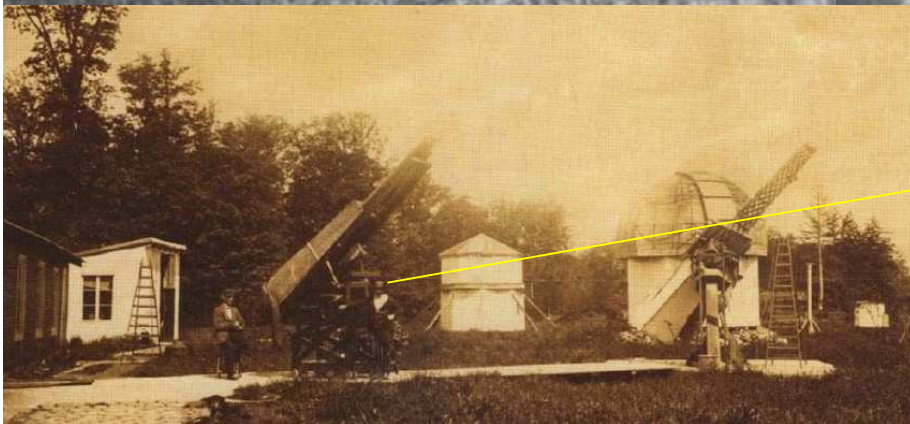
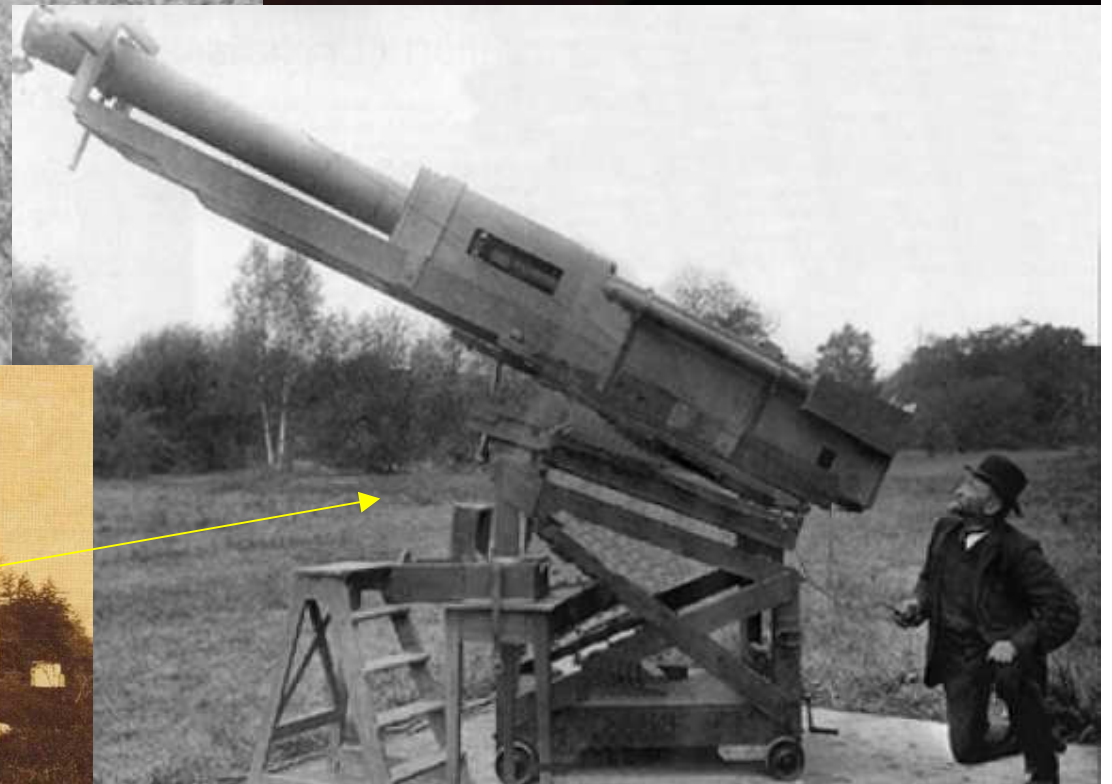
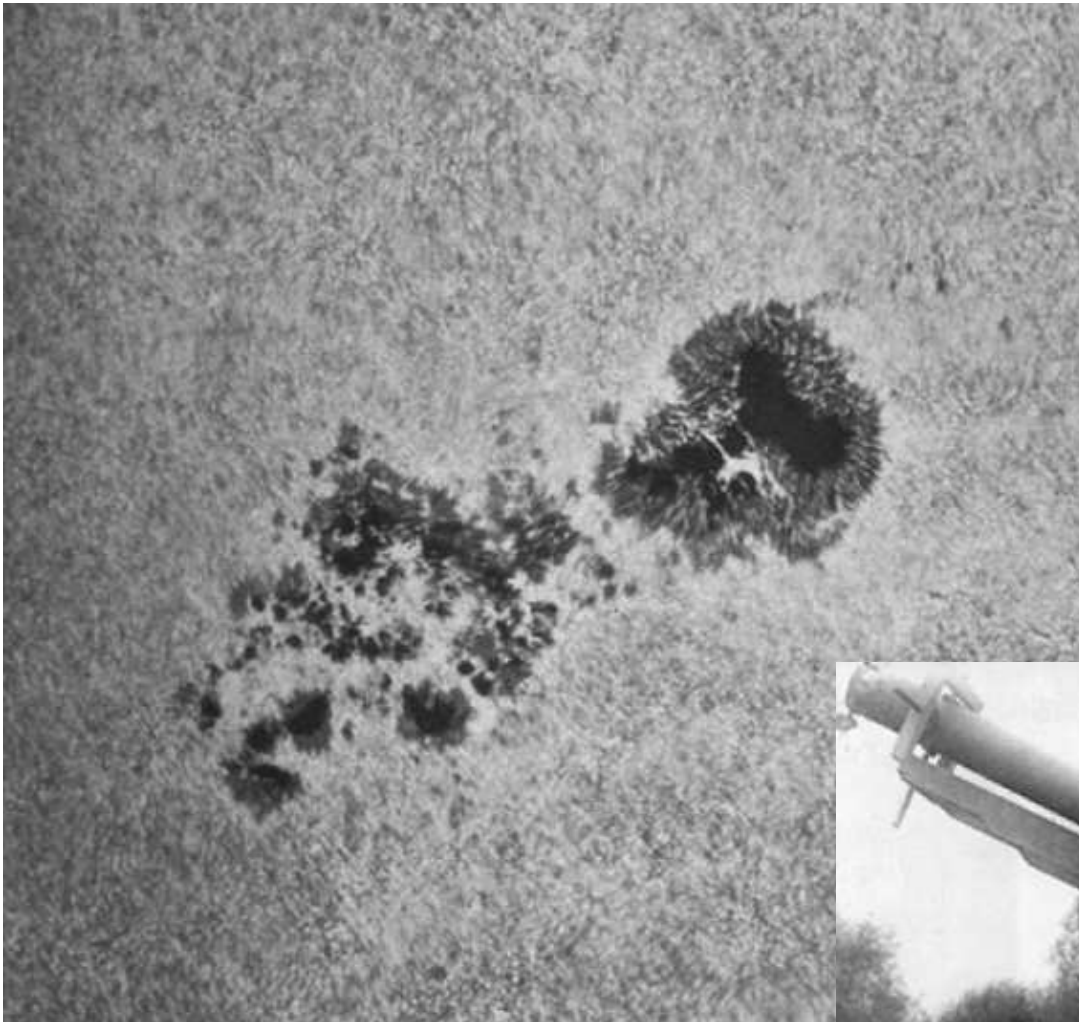


The background of the slide features a silhouette of a person's head and shoulders in profile, looking out of a window. The window shows a sunset over a body of water, with the sun low on the horizon, creating a warm, orange and yellow glow. The sky is dark, and the water reflects the light from the sun. The overall mood is contemplative and historical.

HISTORIQUE ET  
PANORAMA DES  
OBSERVATIONS  
SOLAIRES A  
MEUDON

1878

*Janssen et la lunette solaire*



1909:

*Henri Deslandres  
(1853-1948) et  
George Hale, USA  
(1868-1938)  
inventent le  
spectro  
héliographe  
permettant de  
produire des  
images mono  
chromatiques  
(bande passante  
0.025 nm)*

PARIS-MEUDON-OBSERVATORY  
DASOP  
Date: 07-Sep-1989  
Time: 07h20min  
H alpha

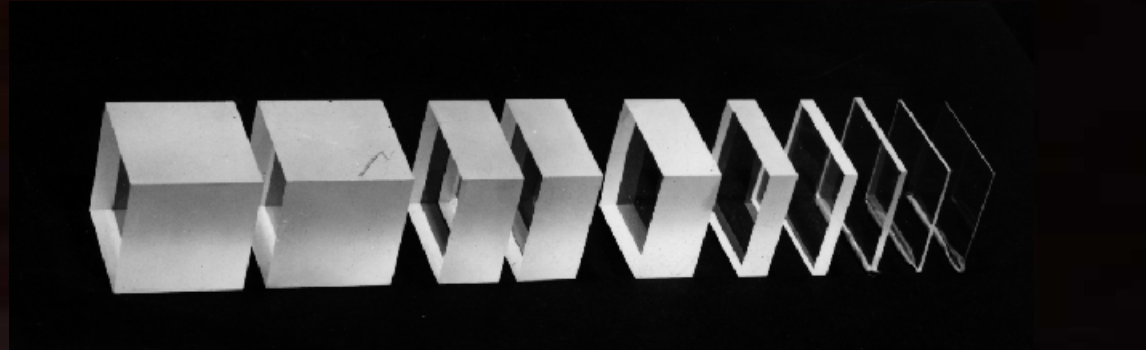




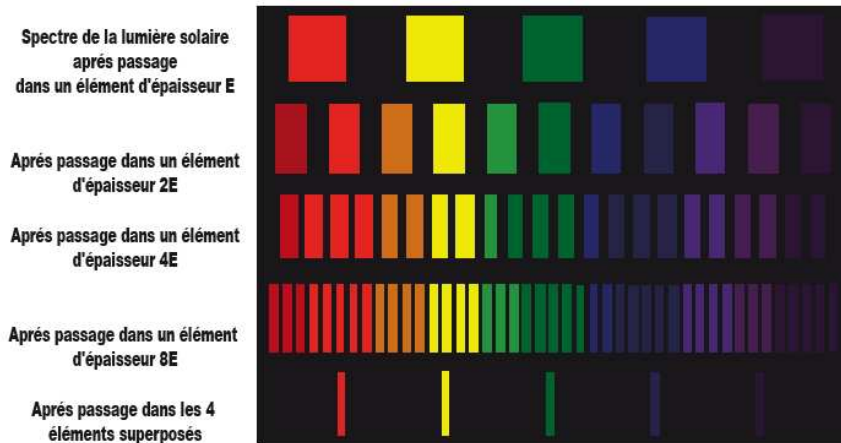
*The spectroheliograph in 1950*

1935

*B. Lyot, le coronographe et le filtre  
monochromatique biréfringent*



**Principe du filtre polarisant**



La distance entre cannelures dépend de l'élément d'épaisseur  $E$ .  
La bande passante dépend de l'élément d'épaisseur  $8E$ .

# SURVEILLANCE DES PHENOMENES DYNAMIQUES

Année Géophysique  
Internationale de 1957  
et le filtre  
monochromatique  
biréfringent de Lyot

3 Juillet 1957

7h14 à 10h30

*Bernard Lyot et Lucien  
d'Azambuja en 1952 →*



# Meudon H alpha Heliograph with TUNABLE LYOT FILTER

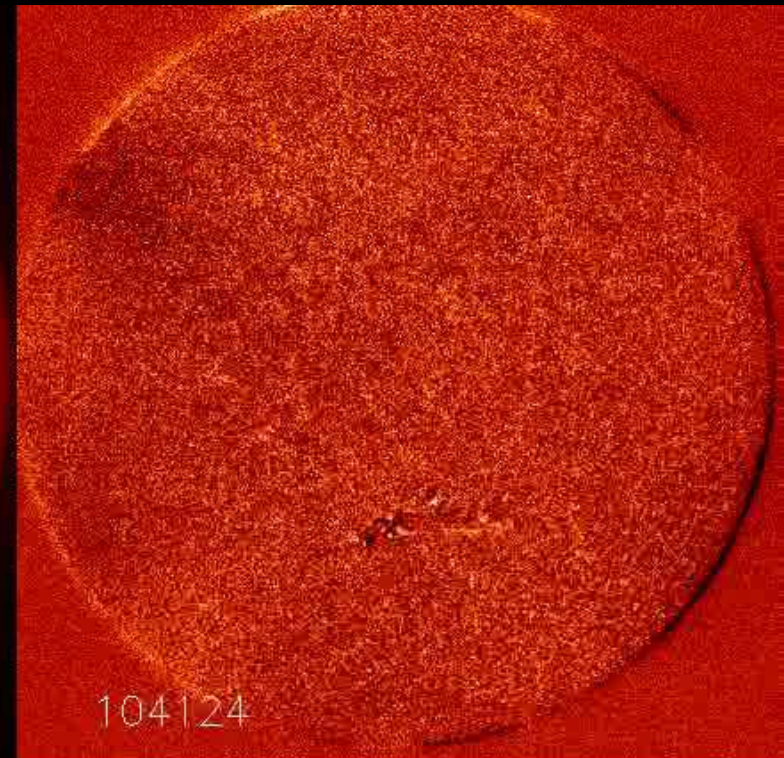
## FILAMENT INSTABILITIES, FLARES, CME AND MORETON WAVES

Observations CCD 1997 – 2004

**The future is METEOSPACE IN CALERN (2018)**

H alpha intensity

Running differences





# Spectroheliograph

1 Mai 1988

08h55mn

2 Mai 1988

13h15mn

3 Mai 1988

12h19mn

4 Mai 1988

06h37mn

4 Mai 1988

13h07mn

**Solar activity  
in H $\alpha$ :  
daily  
observations  
(continuing)  
and movies  
(until 2004)**

20 juin 1989

H $\alpha$  -0,5 Å

H $\alpha$

H $\alpha$  +0,5 Å

**TUNABLE LYOT  
FILTER H $\alpha$  +/- 0.5 Å**

14:58:06

14:58:17

14:58:12

15:00:44

15:00:55

15:00:50

15:03:22

15:03:33

15:03:28

15:06:00

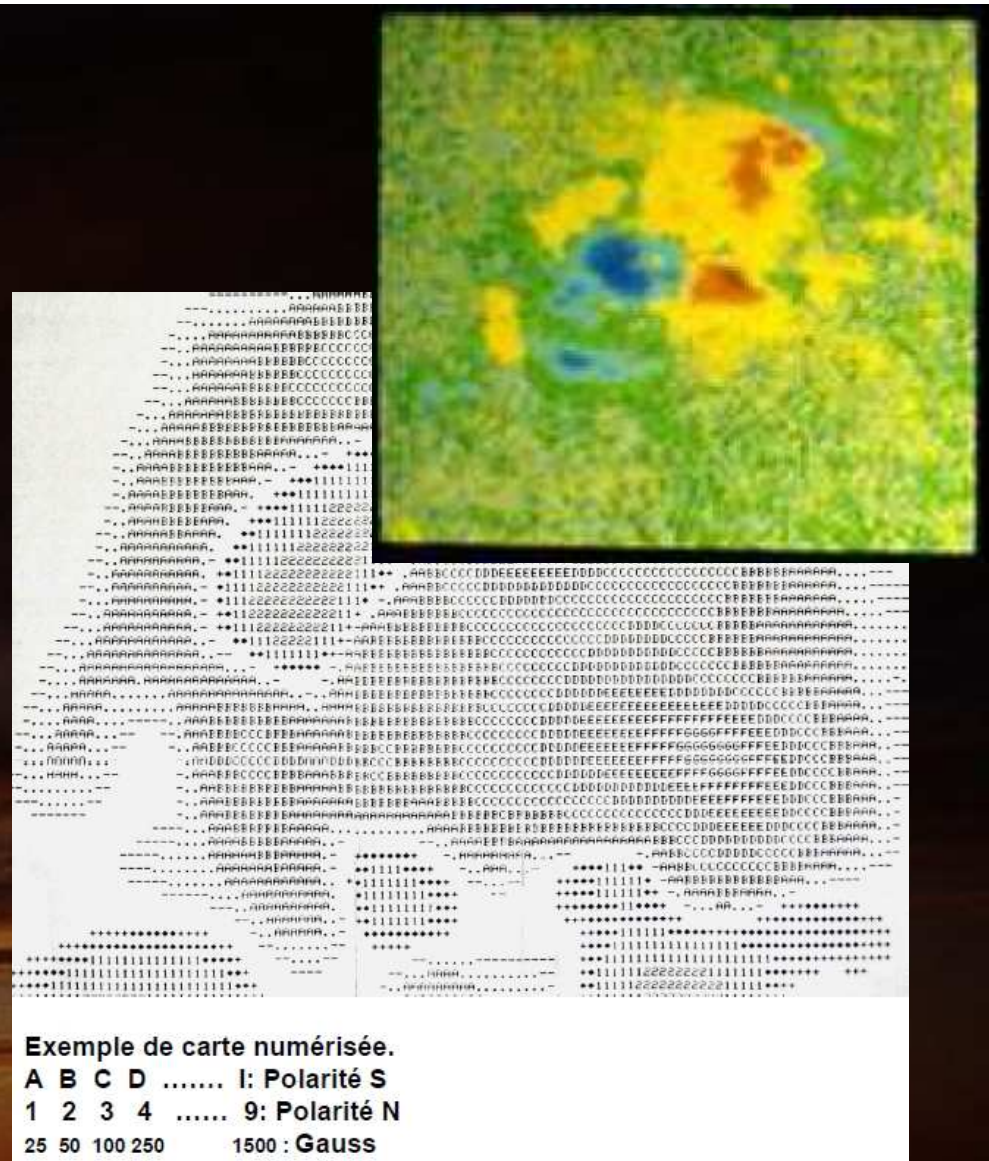
15:06:11

15:06:06

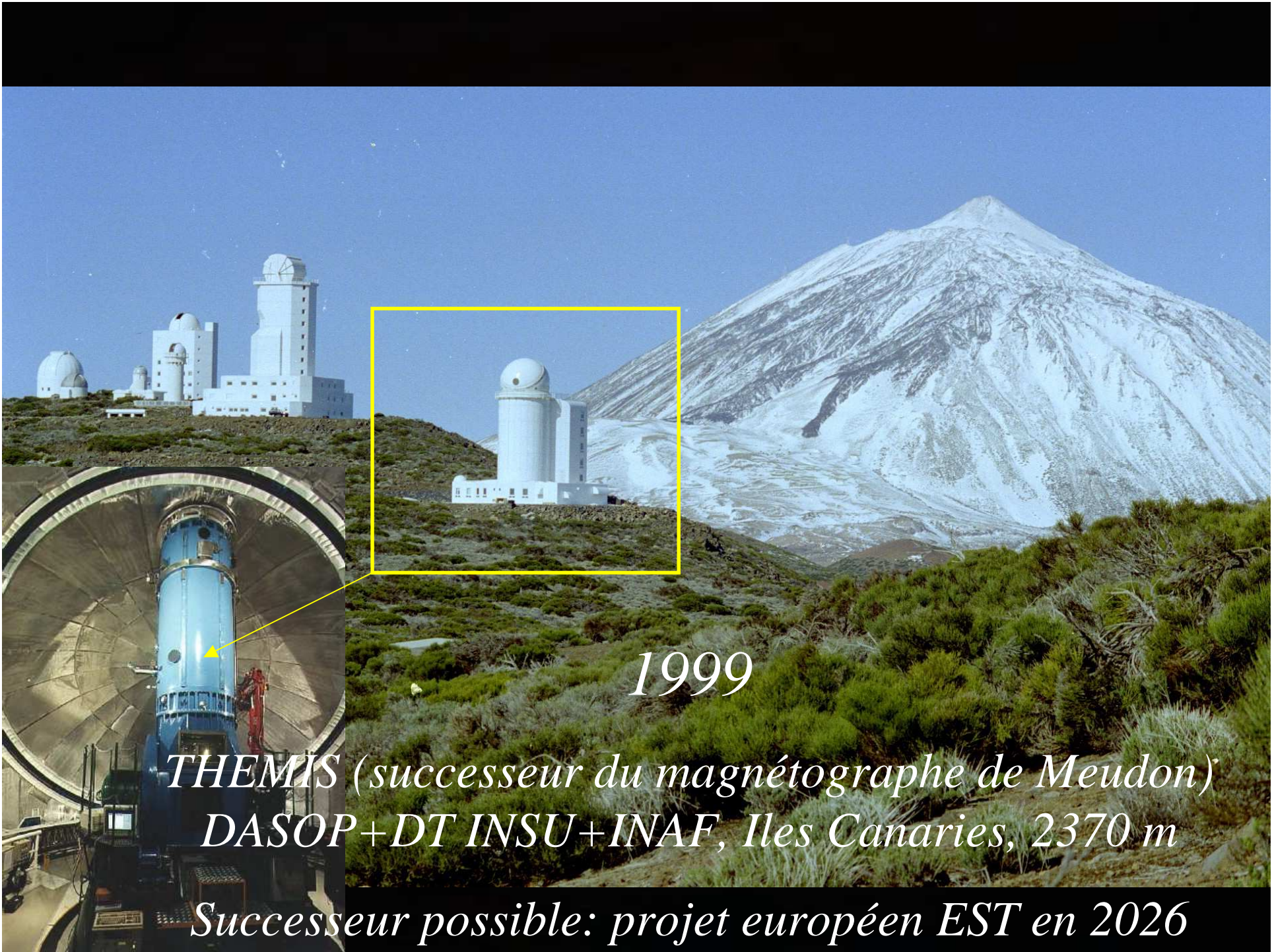
15:07:19

15:07:30

15:07:25



*1980 Le Grand Sidérost de Foucault alimente le magnétographe de Meudon, appareil de cartographie des champs magnétiques solaires longitudinaux (J. Rayrole)*



1999

*THEMIS (successeur du magnétographe de Meudon)  
DASOP+DT INSU+INAF, Iles Canaries, 2370 m*

*Successeur possible: projet européen EST en 2026*



## Tour solaire de Meudon (1970)

### DPSM – P. Mein

- 1er dispositif DPSM en 1977
- berceau des DPSM du Pic du Midi, du VTT, de Wroclaw et de THEMIS
- DPSM actifs: Meudon, Wroclaw
- Prolongation actuelle: S4I (Meudon) + SCD (Wroclaw, Belfast)

### BANC DE TEST

- SOPHI en 2015/2016, S4EI 2017/2018

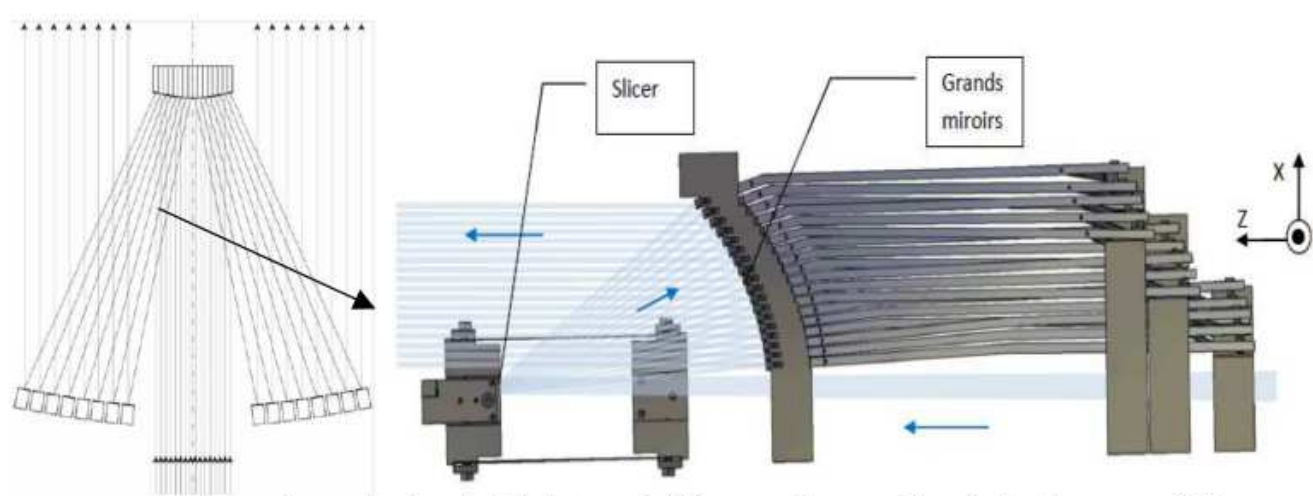
### AVENIR

- S4EI extragalactique (PI M. Puech, GEPI)
- S4I solaire: incertain

# DPSM nouveau concept S4I futurs télescopes

P. Mein  
F. Sayède

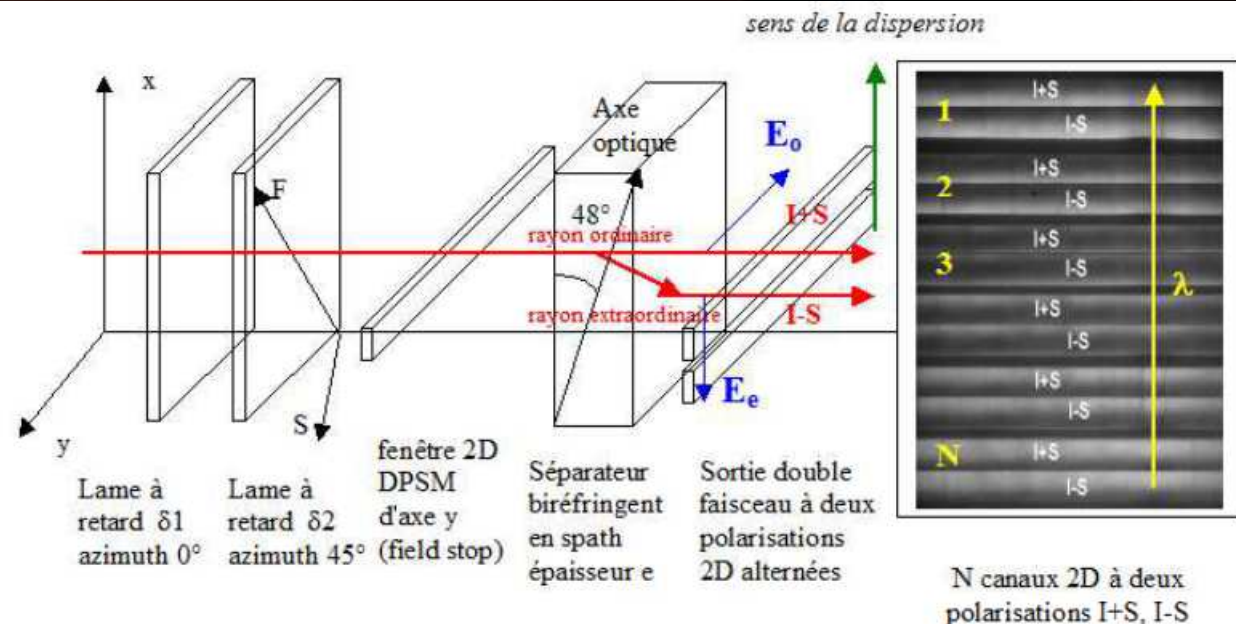
18 canaux  
résolution 30  
mÅ



à gauche: principe de l'éclateur de faisceau de nouvelle génération pour S4I permettant d'accroître le nombre de canaux spectraux

à droite: les faisceaux issus de l'éclateur sont repris par des grands miroirs pour réinjection dans le spectrographe (second passage soustractif)

Nouveau concept polarimétrique (J.-M. Malherbe)  
S4I: 36 canaux en I+S et I-S, où  $S = Q, U, V$

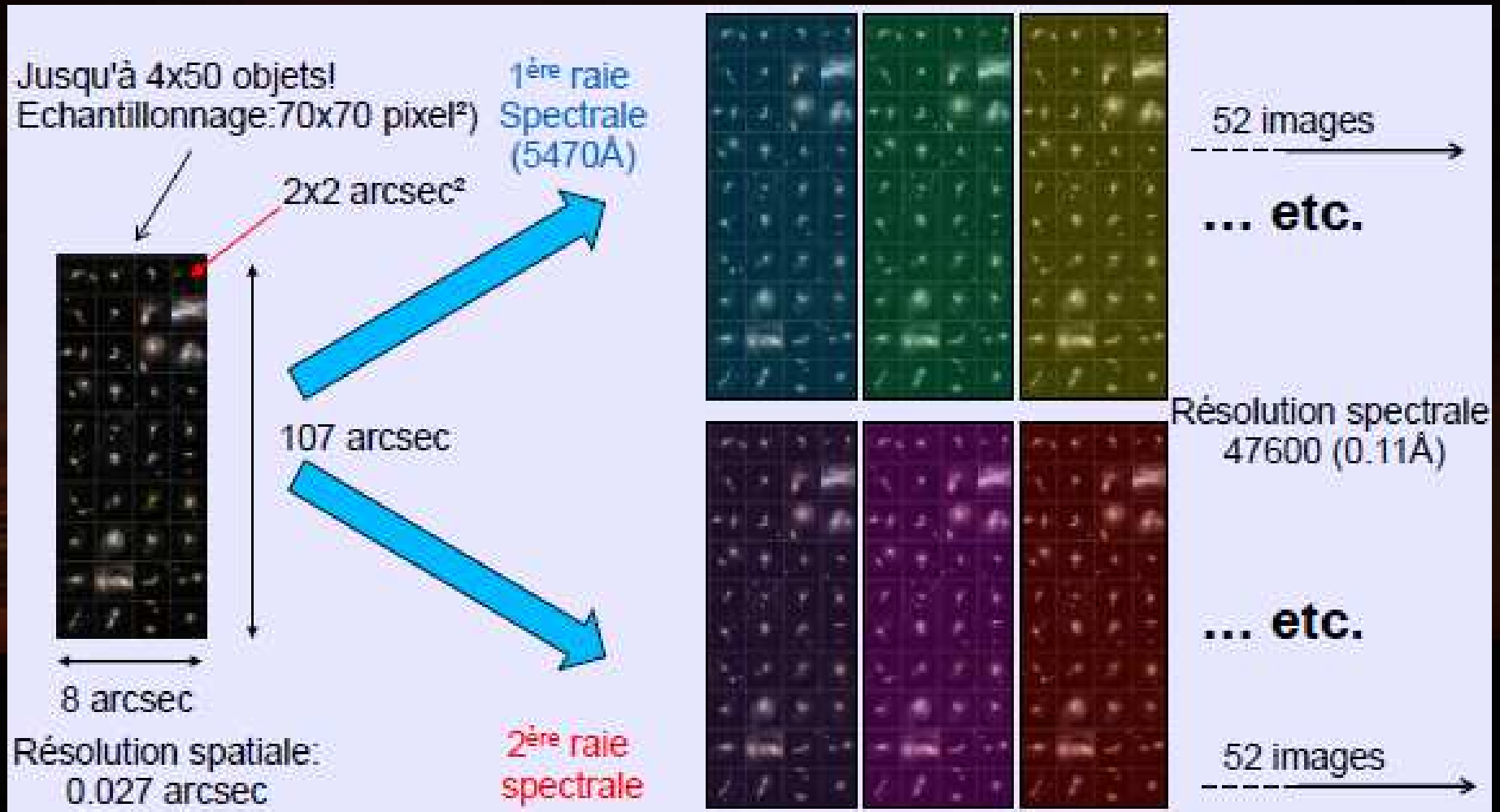


Polarimètre double faisceau et échange de voies pour S4I

*concept S4EI multi objet, à 2 raies et à 52 canaux spectraux simultanés (recouvrant le profil complet d'une raie spectrale)*

*PI M. Puech, chef de projet F. Sayède, GEPI*

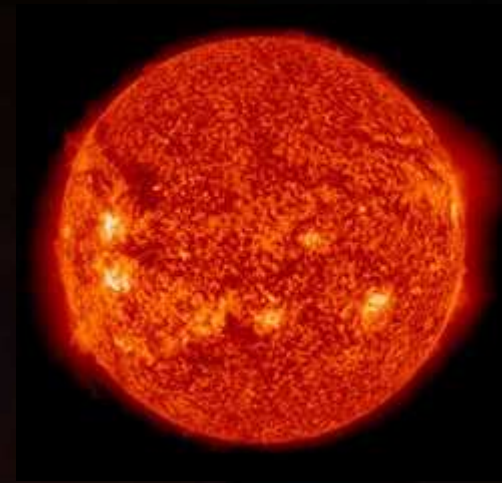
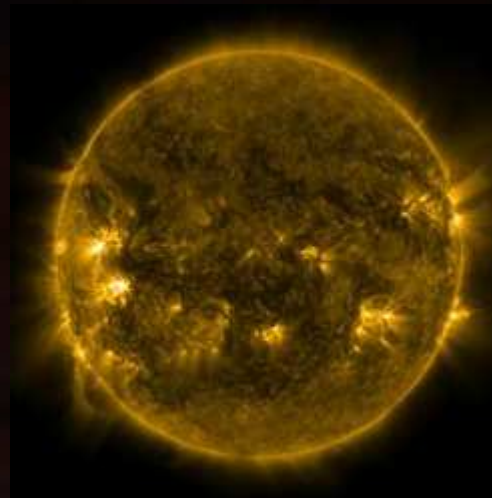
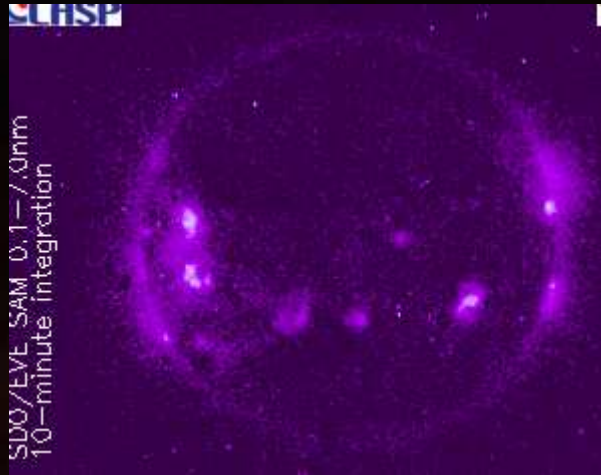
*(soutien DIM ACAV région Ile de France 2014)*



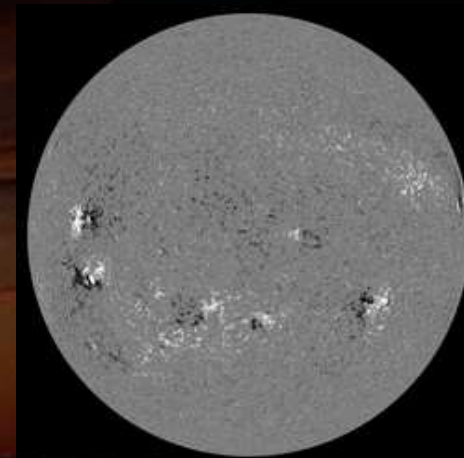
A silhouette of a person's head and shoulders is visible on the right side of the image, looking through a telescope. The background is a sunset sky with horizontal bands of orange, yellow, and red, transitioning to a dark blue/black sky at the top. The text is overlaid in the center-left area.

OBSERVATIONS  
SYSTEMATIQUES  
SOLAIRES

**Contexte spatial: SDO/NASA 1 image/min, X, UV, optique**



**Couronne  $10^6$ K, Zone de Transition  $10^5$ K, photosphère 6000 K**



**MAIS: pas d'observation chromosphérique à la source de l'activité solaire**



A spectral plot showing intensity versus wavelength. The plot is color-coded from blue at the top to red at the bottom. Two absorption lines are highlighted with red boxes and ovals: CaII K at the top left and CaII H at the top right. The text 'SPECTROSCOPY' is centered in the middle. Below it, the text 'Lines observed at Meudon:' is followed by 'Hα, CaII K and H (future)'. At the bottom, the text 'H alpha' is highlighted with a blue box and circle.

CaII K

CaII H

# SPECTROSCOPY

Lines observed at Meudon:

H $\alpha$ , CaII K and H (future)

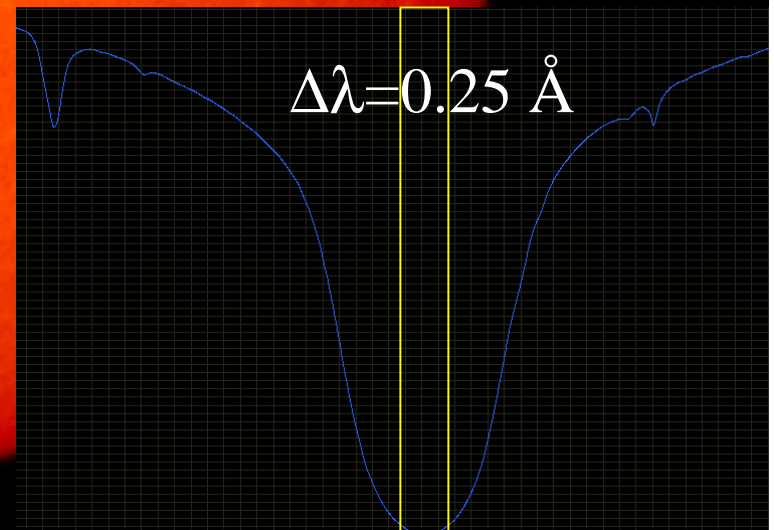
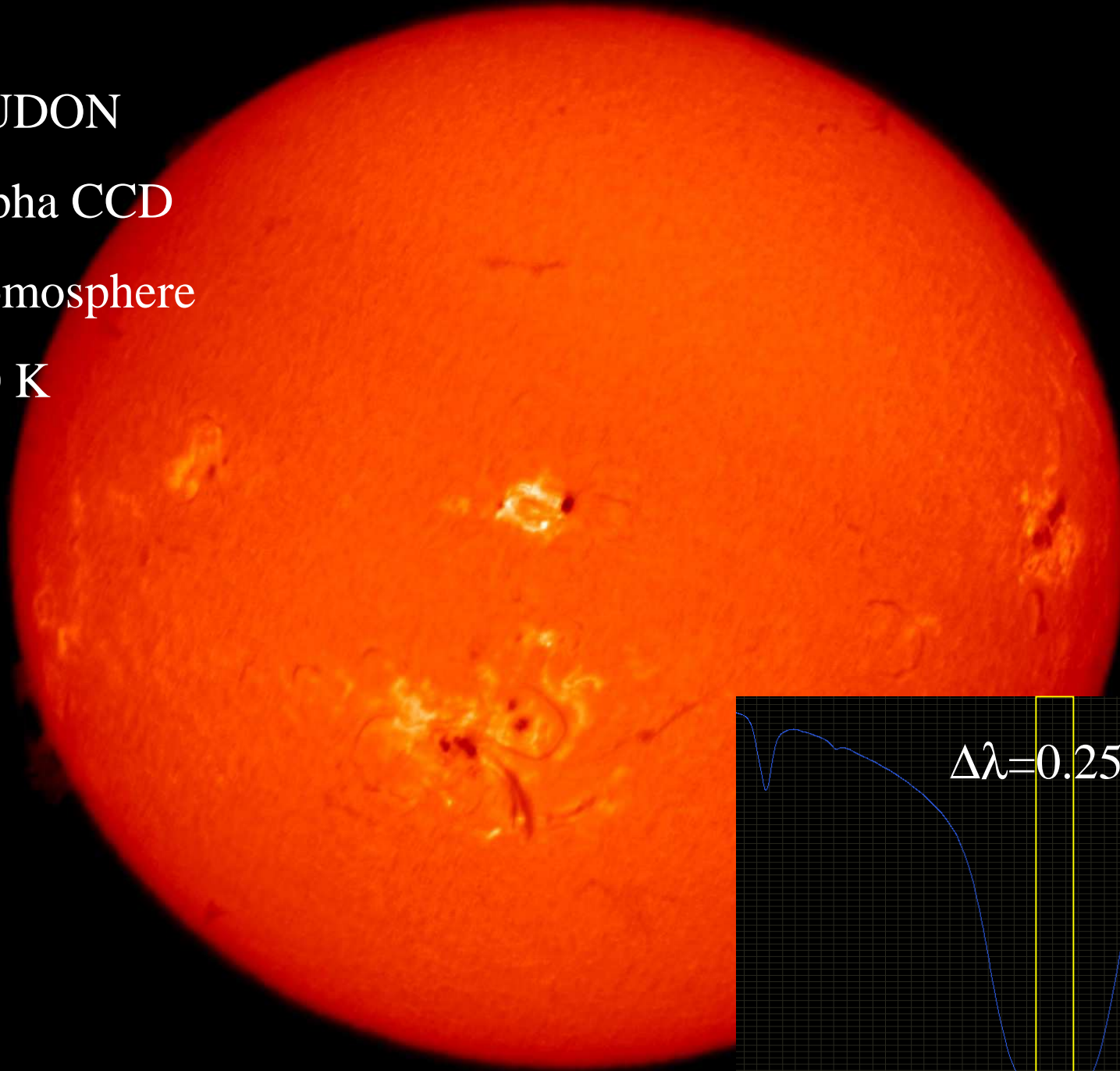
H alpha

MEUDON

H alpha CCD

Chromosphere

8000 K

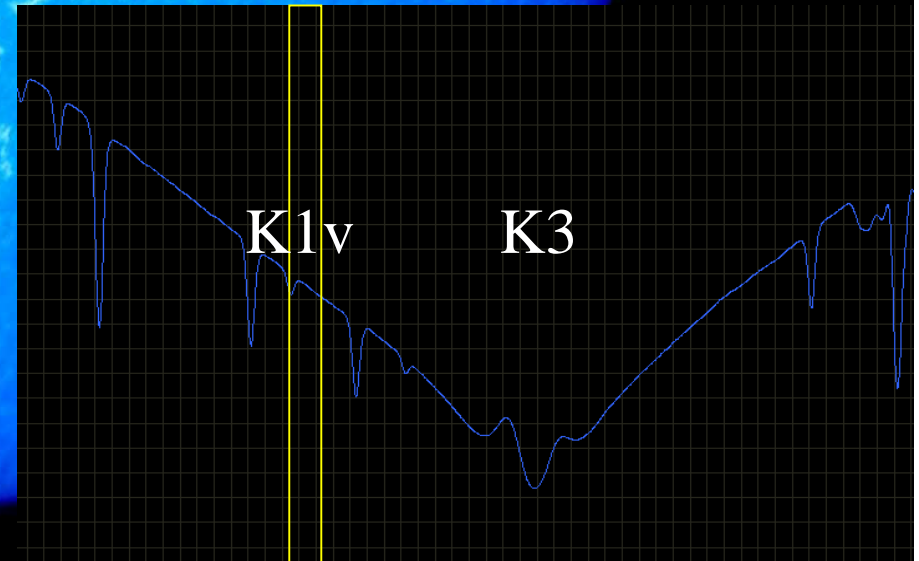
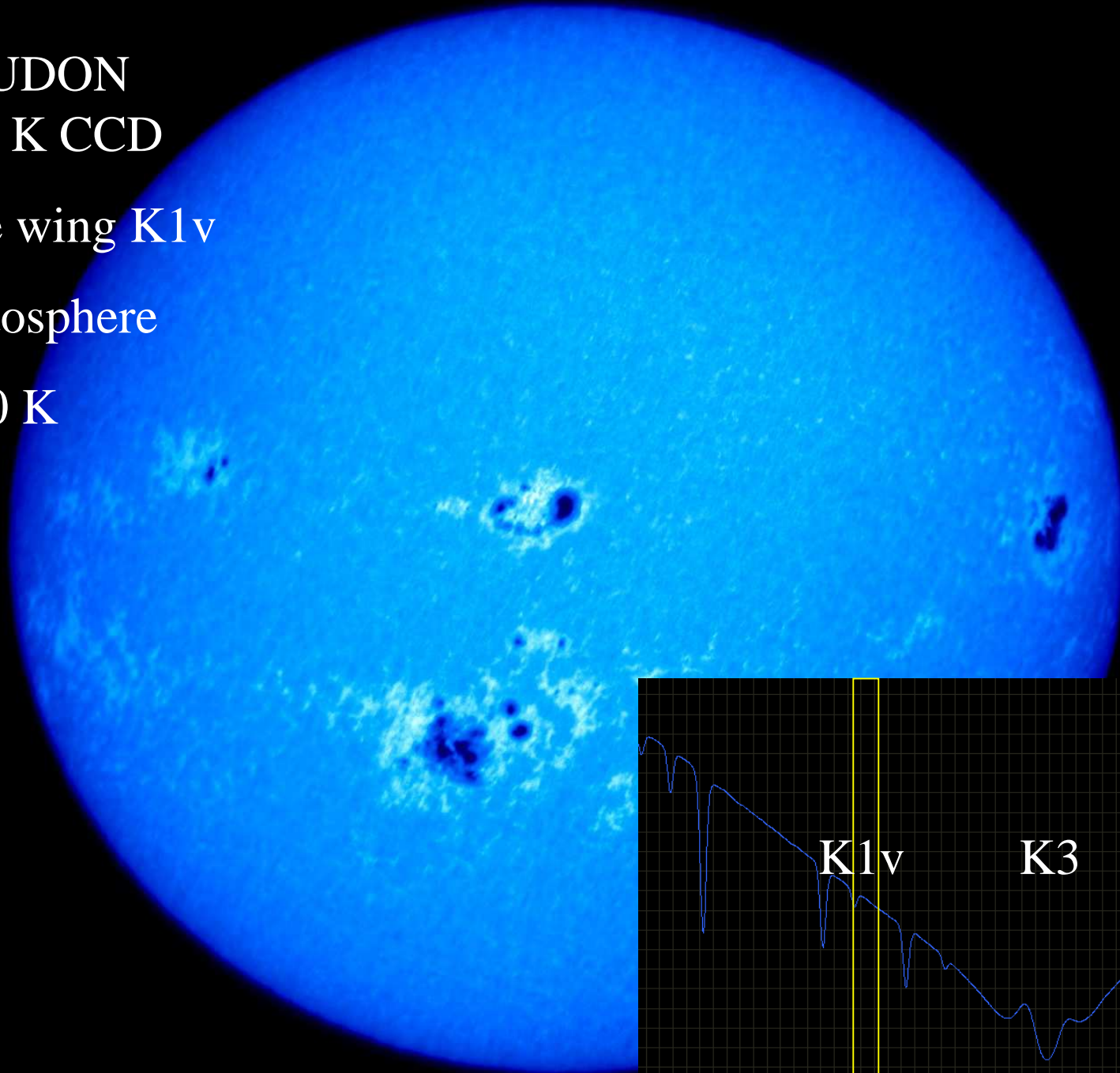


MEUDON  
CaII K CCD

Blue wing K1v

Photosphere

6000 K



Observatoire de Paris-Meudon

03/Oct/28 08:50:59

Rotation: 2009 Lc:296.8

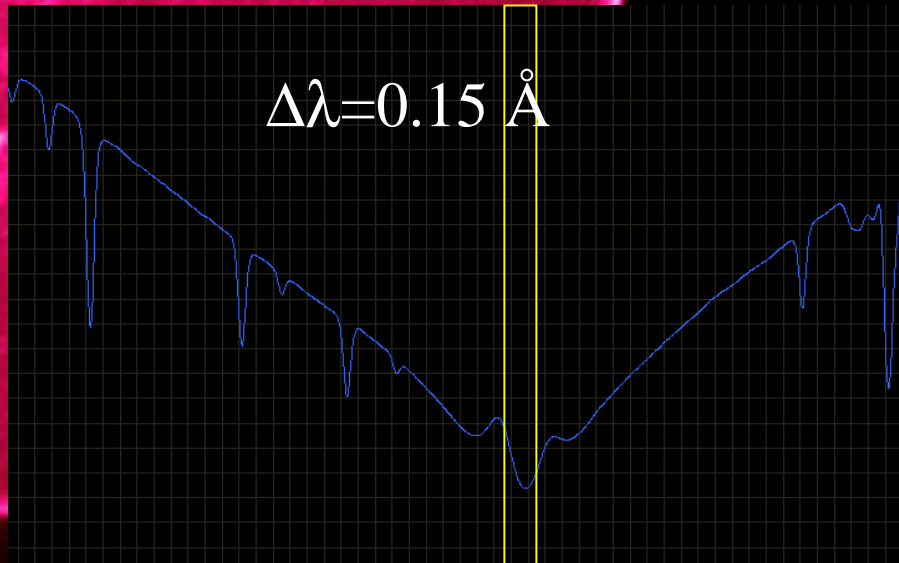
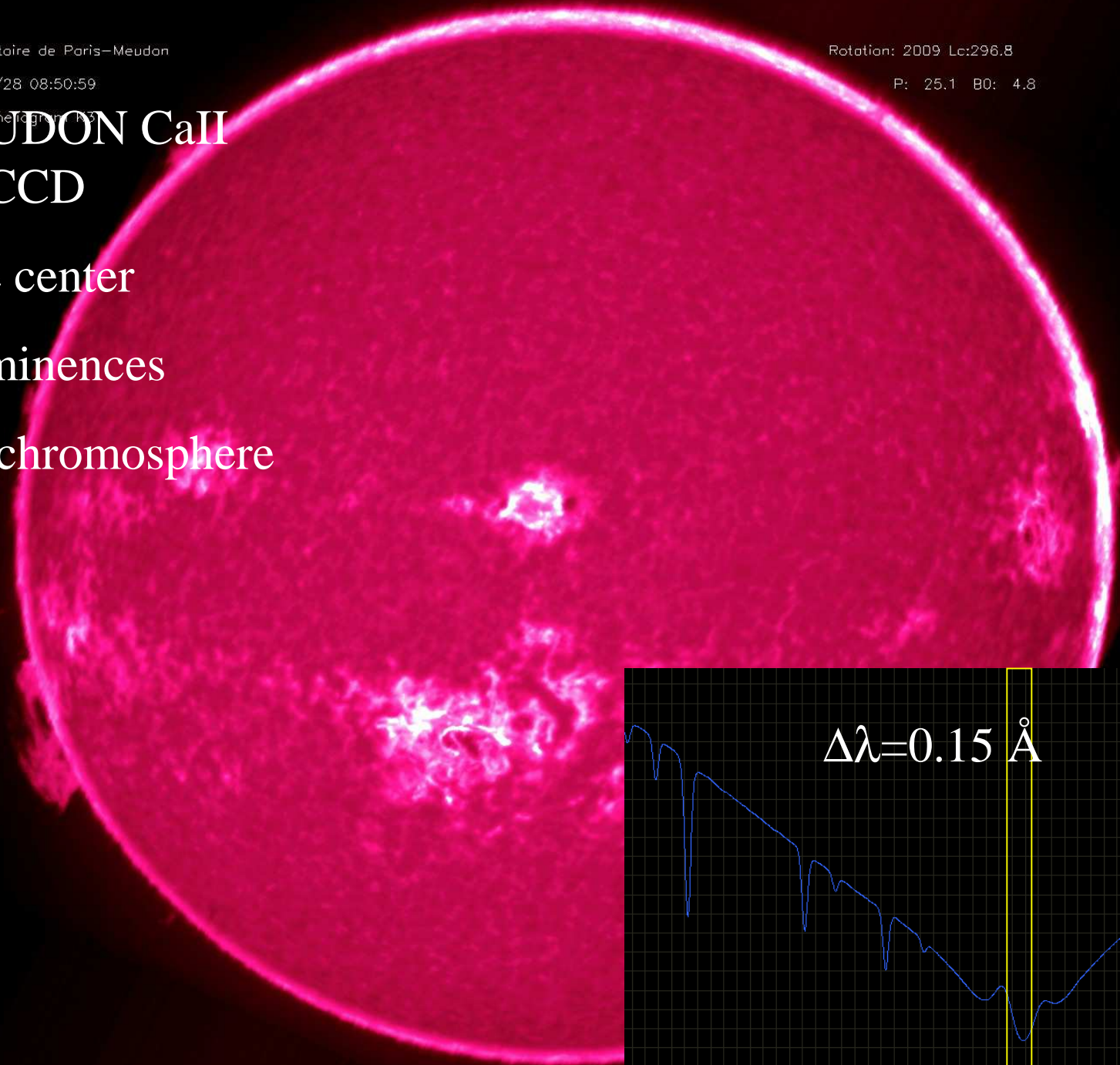
P: 25.1 B0: 4.8

MEUDON CaII  
K3 CCD

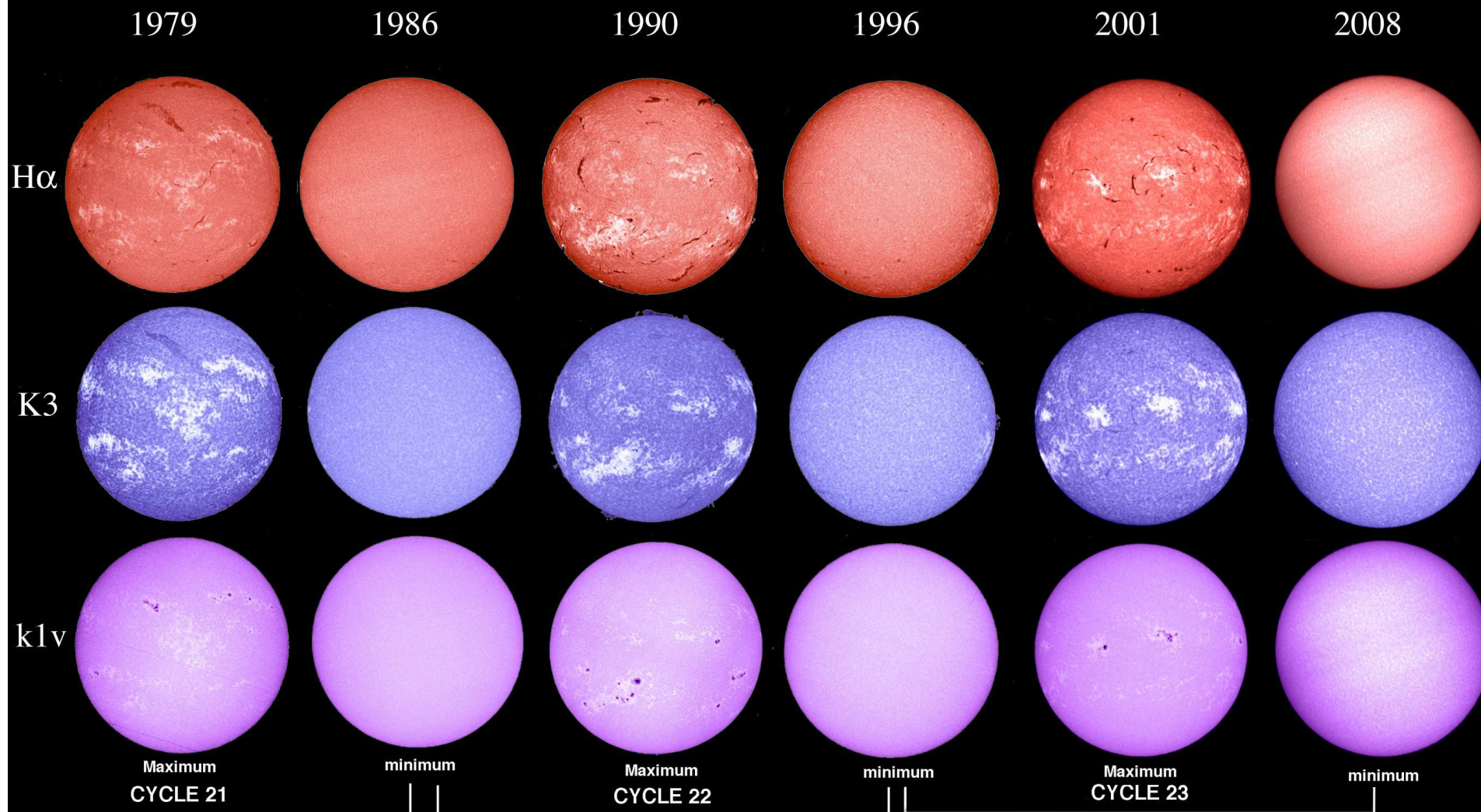
Line center

Prominences

and chromosphere



# CYCLES DE 11 ANS



**Contexte sol: réseaux mondiaux répartis en longitude pour suivi  
24H/24 de l'activité solaire**

*Global H $\alpha$  network (8 stations hétérogènes, peu d'observations  
continues)*

**+ Réseau héliosismologique GONG (7 bons sites homogènes pour  
observations continues, le seul européen est Tenerife)**

**Big Bear  
Solar  
Observatory**



21:20:40 UT Jul 31,  
2013

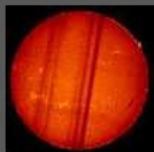


21:20:40 UT Jul 31,  
2013

**Observatory  
de Paris,  
Meudon**



13:33:48 UT Jul 31,  
2013



13:33:48 UT Jul 31,  
2013

**Uccle Solar  
Equatorial  
Table**

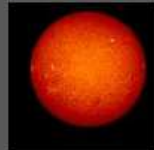


14:46:31 Jul 31,  
2013



14:46:31 Jul 31,  
2013

**Observatoire  
Midi-  
Pyrénées**



08:12:46 UT Jul 31,  
2013

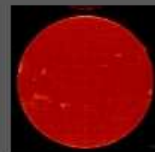


08:12:46 UT Jul 31,  
2013

**Kanzelhöhe  
Solar  
Observatory**



06:09:23 UT Jul 31,  
2013



06:09:23 UT Jul 31,  
2013

**Catania  
Astrophysical  
Observatory**



06:56:26 UT Jul 31,  
2013

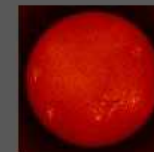


06:56:26 UT Jul 31,  
2013

**Yunnan  
Astronomical  
Observatory**



01:54:13 Aug 09,  
2012



01:54:13 Aug 09,  
2012

**Huairou  
Solar  
Observatory**



03:21:00 UT Jul 25,  
2013



03:21:00 UT Jul 25,  
2013



**HOME**

- Latest observations
- Latest movies
- Long term archive
- News

**QUERY**

- For observations
- For specific content
- For solar features
- For synoptic maps

**TOOLS**

- Ephemerids
- Solar spectrum
- Related topics
- Live Sun & webcams
- Software

**GUIDES**

- Instruments
- Data
- Software

[Solar Web Guide](#)  
[Multimedia Gallery](#)

**LATEST OBSERVATIONS**

**MEUDON HELIOGRAPH**

	18-Oct-2010 15:17:11 CaIIK integrated image	.jpg .fts.gz solar.grid
	18-Oct-2010 15:16:00 G Band image	.jpg .fts.gz solar.grid
	18-Oct-2010 15:15:35 CaIIH integrated image	.jpg .fts.gz solar.grid

**CLIMSO PIC DU MIDI**

	19-Oct-2010 10:13:46 H Alpha coronographic image	.png .fts movie C1/L1 surimpose
	19-Oct-2010 10:16:00 H Alpha image	.png .fts movie C1/L1 surimpose
	19-Oct-2010 10:16:00 CaIIK integrated image	.png .fts movie
	19-Oct-2010 10:13:42 HeI coronographic image	.png .fts movie

**NANCAY RADIOHELIOGRAPH**

	17-Oct-2010 13:21:27 150.9Mhz radio image	.png .fts movie plots 32/10s 128/120s
	17-Oct-2010 13:21:27 327Mhz radio image	.png .fts movie plots 32/10s 128/120s

**NANCAY DECAMETRIC ARRAY**

	18-Oct-2010 07:37:06 10 sec integrated dynamic spectra, left and right hand polarization	.png .fts full spectra
--	---	------------------------------

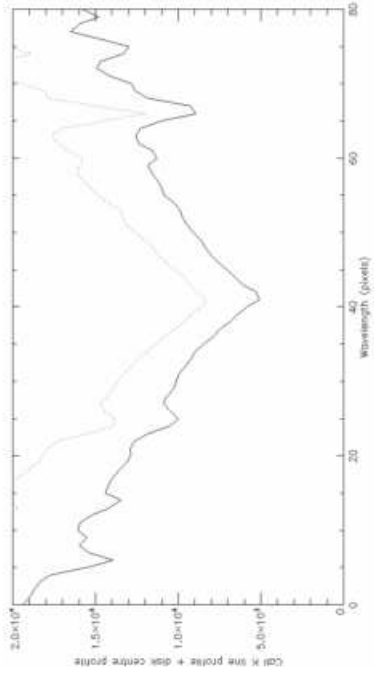
**MEUDON SPECTROHELIOGRAPH**

	18-Oct-2010 12:05:38 H Alpha prominences image	.jpg .fts.Z movie luminosity curve
	18-Oct-2010 12:03:05 CaII prominences image	.gif .fts.Z movie luminosity curve
	18-Oct-2010 12:00:16 CaII K1v image	.gif .fts.Z movie luminosity curve
	18-Oct-2010 11:59:04 CaII K3 image	.gif .fts.Z movie luminosity curve
	18-Oct-2010 11:56:32 H Alpha image	.gif .fts.Z movie luminosity curve



SPECTROCAM OU  
L'AVENIR A 10 ANS DU  
SPECTROHELIOGRAPHE

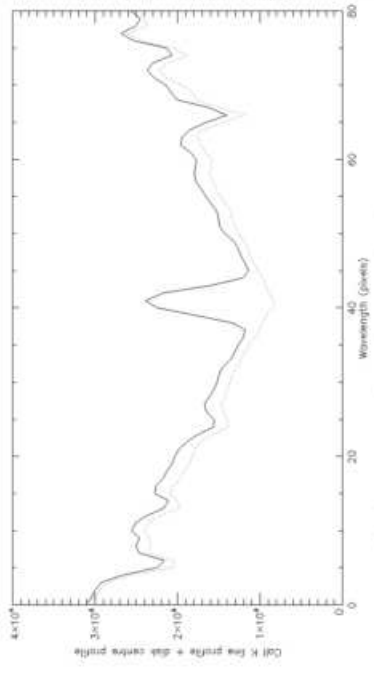
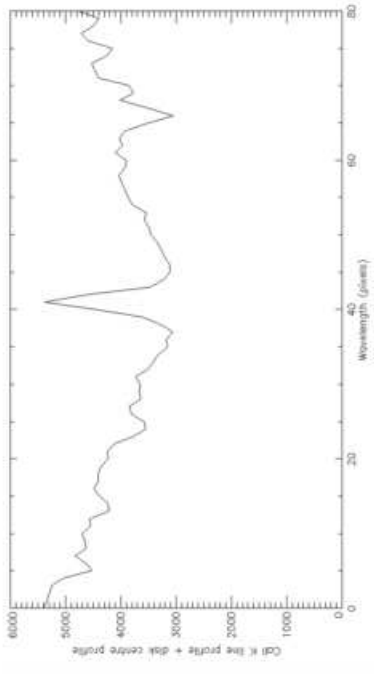




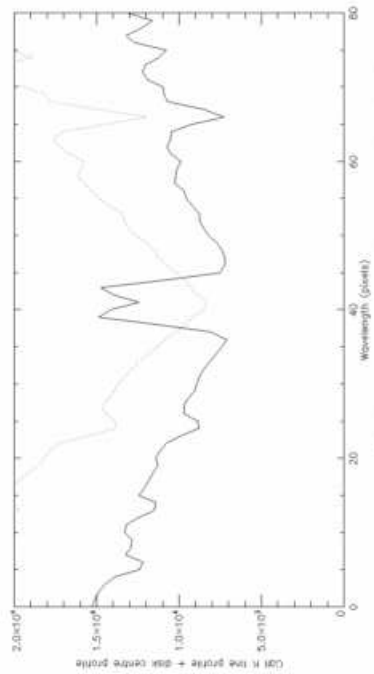
*profil dans un filament*

*(pointillé = profil chromosphérique moyen)*

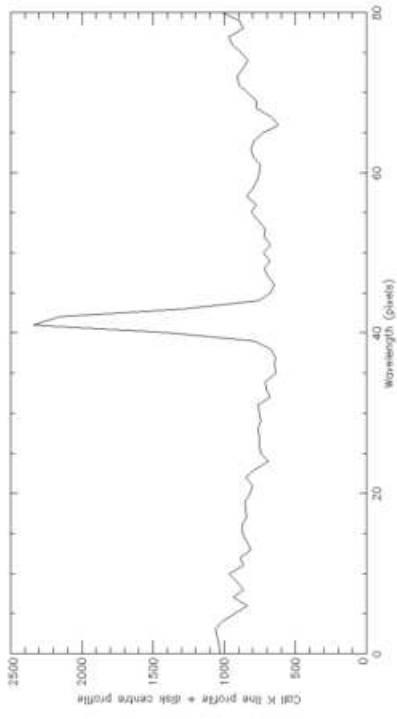
*profil dans une tache*



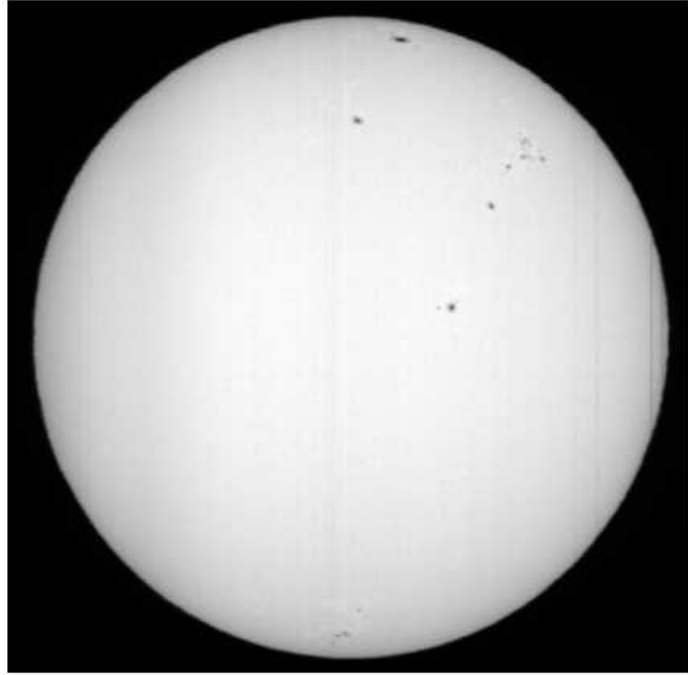
*profil dans une facule sur le disque*



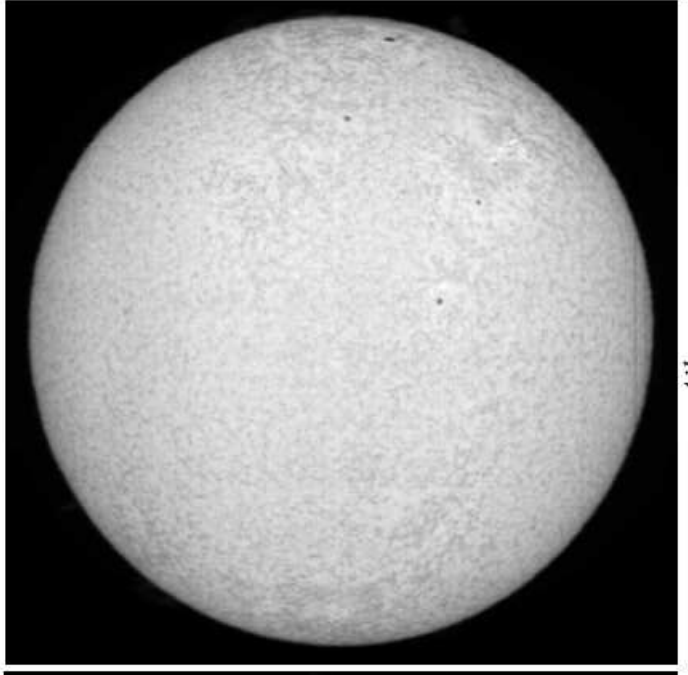
*profil dans une facule près du limbe*



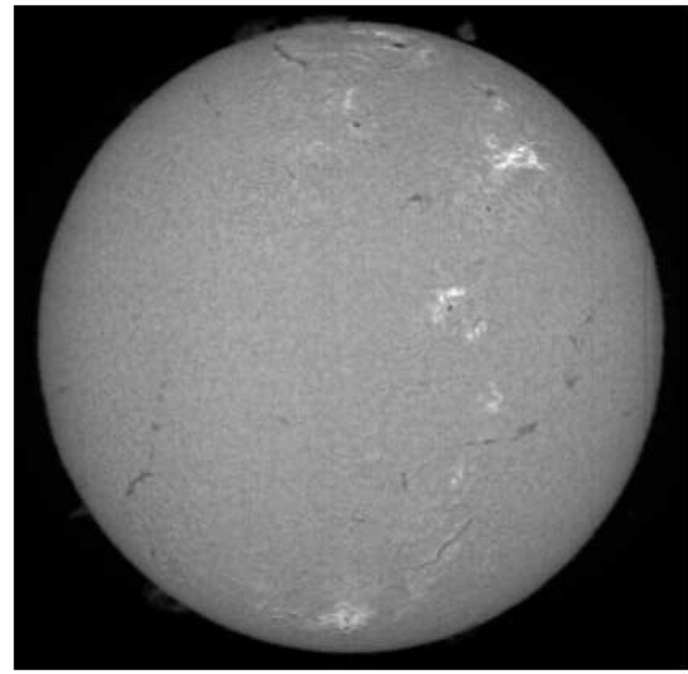
*profil dans une protubérance au limbe*



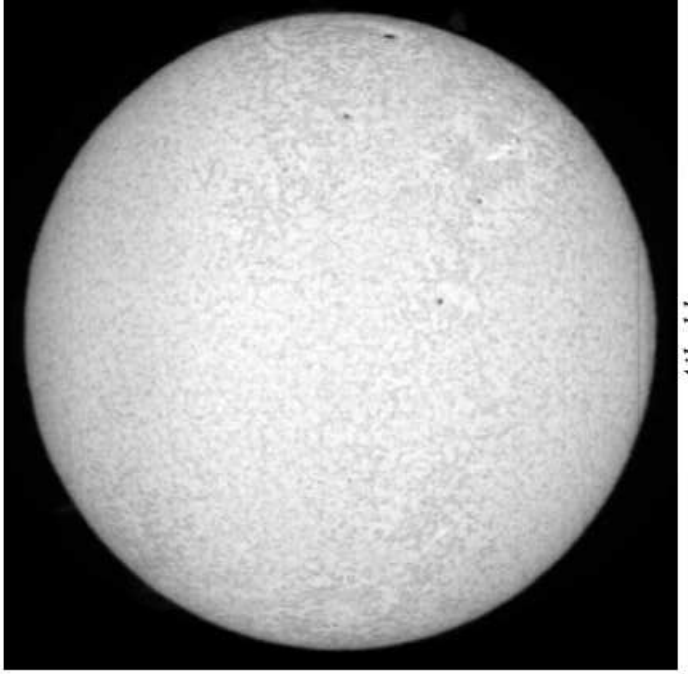
*continu*



*Aile rouge*

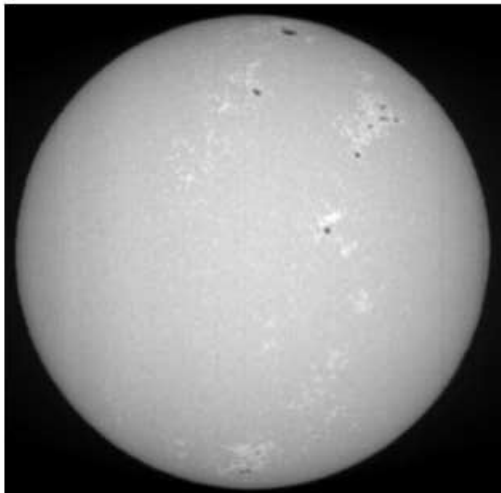


*Coeur de raie*

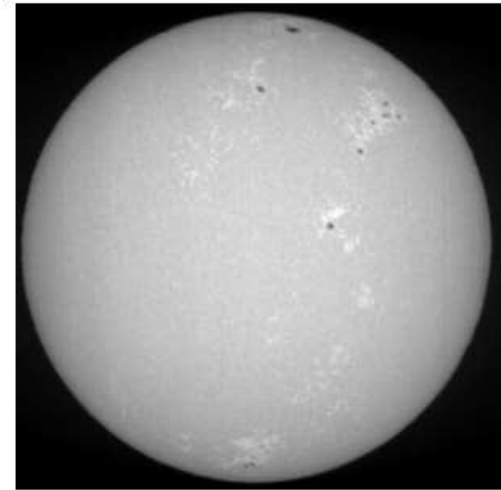


*Aile bleue*

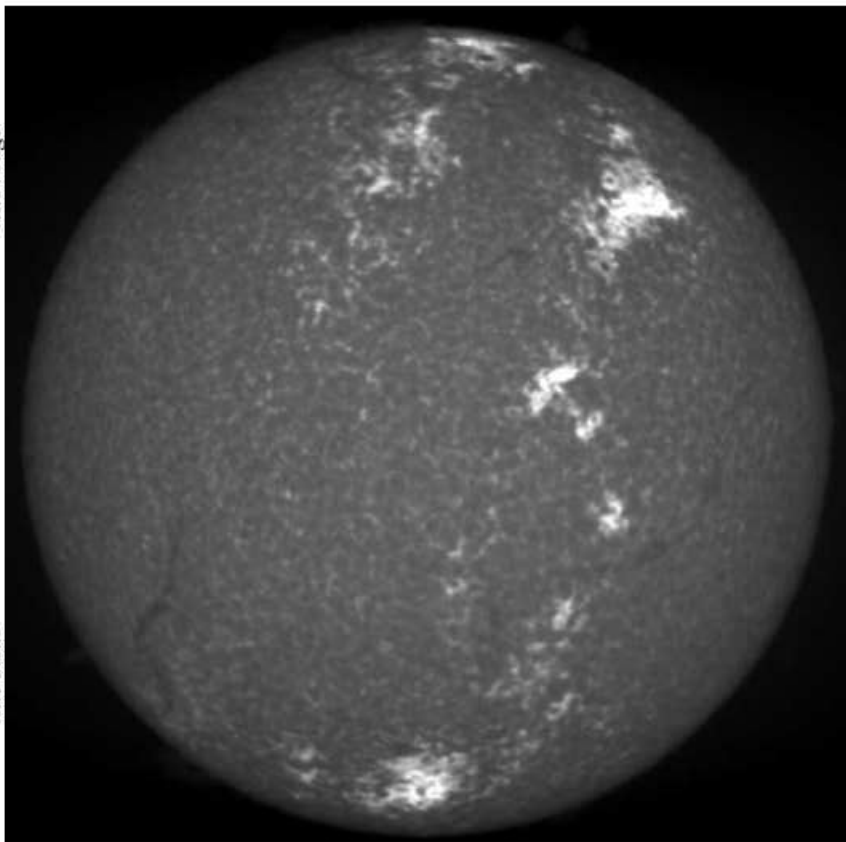




*Aile rouge*



*Aile bleue*



*Coeur de rate*



The background of the slide features a silhouette of a person's head and shoulders on the right side, looking towards the left. The background is a sunset or sunrise over a body of water, with a wooden table in the foreground. The text is centered and reads:

ORGANISATION  
ET PERSPECTIVES  
DES OBSERVATIONS  
SYSTEMATIQUES

# Perspectives liées aux observations systématiques

## *Observations de Meudon:*

- adaptées au site, cible: activité solaire à long terme à l'échelle du cycle de 11 ans et plus
- nouveau potentiel 2017 - 2027: des observations avec **profils de raie complets** dans **Halpha, Hbeta, CaII K et CaII H** dans un champ 2D avec un pixel de 1 arcsec

## *Observations continues de l'activité solaire:*

- projet MeteoSpace sur CALERN financé par la DGA, la région Ile de France et le PNST/INSU; cofinancements demandés par l'OCA à l>IDEX Côte d'Azur et à la CSAA/INSU, livraison 2018
- formation possible d'une ANO (action nationale d'observation)  
OP + OCA auquel pourrait se joindre l'IRAP s'il le souhaite

# Halpa dans l'espace en 2030 ?

Avantages: homogénéité des données et couverture 24H/24

## TEHA

Télescope H Alpha pour la surveillance de l'activité  
solaire et la météorologie spatiale

*Une étude préliminaire*

Leonardo Blanco, Jean-Marie Malherbe  
Observatoire de Paris-Meudon, LESIA  
Mars-Juillet 2006



TEHA'AMANA, PAR GAUGUIN, 1893.

**Service National d'Observation "Spectro-Héliographe"**  
**INSU ANO6**  
**Responsable: LESIA- OP - Partenaire: Lagrange - OCA**  
**Organisation fonctionnelle Avril 2016**

