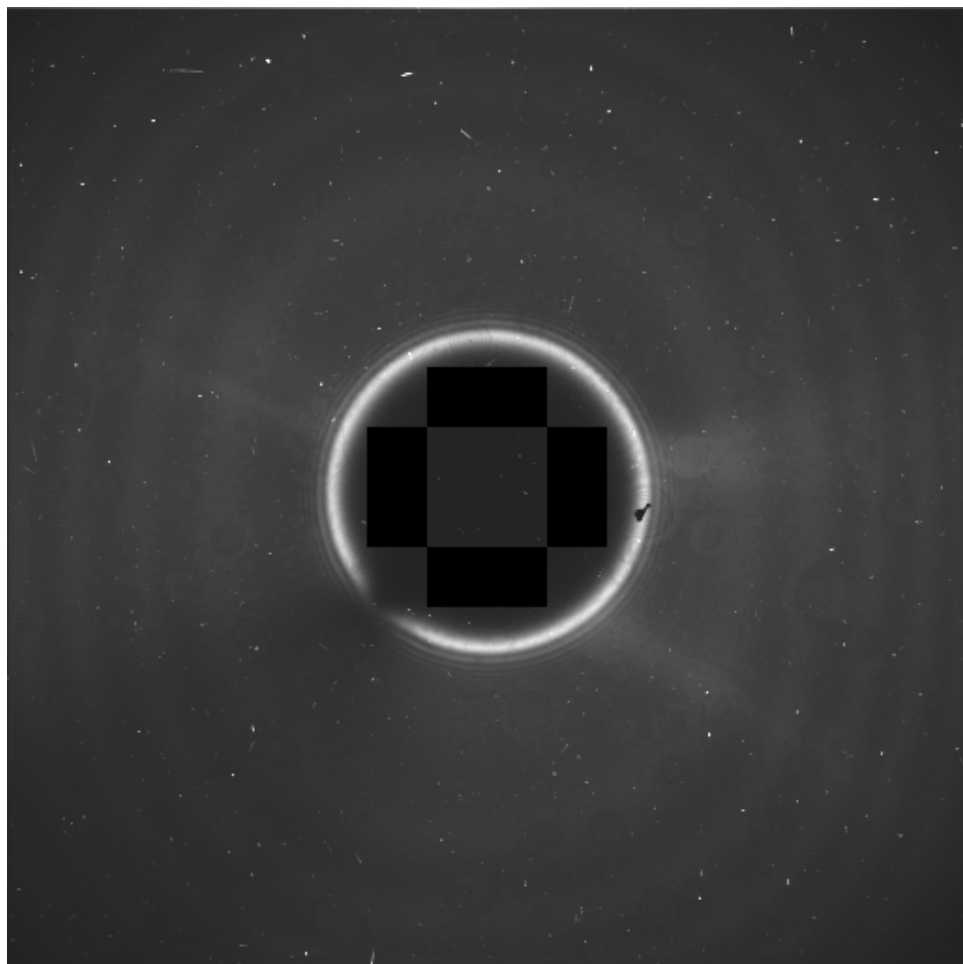14 July 2002, 00:42 UT.
SeqPW Seq, Clear, My BKG.

14 July 2002, 3 polarisers at 0 (00:48 UT), +60 (00:44) and -60 (00:52).
SeqPW Seq, TotB, My BKG.
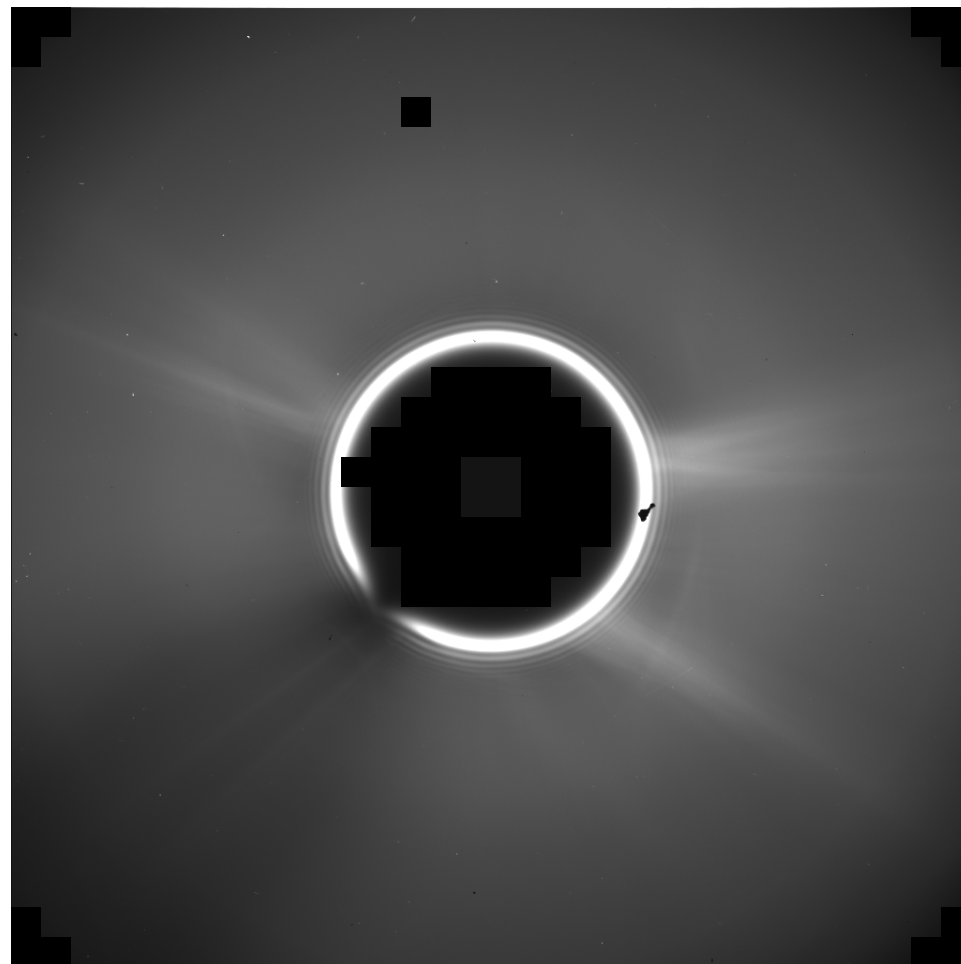
LASCO-C2, July 2002 - backgrounds

Angelos: If the SeqPW is 100s exp, it has 2x times the sensitivity of the normal 25s imag.

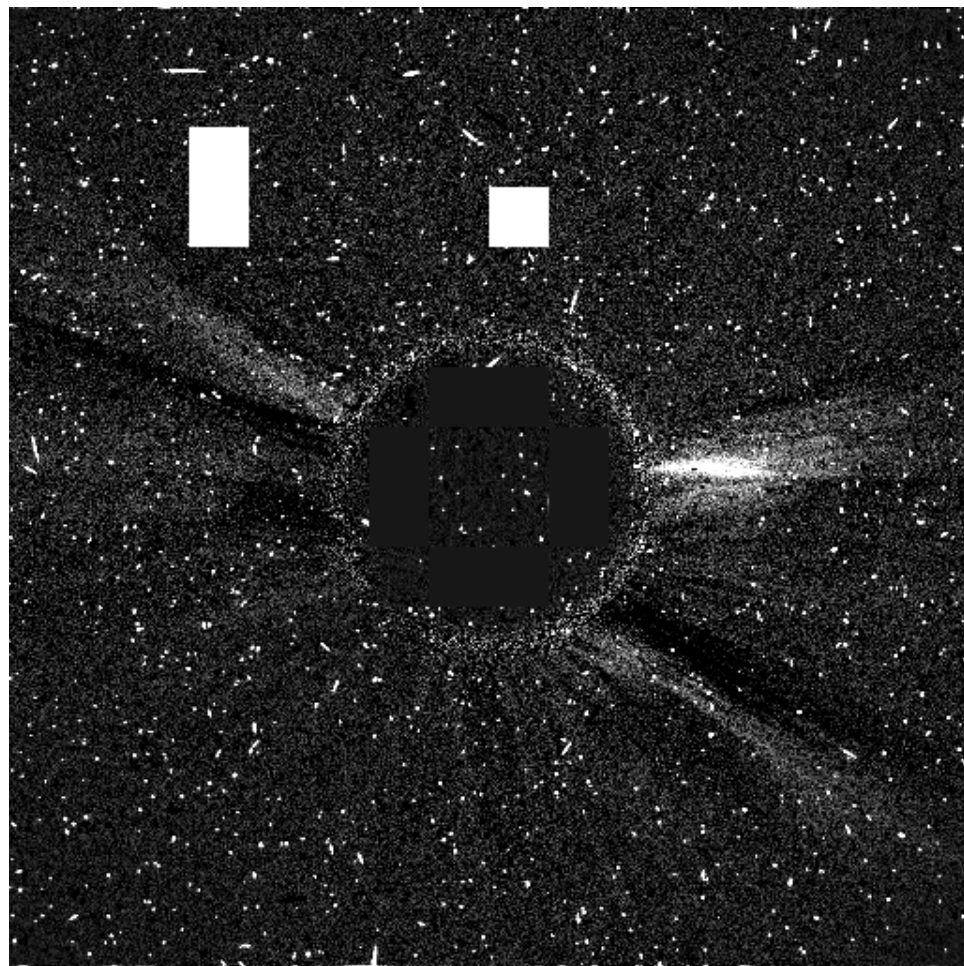# LASCO-C2, Halpha compared with Orange filter

27 April 1998, 02:08 UT,
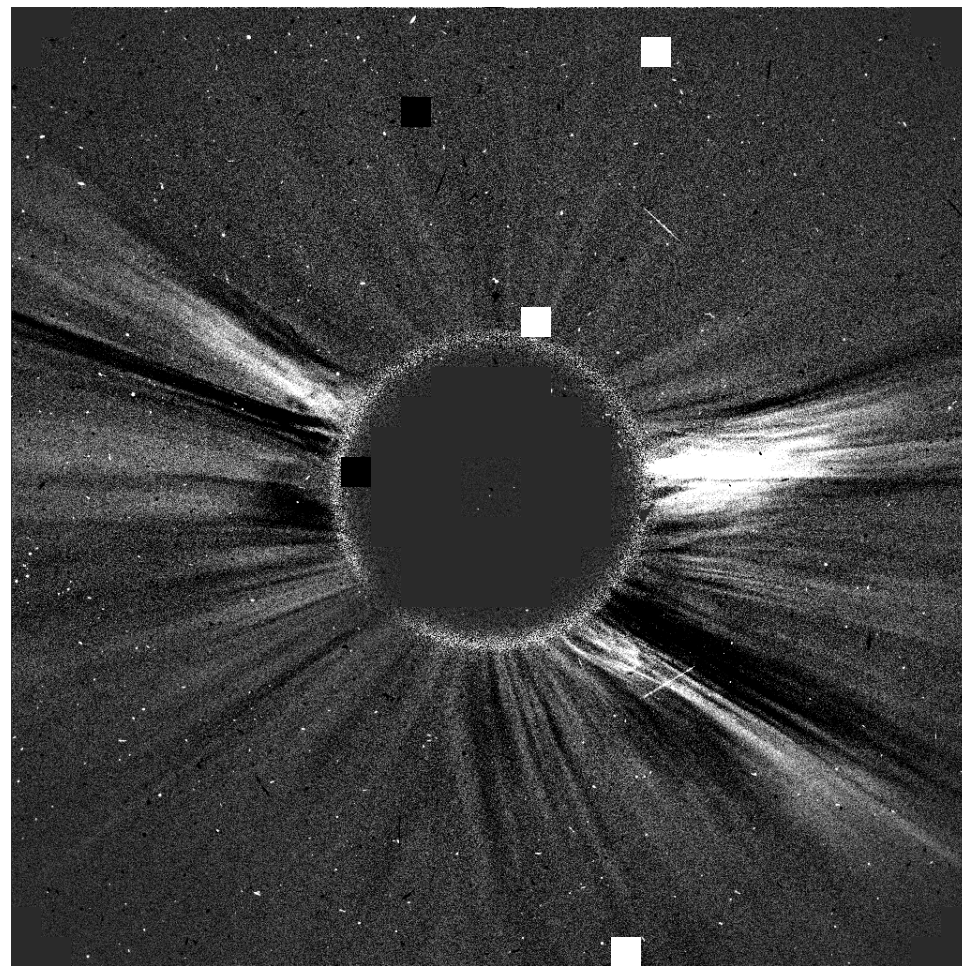Halpha filter.

27 April 1998, 02:02 UT,
Orange filter.

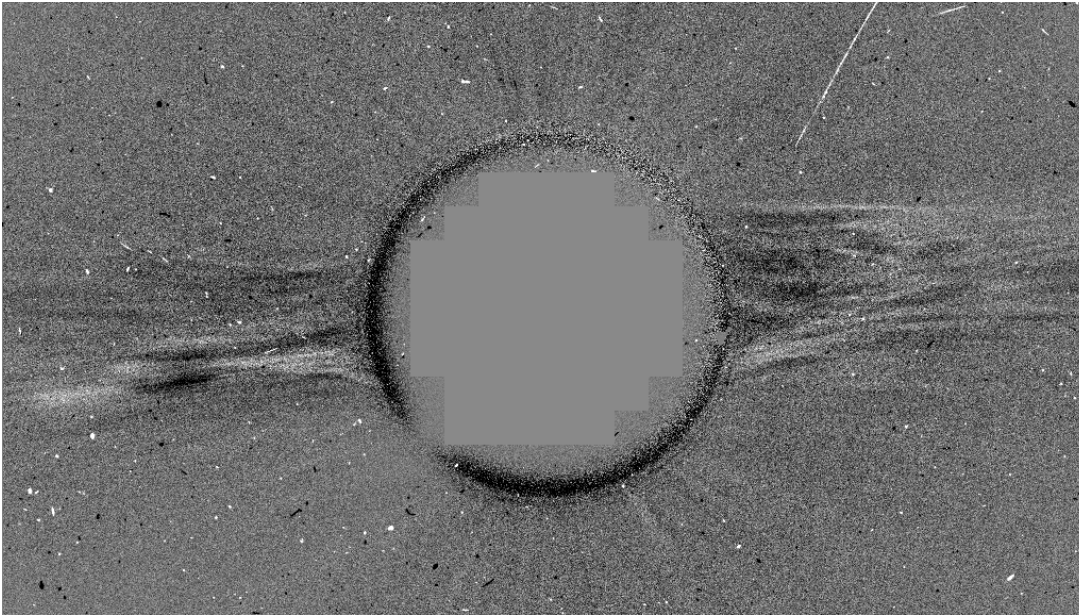# LASCO-C2, Halpha compared with Orange filter

27 April 1998, 02:08 – 00:06 UT,
Halpha filter.

27 April 1998, 02:02 – 00:00 UT,
Orange filter.

LASCO-C2, SN, Orange filter

Average of 3 points,
inside the blob area
(for the BKG: average of a
box 21 x 21 pixels):

I_{blob} = 1.31
$I_{streamer}$ = 14.67
I_{blob} / I_{bkg} = 7.98
I_{blob} / $I_{streamer}$ = 0.09
I_{bkg} / $I_{streamer}$ = 0.01

For blob: 24 May 1996, 08:14 – 07:16 UT,
For BKG: 24 May 1996, 04:24 – 03:59 UT
For streamer: 24 May 1996, 04:24 – Monthly minimum BKG.

EXTRA SLIDES

The solar corona

The solar corona is optically thin: what we usually observe in coronagraph images is integration along the line-of-sight (LOS).
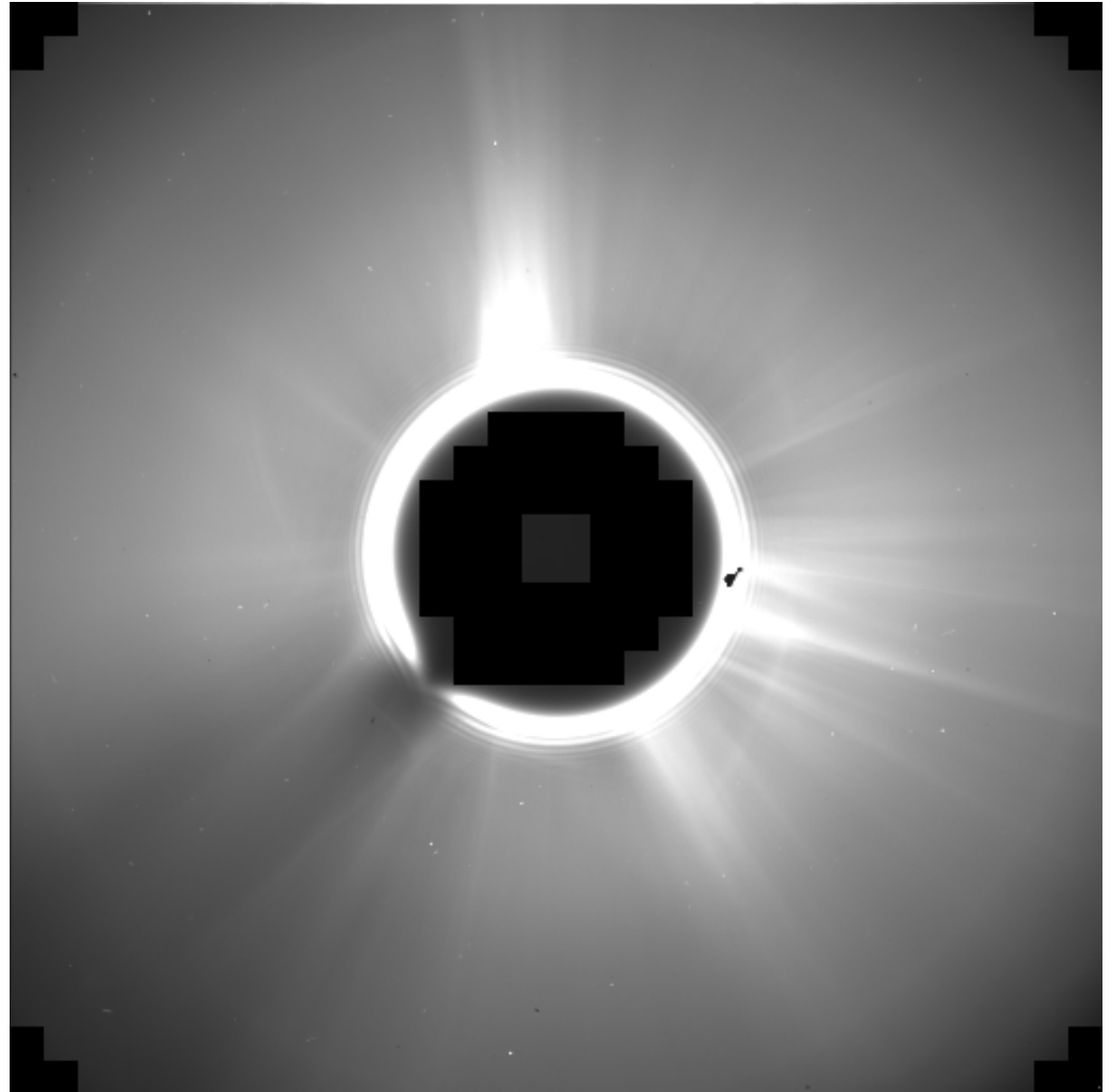
The solar corona components:

➢ K-corona: electron or continuum corona – Thomson scattering

➢ F-corona: Fraunhofer or dust corona – scattering of the light on the dust particles (contains Fraunhofer absorption lines)

➢ E-corona: emission corona – emission of highly ionized atoms (and sometimes also H alpha emission)

LASCO raw image

One raw white-light coronagraph image contains:

- The dark current
- The bias
- The stray-light
- The K-corona
- The F-corona
- Emission corona
- Cosmic rays…

LASCO-C2 raw image

BKG – no division by 4

Legend:
- BKG 0 ✳ (blue)
- BKG +60 ✳ (green)
- BKG −60 ✳ (magenta)
- BKG clear ✳ (red)
- BKG monthly ✳ (black)
- BKG monthly mine ✳ (orange)
- BKG polariz ✳ (light green)