Data Archive Project of 44-year Full Disk CaII K Images
- Status Report -

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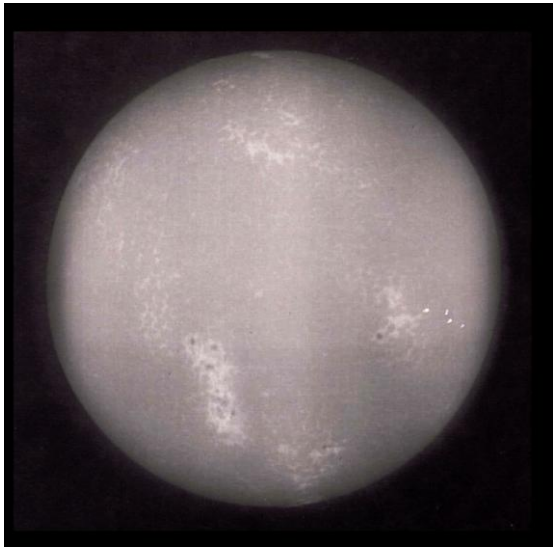
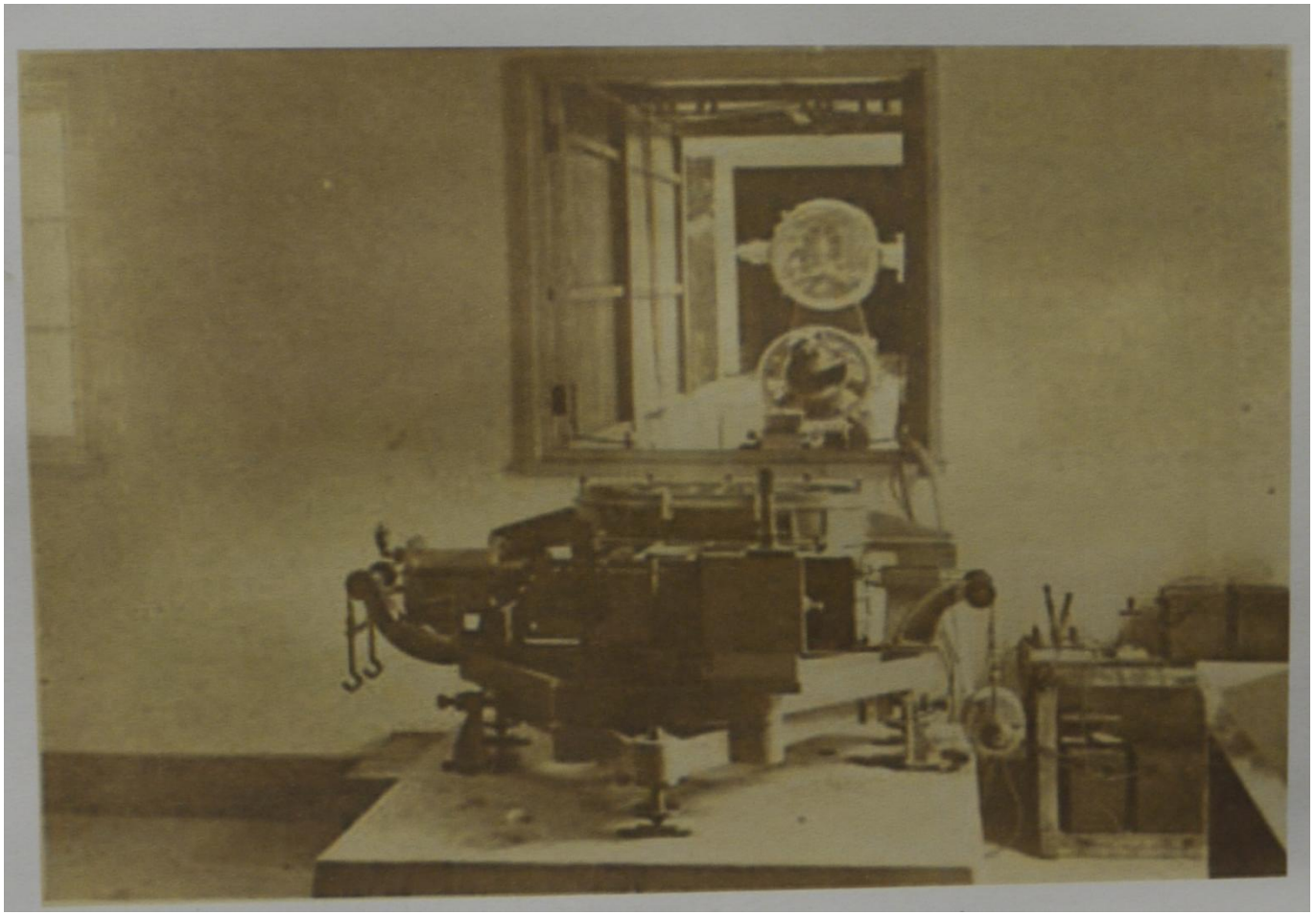


INTRODUCTION

Spectroheliographic Observation at Kwasan Observatory around 1930's



Grubb
D 42cm
Coelostat

Imaging Mirror (backside)

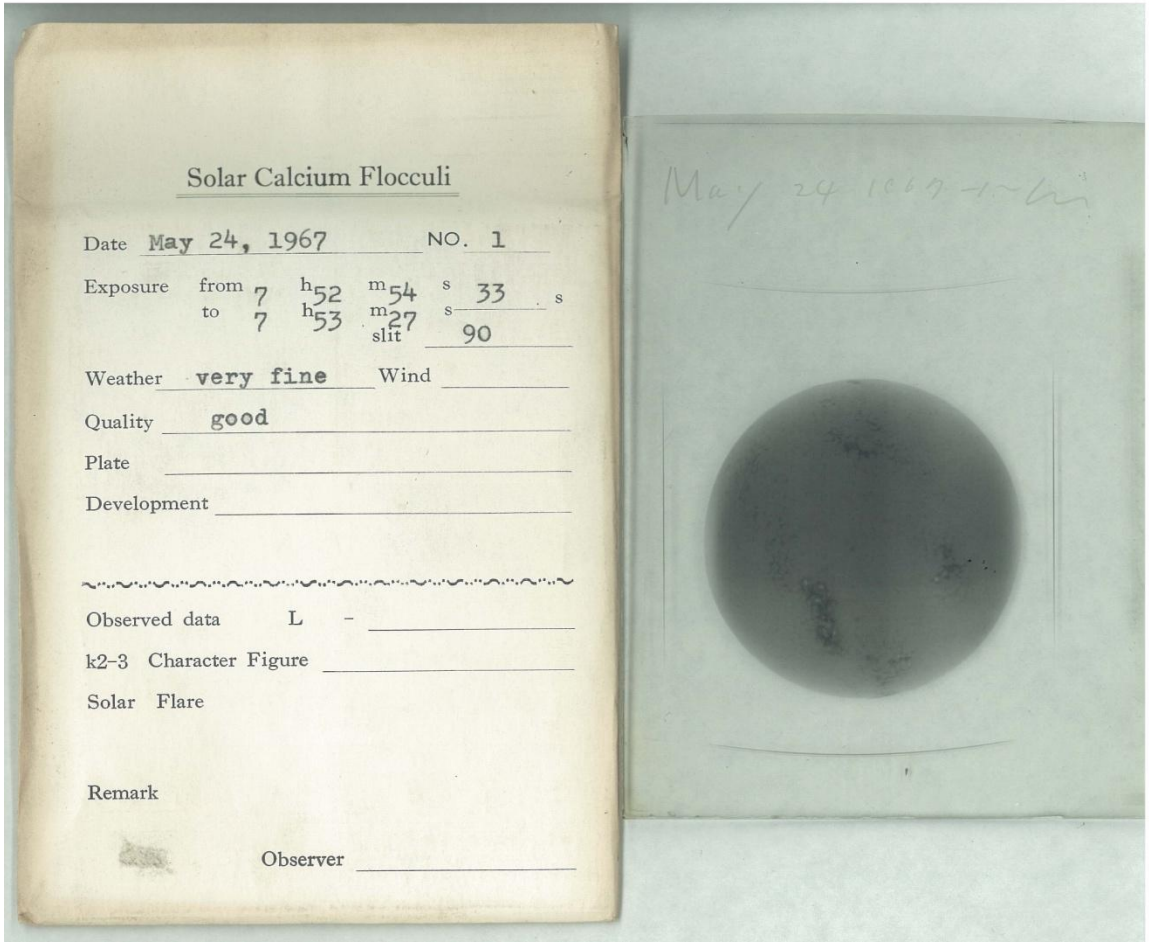
Steinheil
D 20cm
F 5m

Solar Diameter 50mm

History of 44 year continuous observation

- 1926
  - Installation of ASKANIA Spectroheliograph
  - Start of Solar full-disk observation in CaII K line
  - Siderostat telescope
- 1929
  - Movement of the device to Kwasan Observatory
  - Continuation of the observation
  - 30cm Ceolostat telescope
- 1941
  - Movement of the device to Ikoma Observatory
- 1969
  - Observation project ended

Photographic Plate



Solar Calcium Flocculi

Date May 24, 1967 NO. 1

Exposure from 7 h 52 m 54 s 33 s
to 7 h 53 m 27 s
slit 90

Weather very fine Wind

Quality good

Plate

Development

Observed data L -

k2-3 Character Figure

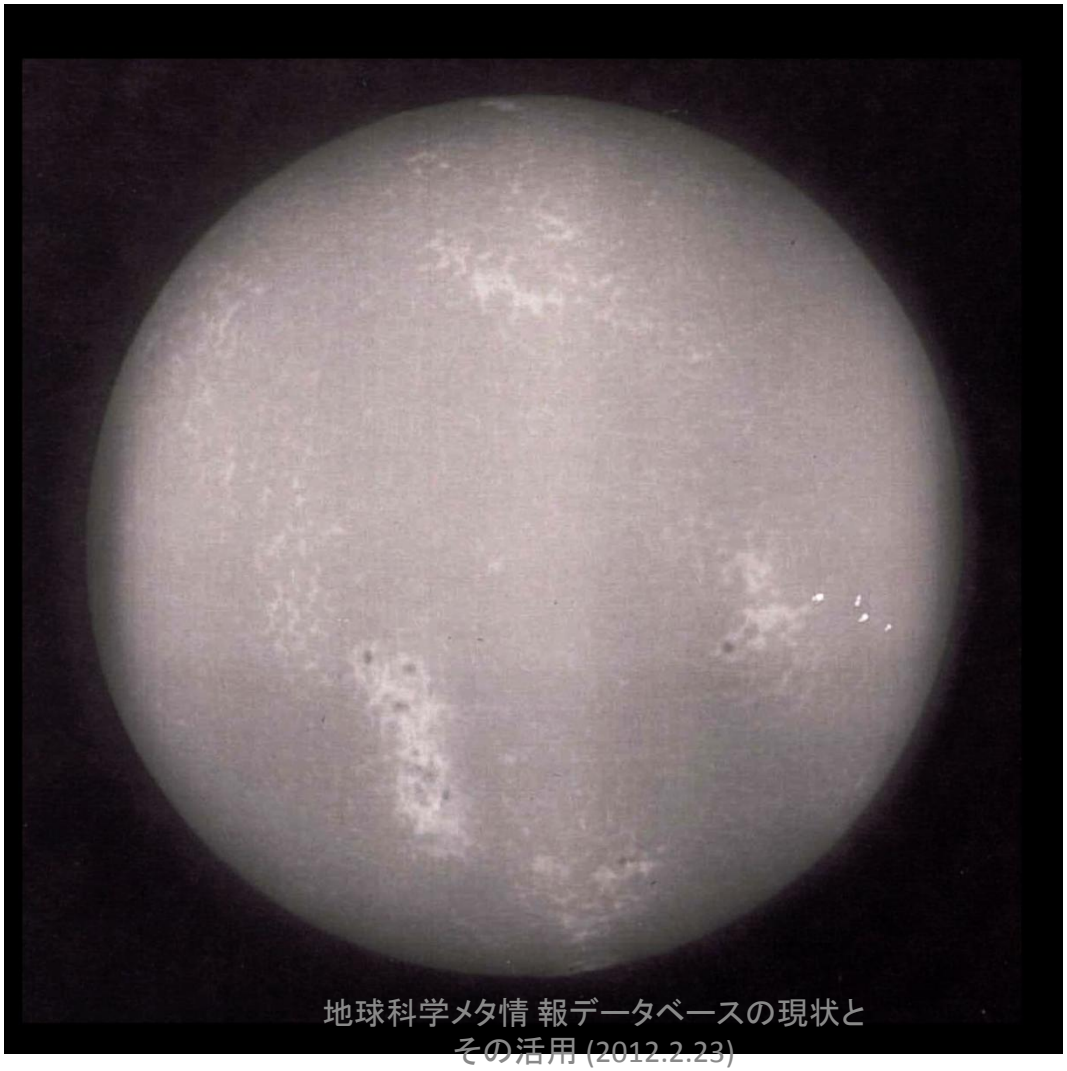
Solar Flare

Remark

Observer

May 24 1967

Solar Chromosphere in CaIIK
1967 May 24

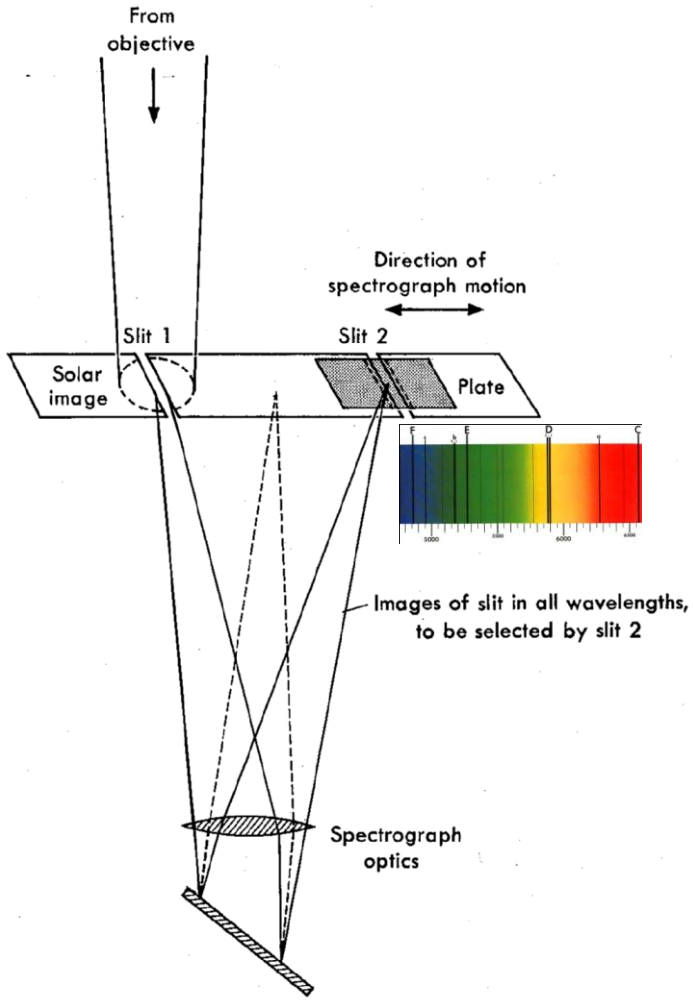


SPECTROHELIOGRAPH

Spectroheliograph(Single Image)

- Monochromatic solar image

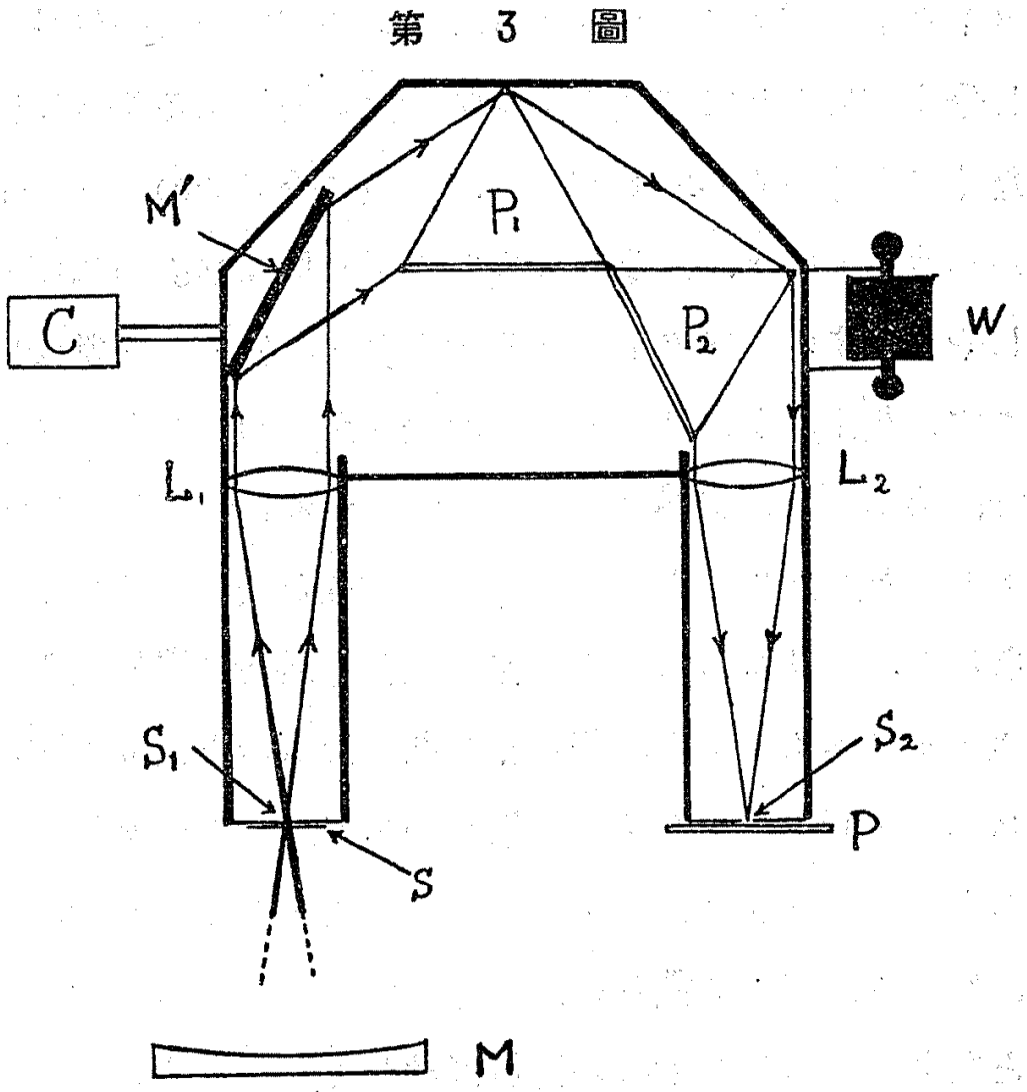
- Solar image fixed
- Slit1 and Slit2 move with dispersing unit
- Plate(camera）fixed



Askania Spectroheliograph

- K. Araki (1937)
- Tenkai Vol. 197,P401

- 荒木九皐（昭和12年）
- 天界197号、401頁
- 分光太陽写真儀と分光太陽鏡

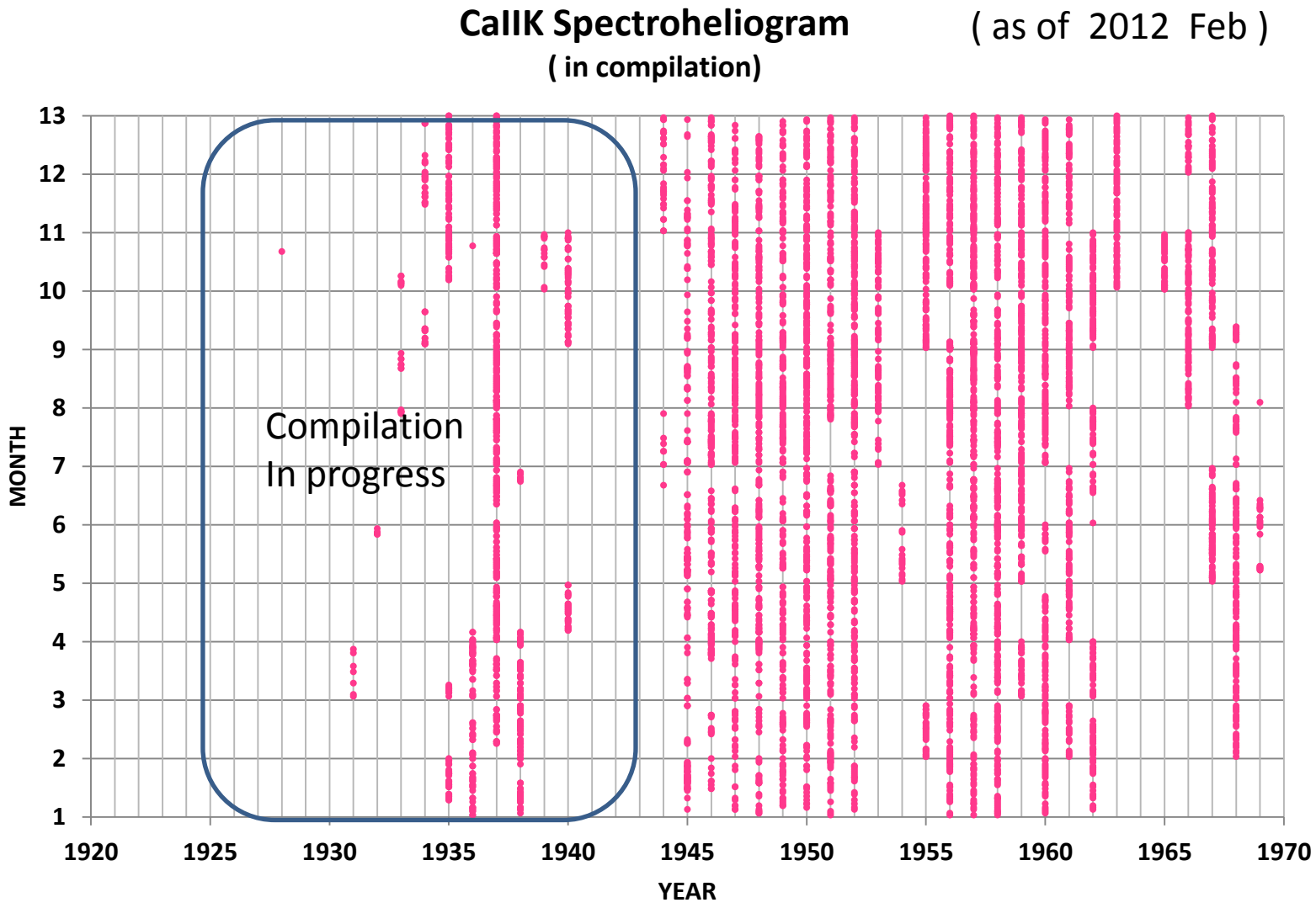


Present status in Kwasan History museum

Front view

Double prism disperser

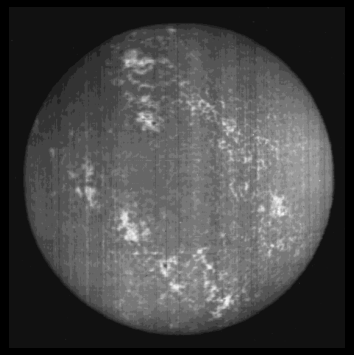
IMAGE DATA ARCHIVING


CaIIK Spectroheliogram
(in compilation)
(as of 2012 Feb)
Compilation
In progress
MONTH
YEAR
1
2
3
4
5
6
7
8
9
10
11
12
13
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970

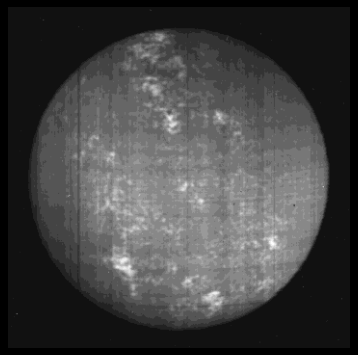
Digital Scan of CaII K Spectroheliogram

Since Jan 23, 2012

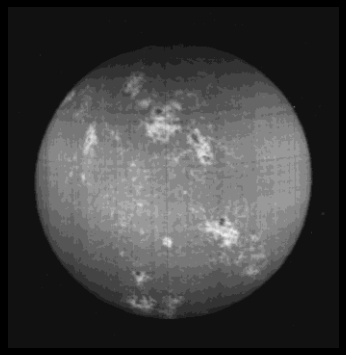
CaII K Monthly Variation in 1958



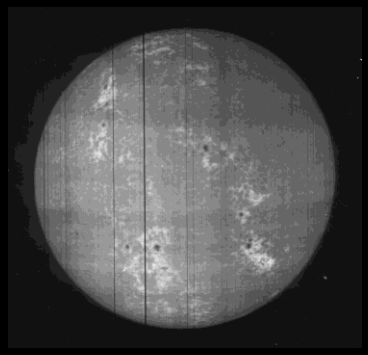
Jan.30



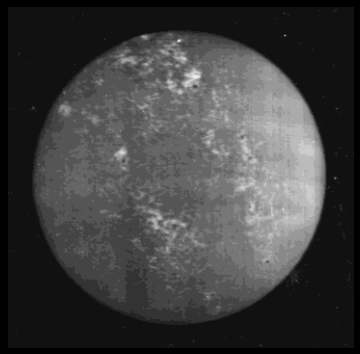
Feb.27



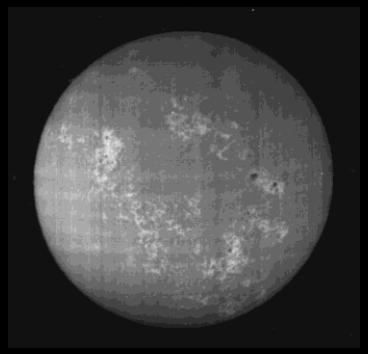
Mar.31



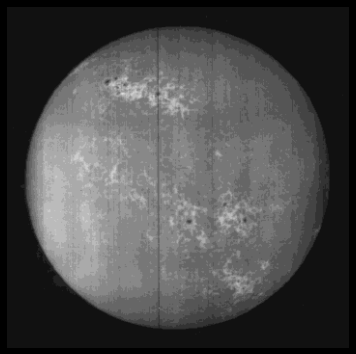
Apr.30



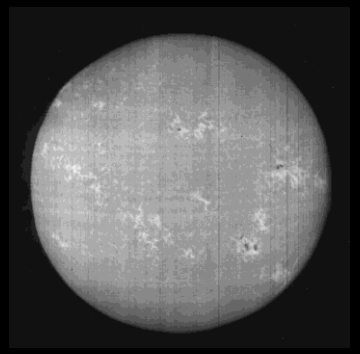
May .31



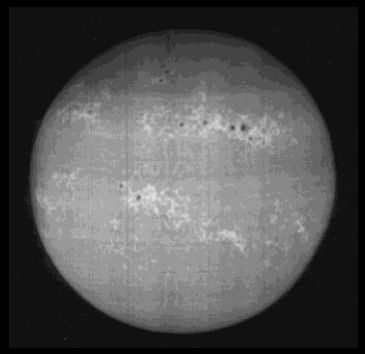
Jun.27



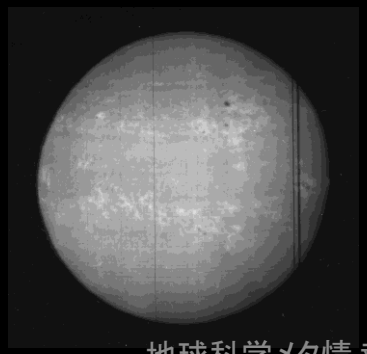
Jul.29



Aug.19

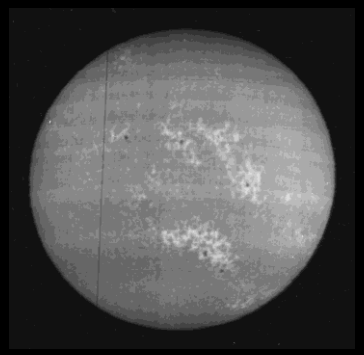


Sep .18



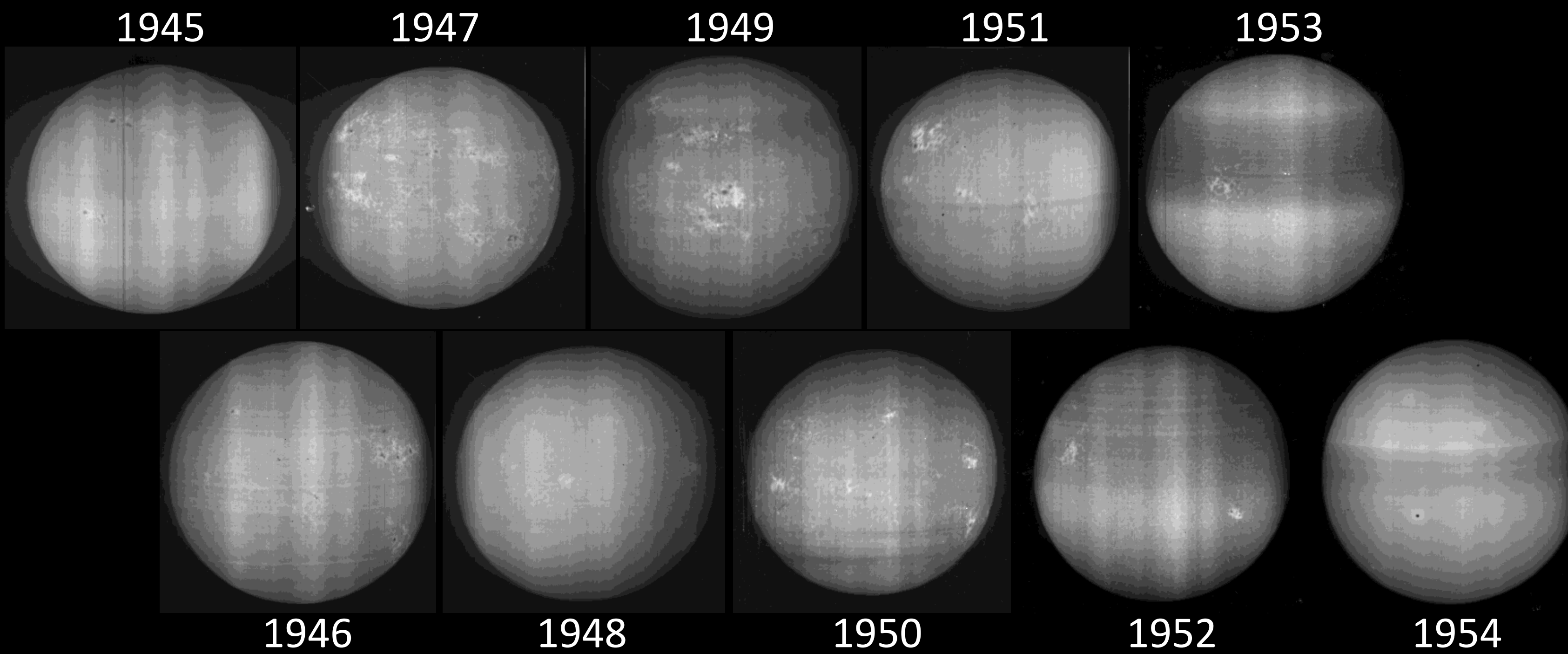
Oct.16

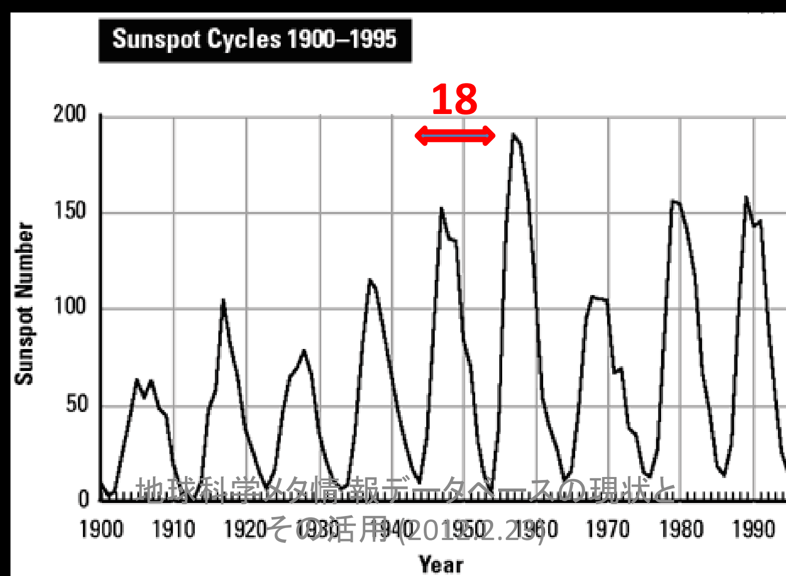
Nov.29



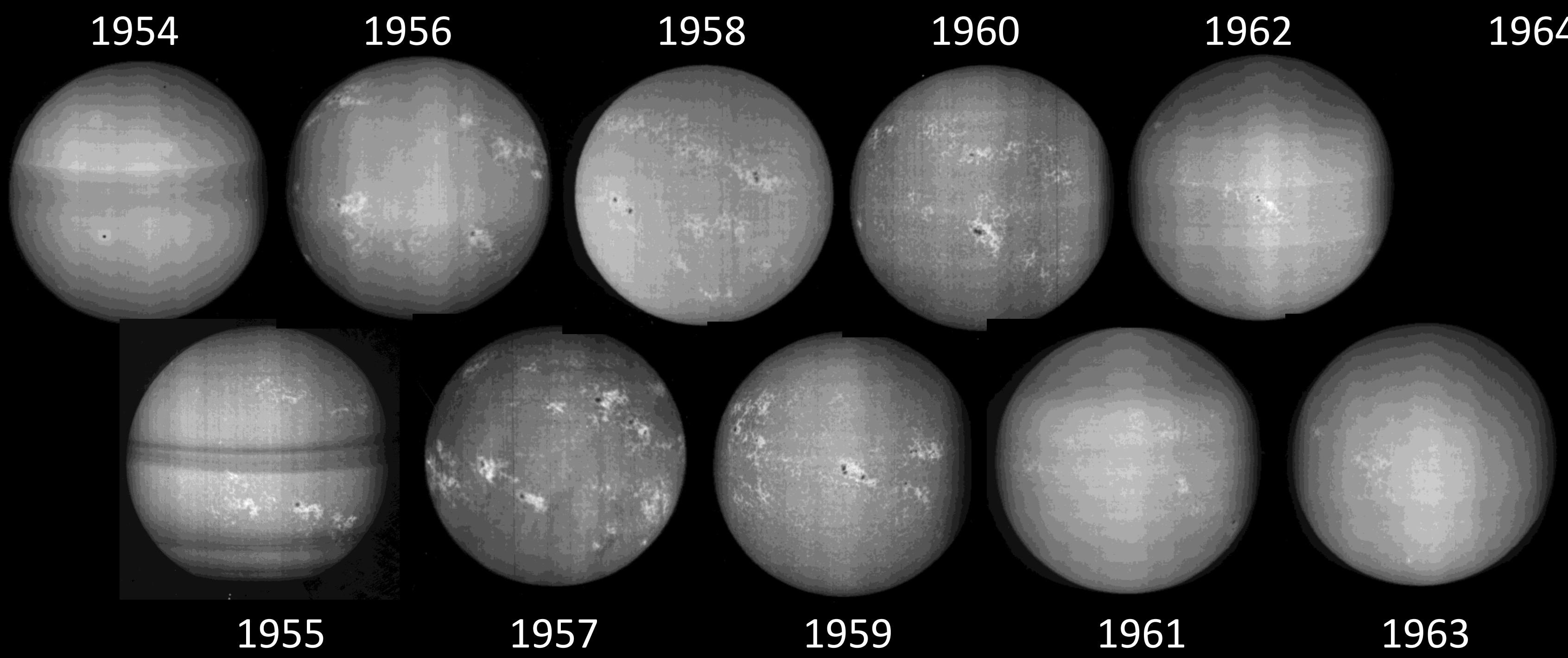
Dec.30

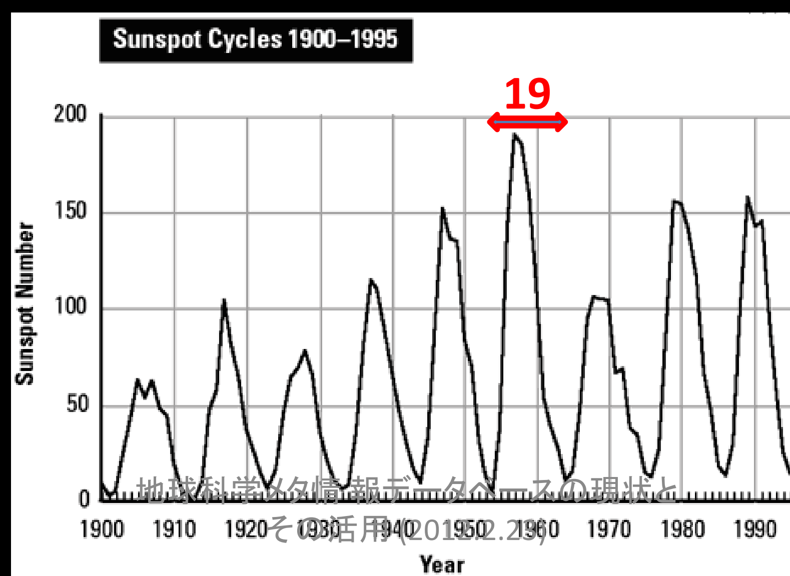
Yearly Variation of CaII K in Cycle 18



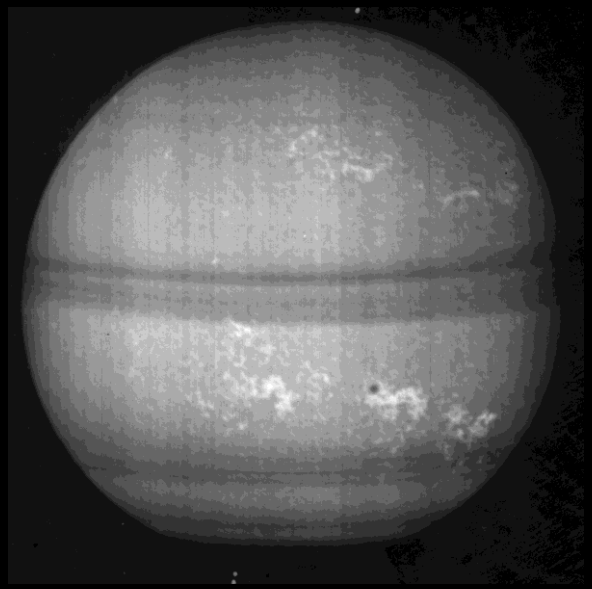


Yearly Variation of CaII K in Cycle 19





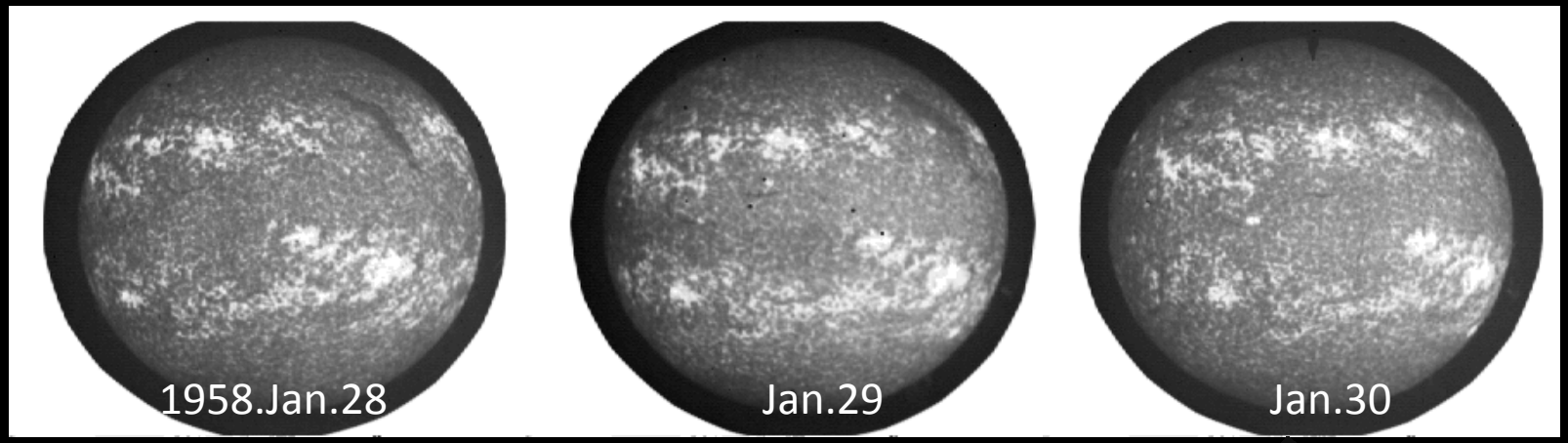
To be fixed



- Orientation of the image
  - Celestial NS EW
  - Inclination of solar rotation axis
- Flat fielding
  - Curved band undulation
    - Irregular sliding motion of the spectrograph
    - Passing clouds
  - Thin straight lines : Dusts on the entrance slit
- Intensity calibration

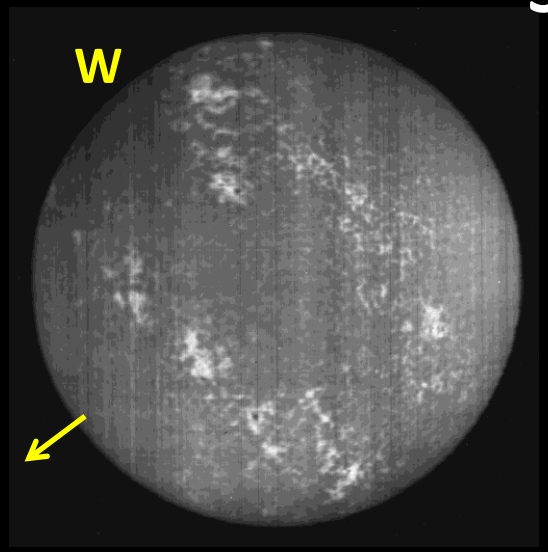
Orientation

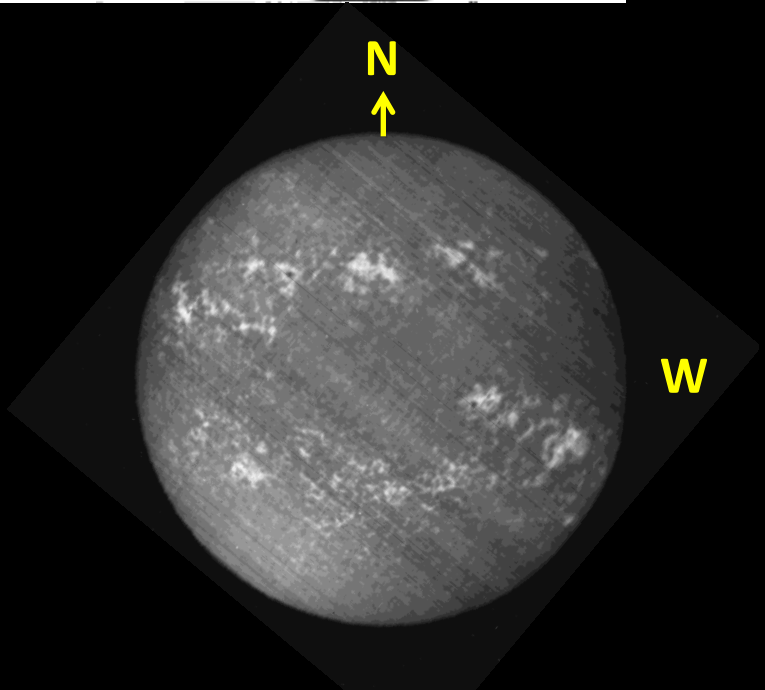
Mt. Wilson



Ikoma
1958.Jan.30

P=-11.4





Levels of image files

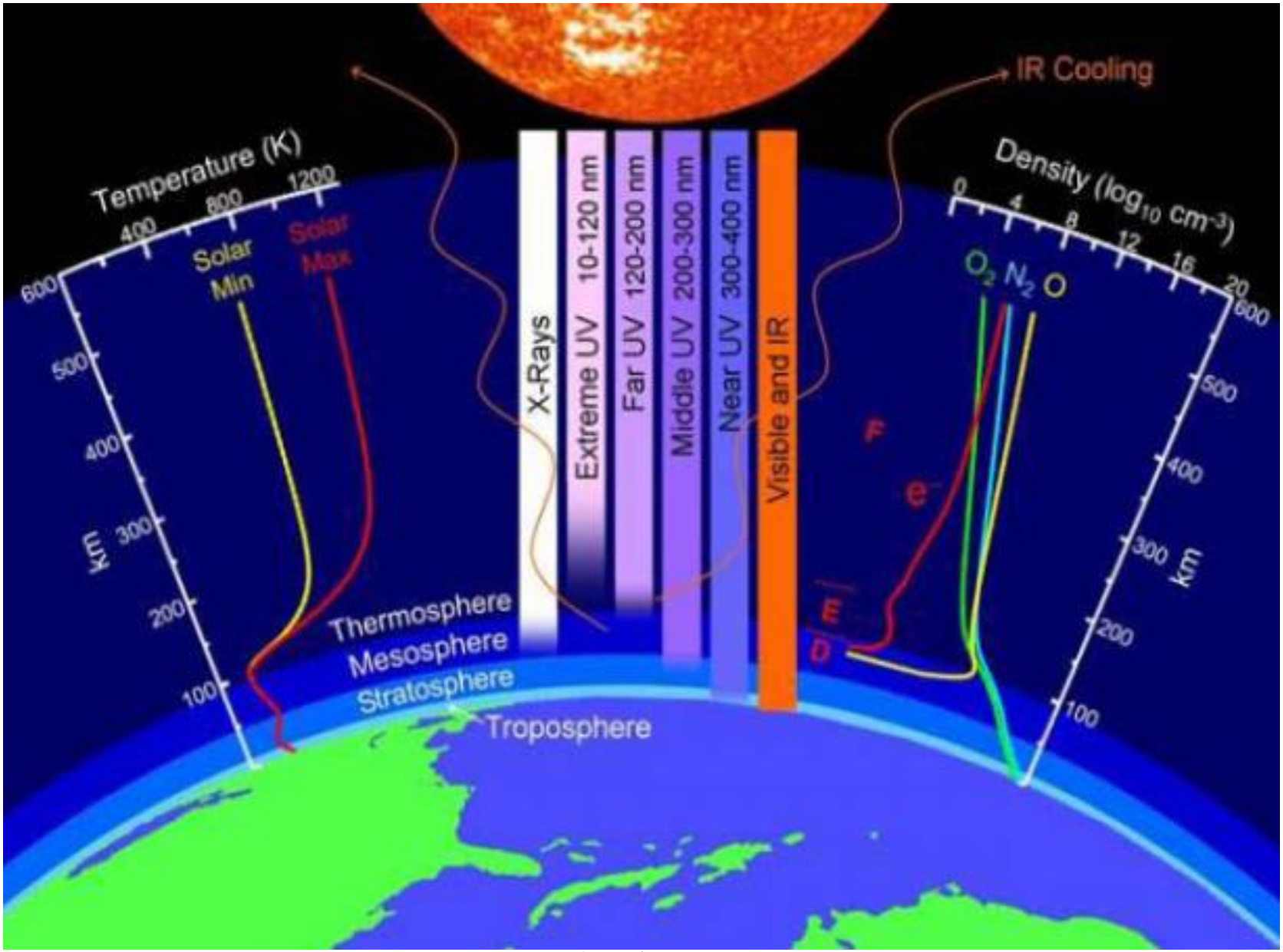
- Level0
  - Original images as are scanned and co-alligned
- Level1
  - Correction of Orientation applied
- Level2
  - Flat fielding applied

SCIENTIFIC ANALYSIS PLAN OF ARCHIVE DATA

Heating of upper terrestrial atmosphere

- Open the image database through IUGONET (Inter-university Upper atmosphere Global Observation NETwork)

- CaII K Flux (Plage area) as a proxy index of UV irradiation to the Earth
  - UV irradiation as a heating source of upper terrestrial atmosphere



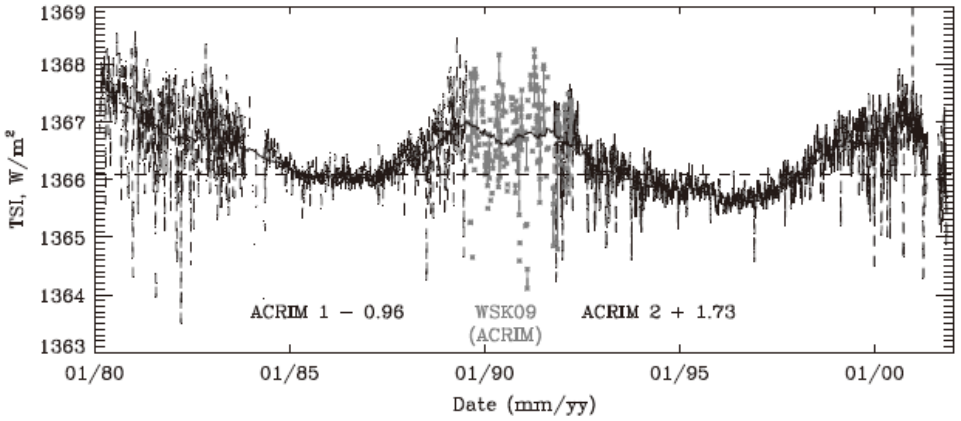
地球科学メタ情 報データベースの現状と
その活用 (2012.2.23)

Model and Observation

TSI variation : 0.2 %

in phase with the cycle

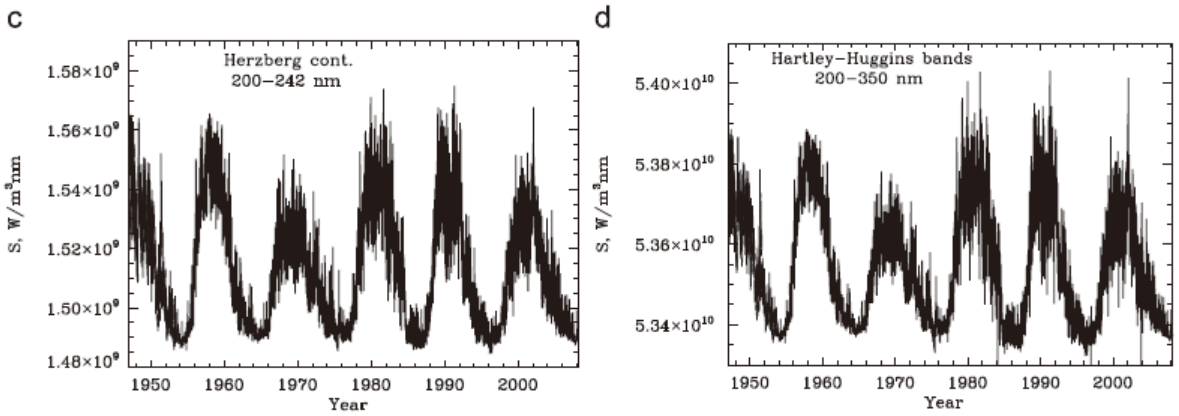
- TSI



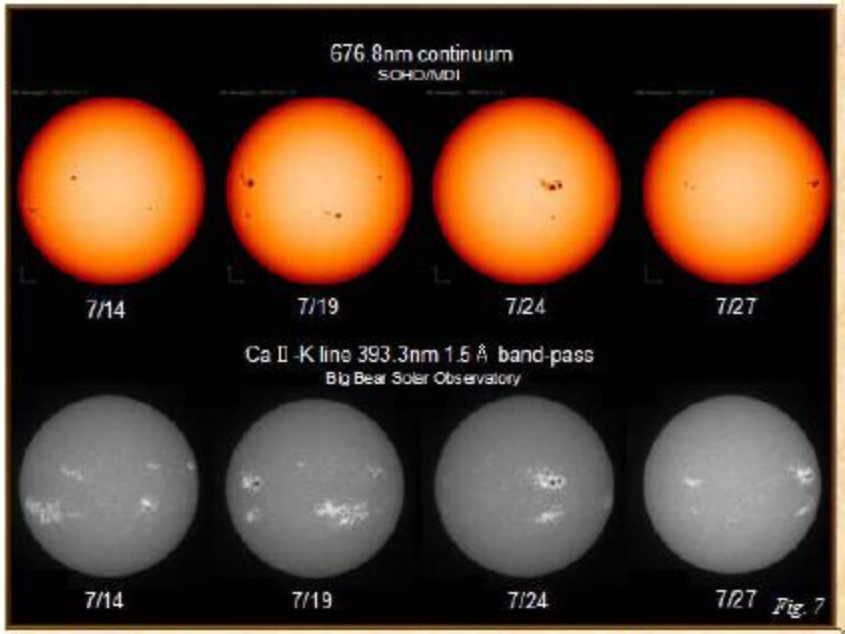
- UV spectral irradiance

UV variation : 5-10 %

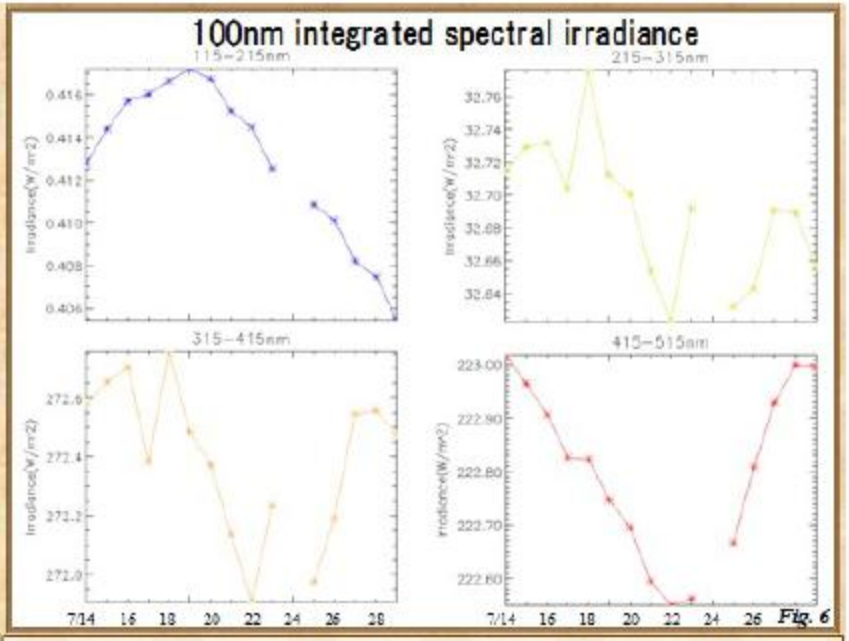
in phase with the cycle



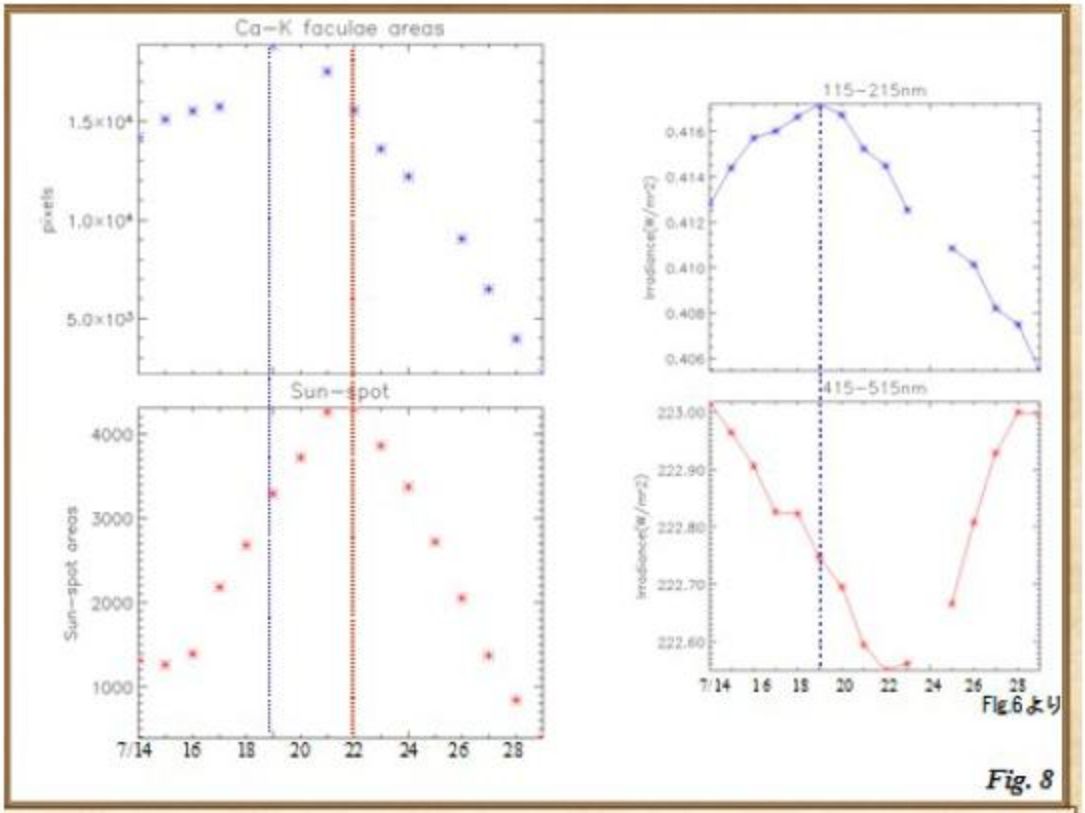
Solar UV irradiation and the solar chromosphric brightness
(M. Yokoyama, S. Masuda and J. Sato, 2005)



(top panel) : Sunspots observed with SOHO/MDI in the solar disc on 14, 19, 24 and 27 July 2004 respectively. *(bottom panel)* : Faculae area observed by Big Bear Solar Observatory in the solar disc on 14, 19, 24 and July 2004 respectively.



Integrated spectral irradiance variations at 1 AU from 14 July 2004 to 29 July 2004. The top-left panel demonstrates 115-215 nm integrated spectral irradiance variations and the bottom-right panel demonstrates 415-515 nm integrated spectral irradiance variations.

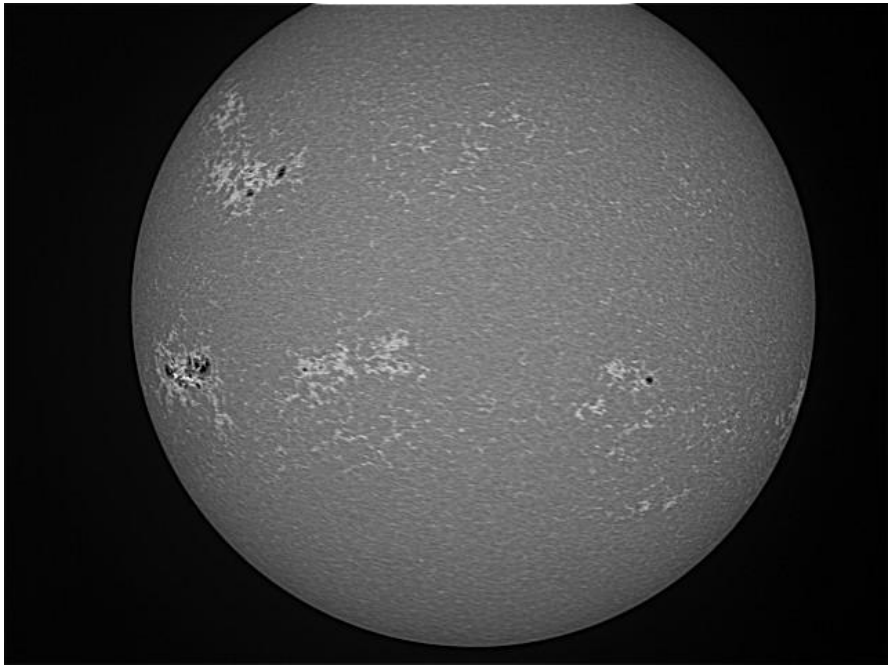


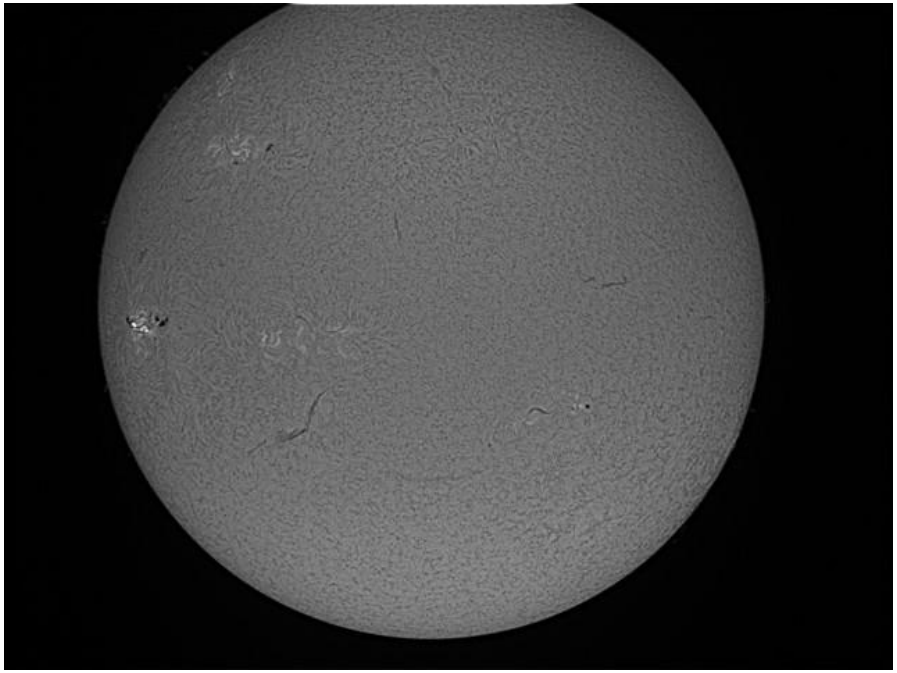
(top-left panel) : Variation of sunspots area observed with SOHO/MDI in the solar disc from 14 July 2004 to 29 July 2004 day by day. *(bottom-left panel)* : Variation of faculae area observed by Big Bear Solar Observatory in the solar disc from 14 July 2004 to 29 July 2004 day by day.

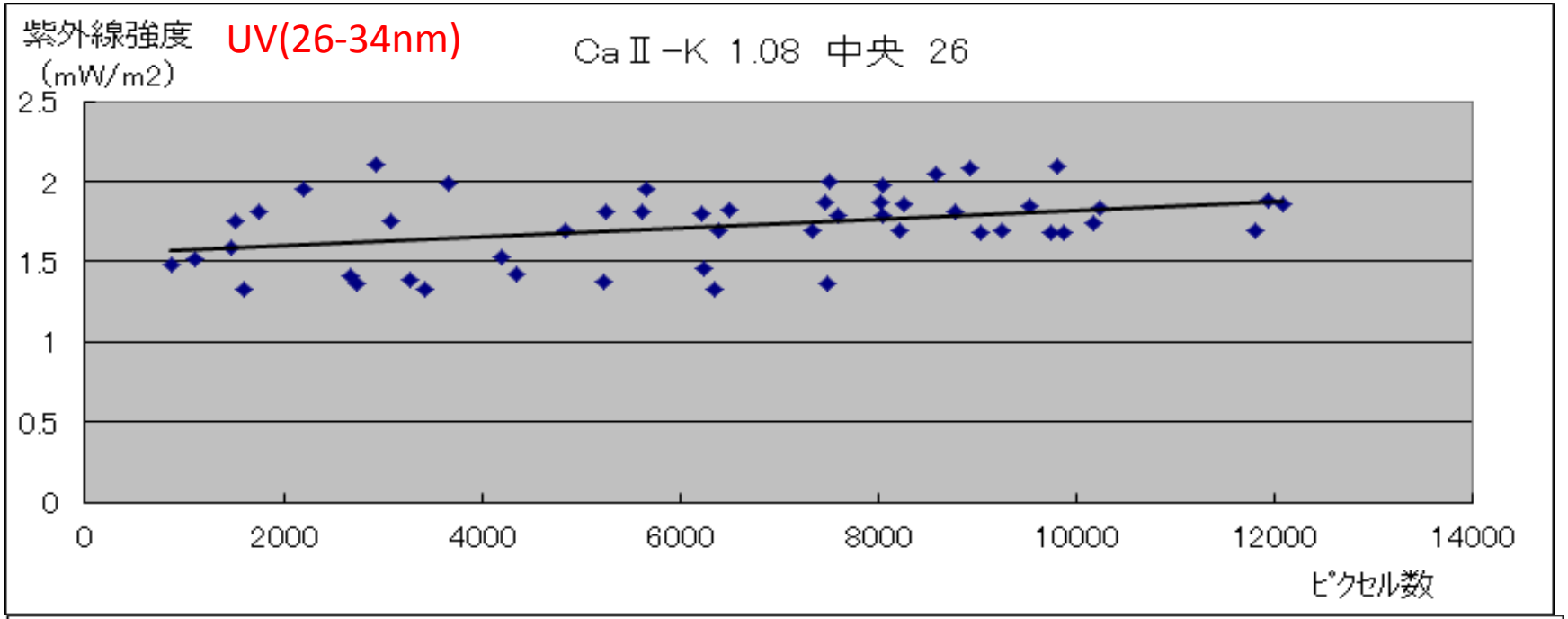
Solar plage area is a good proxy index of the UV irradiation on the upper terrestrial atmosphere .

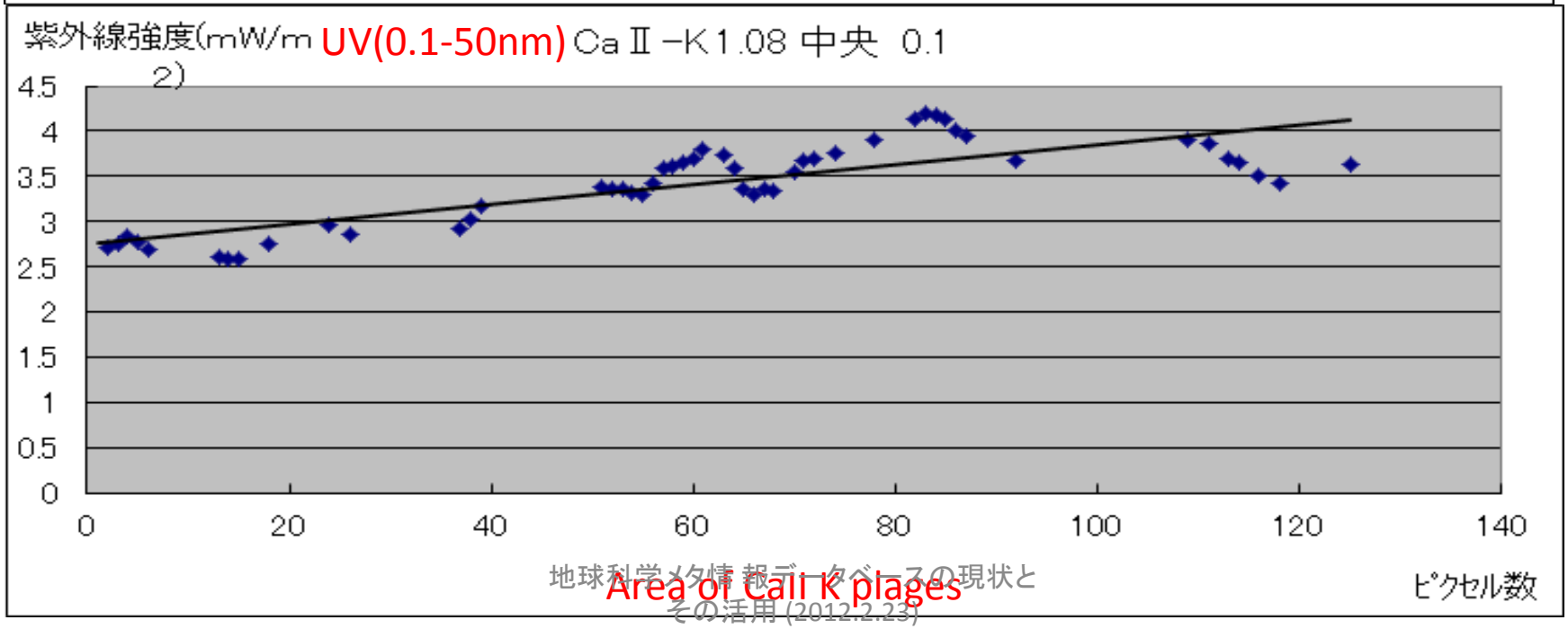
滋賀県立米原高校天文部（SSH）

- Φ60mm
- CaII K 2.6 Å 、Hα　0.75 Å









Area of CaII K plages

I. Ermolli, S.Criscuoli and F. Giorgi

Contri. Astron. Obs. Skalnate Pleso Vol 41, 73-84, (2011)

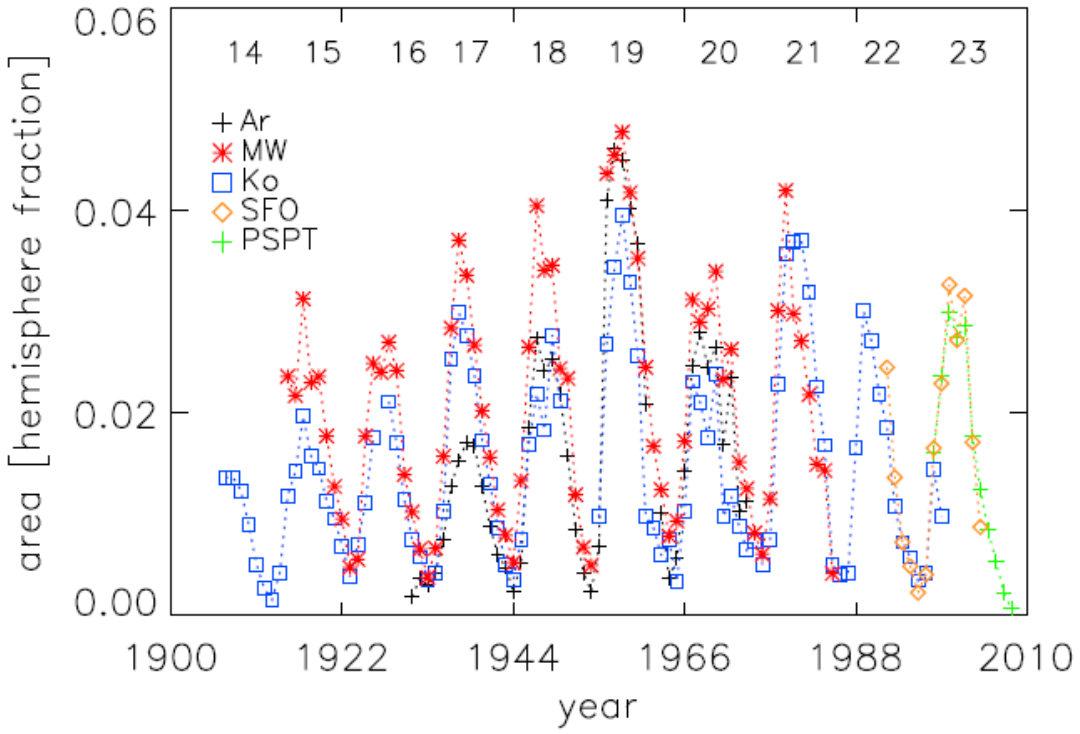
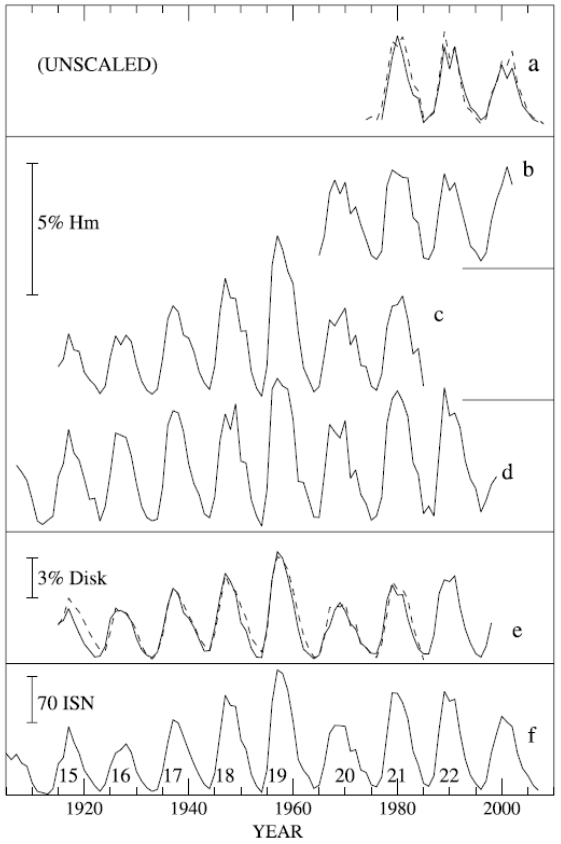


Figure 4. Temporal variation of the annual median values of the plage coverage measured from Arcetri (Ar), Kodaikanal (Ko), and Mt. Wilson (MW) series, as well as those obtained from the analysis of present-day Ca II K observations carried out with the Rome-PSPT (PSPT) and the synoptic telescope of the San Fernando Observatory (SFO). Details for the results derived from historical observations are given in Ermolli *et al.* (2009). Cycle numbers are given at the top of each cycle.

A Century of Solar Ca II Measurements and Their Implication for Solar UV Driving of Climate

(P. Foukal et al. : Solar Phys (2009) 255: 229–238)

Annual mean of CaII K Index and Sunspot number



Sun-as-a-star

SPO

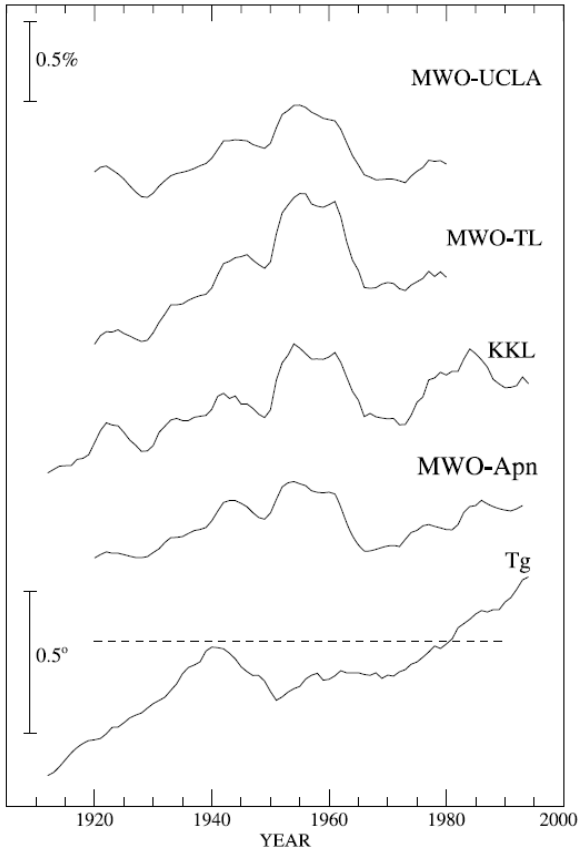
MWO

Kodaikanal

Apn

Sunspot

11-year running mean of CaII K Index



Summary

- We are building an image database of 44-year solar full disk in CaII K line, which will be open via IUGONET system.
- The data archive will serve as a basic data for solar UV irradiance variation, which have a important role in upper atmospheric heating.