

T.H.E.M.I.S

Télescope Héliographique pour l'Etude du Magnétisme et des Instabilités Solaires

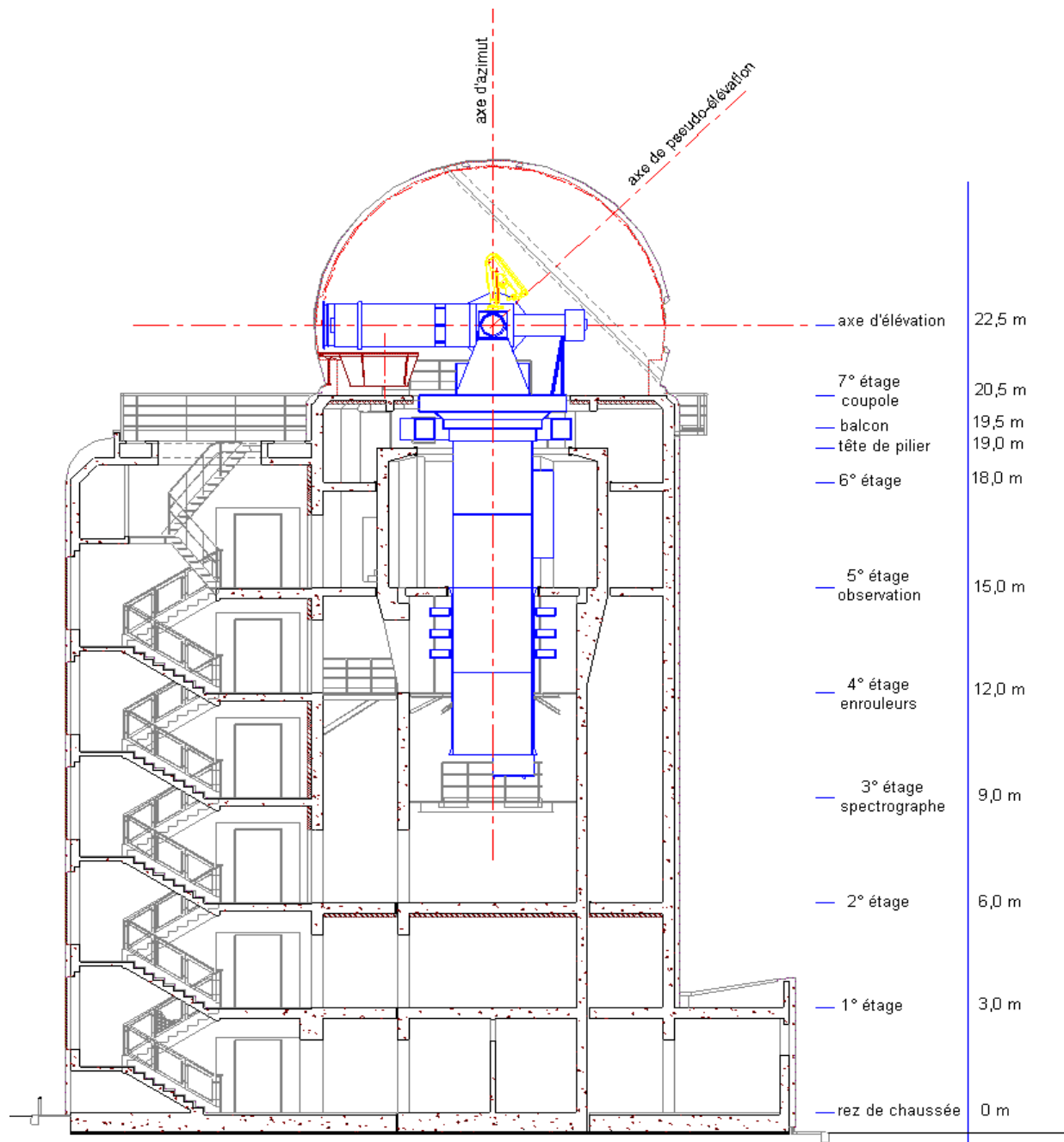
- Franco-italien, Observatoire du Teide à Tenerife (IAC)
- 90 cm, polarimètre Stokes au premier foyer, hélium
- Spectrographe et prédisperseur de 8 m
- Altitude 2400 m
- Campagne de site 1969-1979, "Joint Organization for Solar Observations"
- Première lumière mars 1996

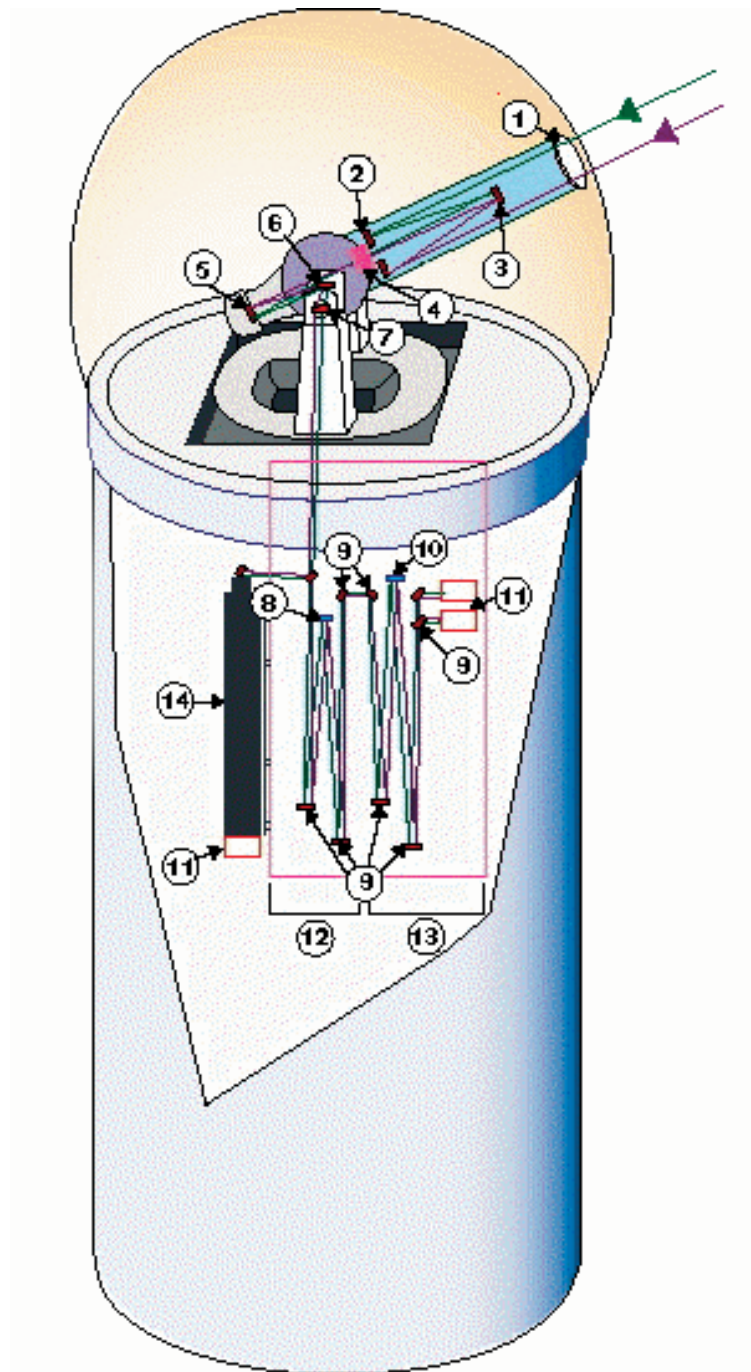


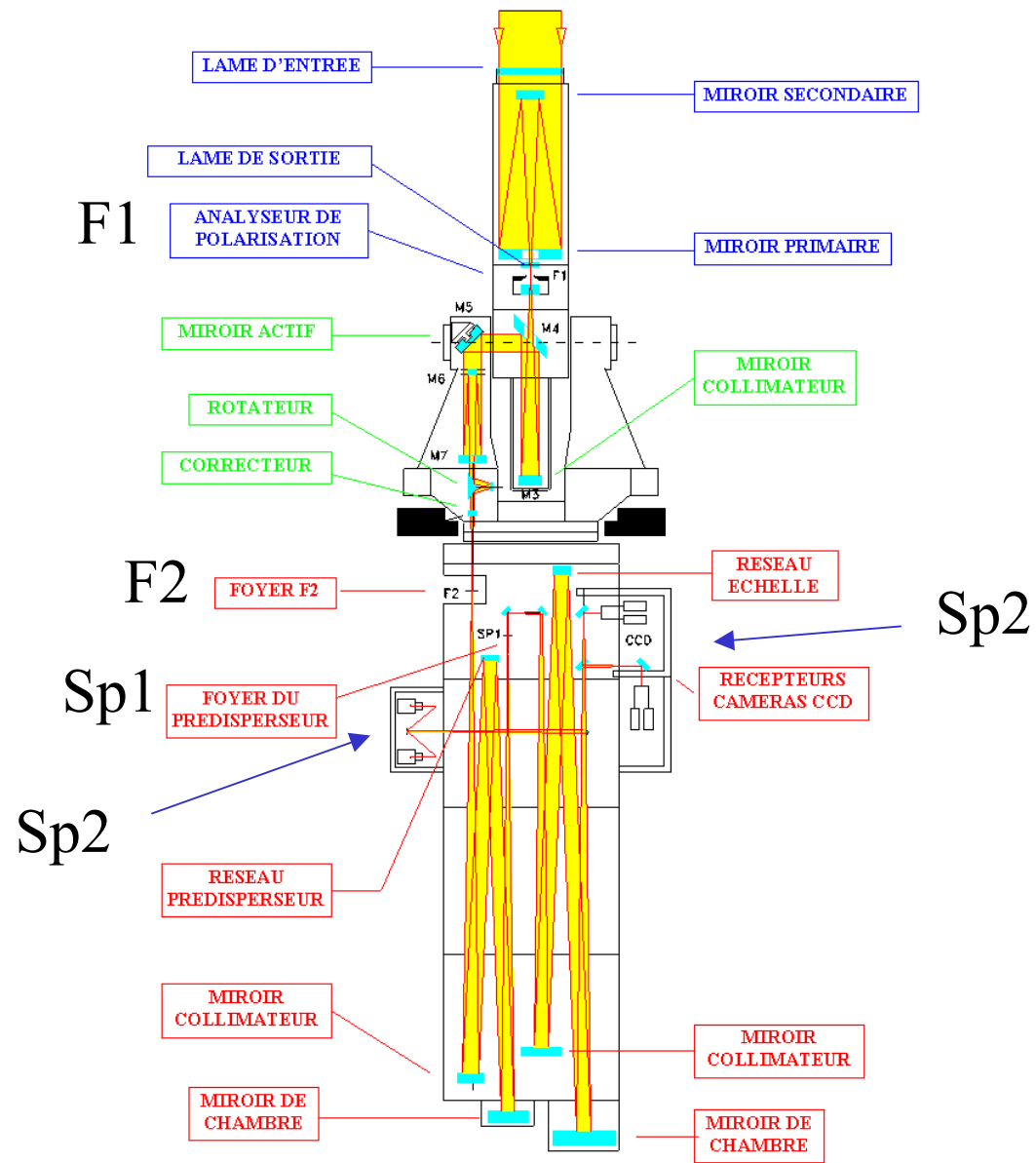












Modes d'observation

- Multi Raies (MTR)

Jusqu'à 10 domaines spectraux simultanés

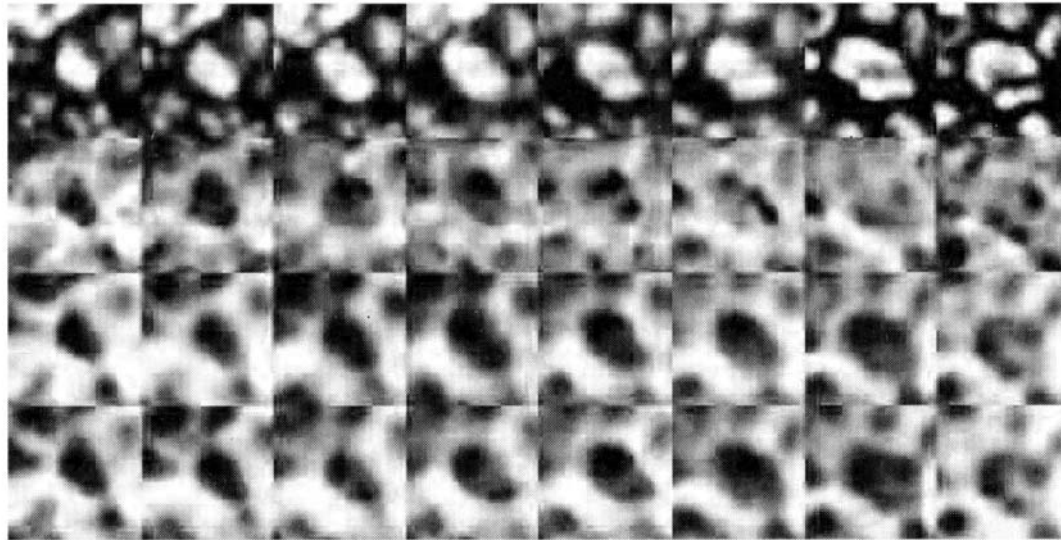
- Double Passage Soustractif Multicanal (DPSM)

Spectro-polarimétrie 2D, 2 raies, 16 canaux par raie

- Italian Panoramic Monochromator (IPM)

Filtre biréfringent et Fabry-Pérot

Exemple d'observation IPM

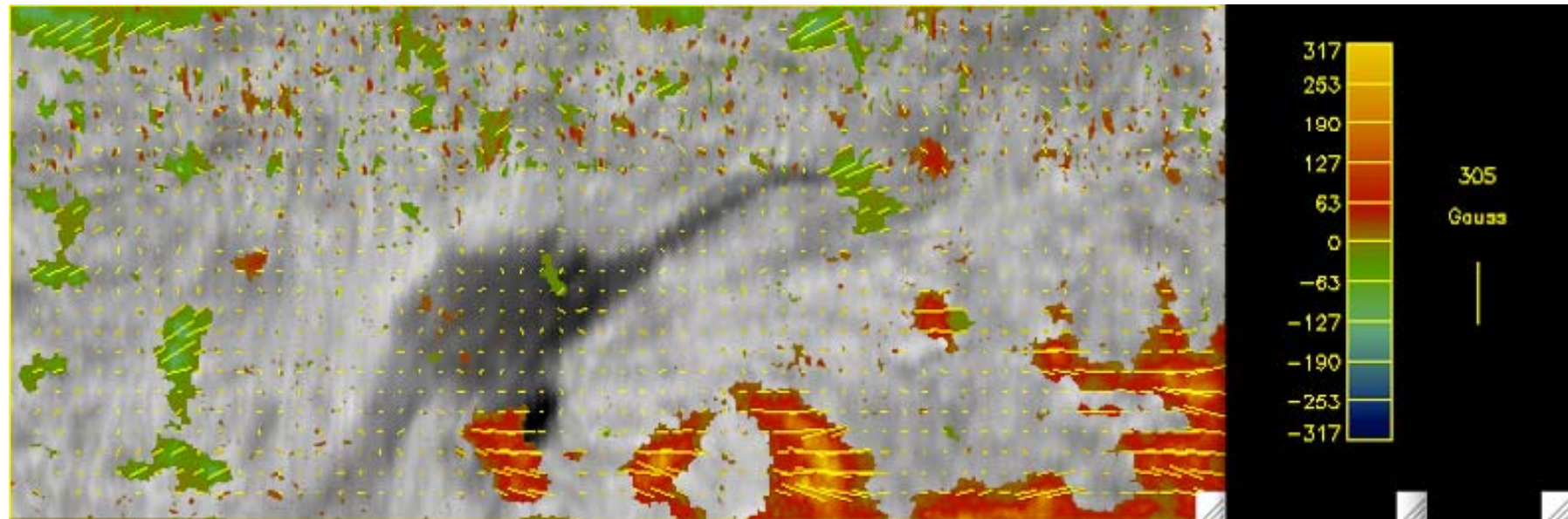


First row: Broad band intensity snapshots of an exploding granule; Last three rows: the velocity field at different wavelengths (heights in the solar atmosphere). The exploding granule shows a strong upward motion (dark area on the velocity images) at its center and a ring-like downward motion is surrounding it (from Berrilli et al. 2002, A&A 381, 253)

Polarimétrie THEMIS / MTR

Carte de champ magnétique vectoriel

V. Bommier



Filament near NOAA 517 active region

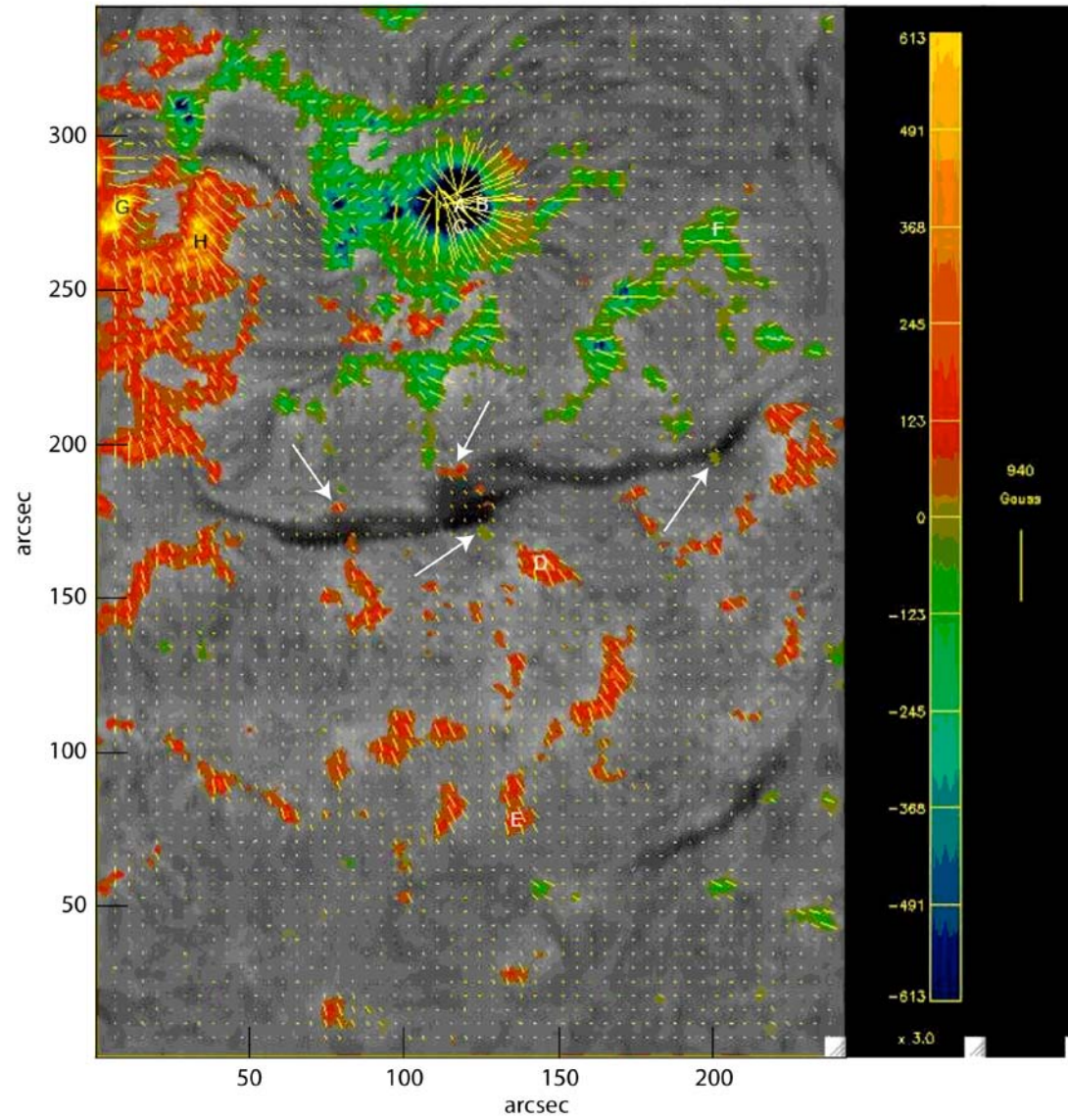


Fig. 1. The map obtained on 7 December 2003 in Fe I 6302.5 Å and composed of 3 superimposed layers. The bottom layer is the $H\alpha$ image; the colored layer displays the longitudinal field, saturated inside the spot, where the maximum field is 3×613 Gauss; the dash layer displays the transverse field, unresolved in orientation due to the fundamental ambiguity. The white arrows point to parasitic polarities at the filament feet. The letters from A to H localize the 8 points where the UNNOFIT inversion code has been applied to test our magnetic field diagnostic method.

La spectropolarimétrie multitraies

J. RAYROLE



Champ B longitudinal (17/08/99)

6150.6 FeI

5247.6 FeI 6302.5 FeI 5250.2 FeI

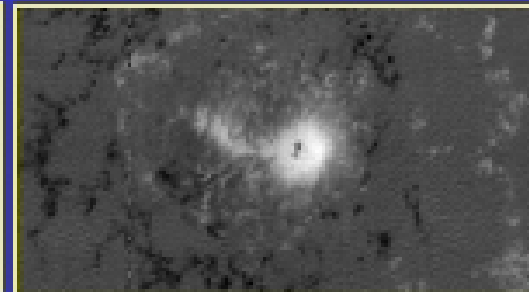
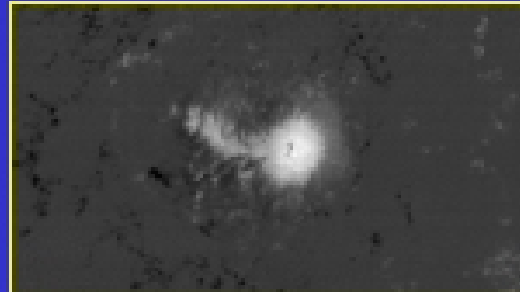
6149.2 FeII 6301.5 FeI 5250.6 OI



Observations du 15/8/99 au

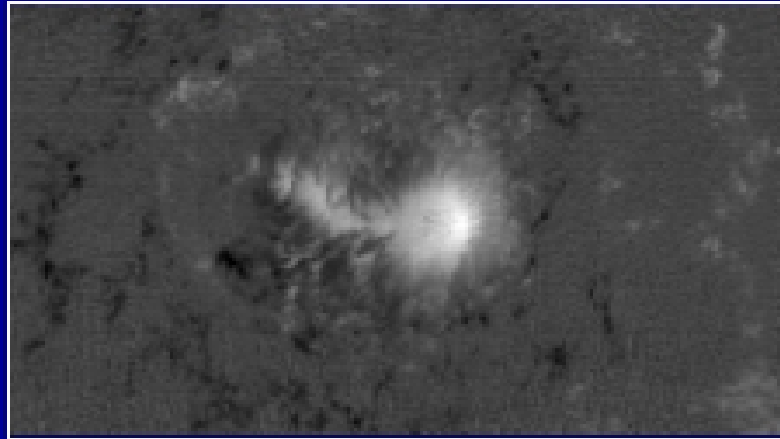
29/8/99

Région active No 8668

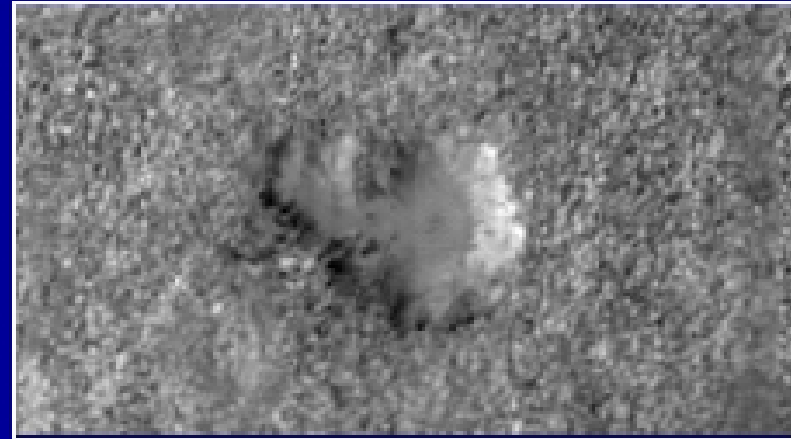


17 Août 1999 - 08:59 TU - RA No 8668 - raie 6302.5 FeI
Gradients de B_{\parallel} et V_{\parallel} dans le domaine d'altitude de la formation de la raie

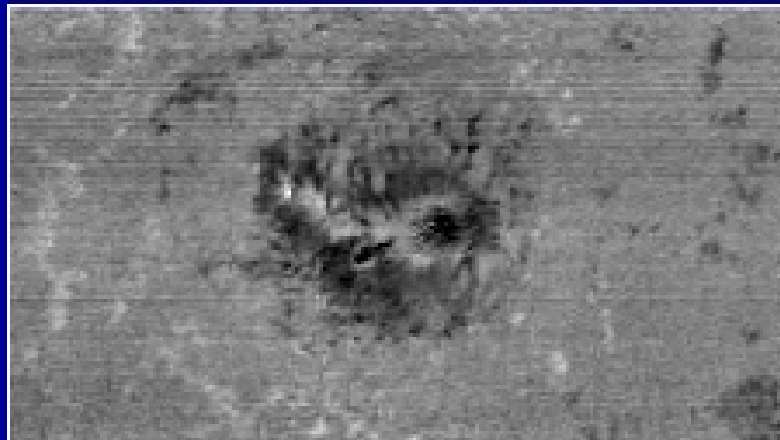
Champ magnétique B_{\parallel} : -823.2 à 2483.9 gauss



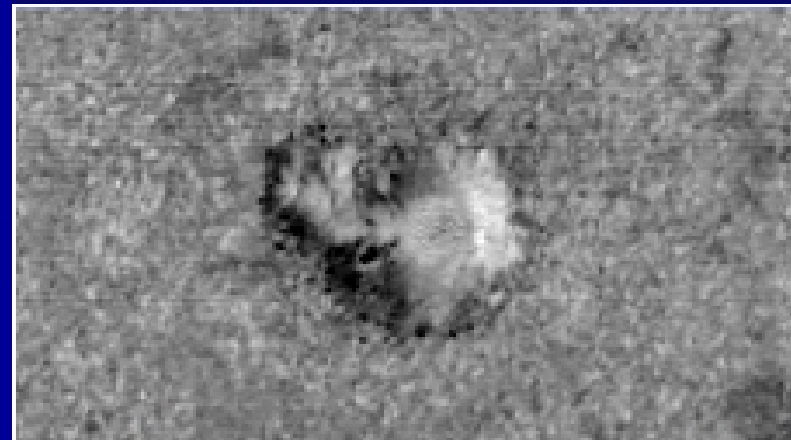
Vitesse radiale V_{\parallel} : -1792 à 2370 m/sec.



Gradient de B_{\parallel} : -200 à +200 gauss

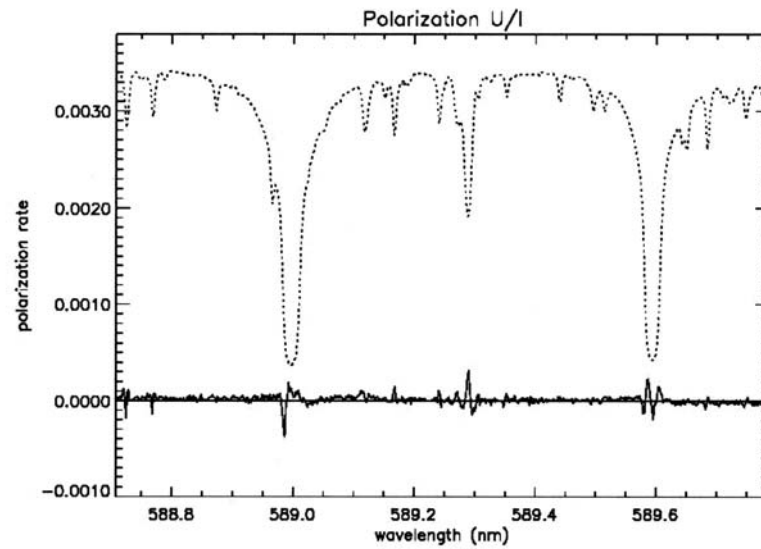
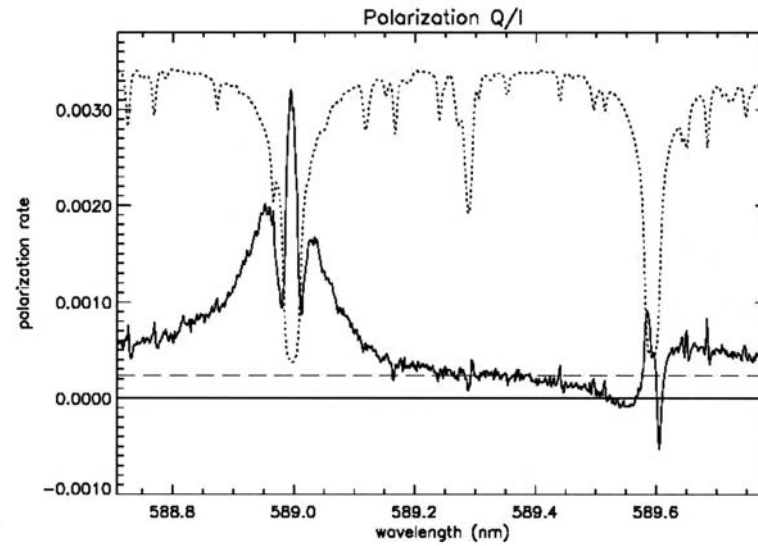


Gradient de V_{\parallel} : -800 à +800 m/sec.

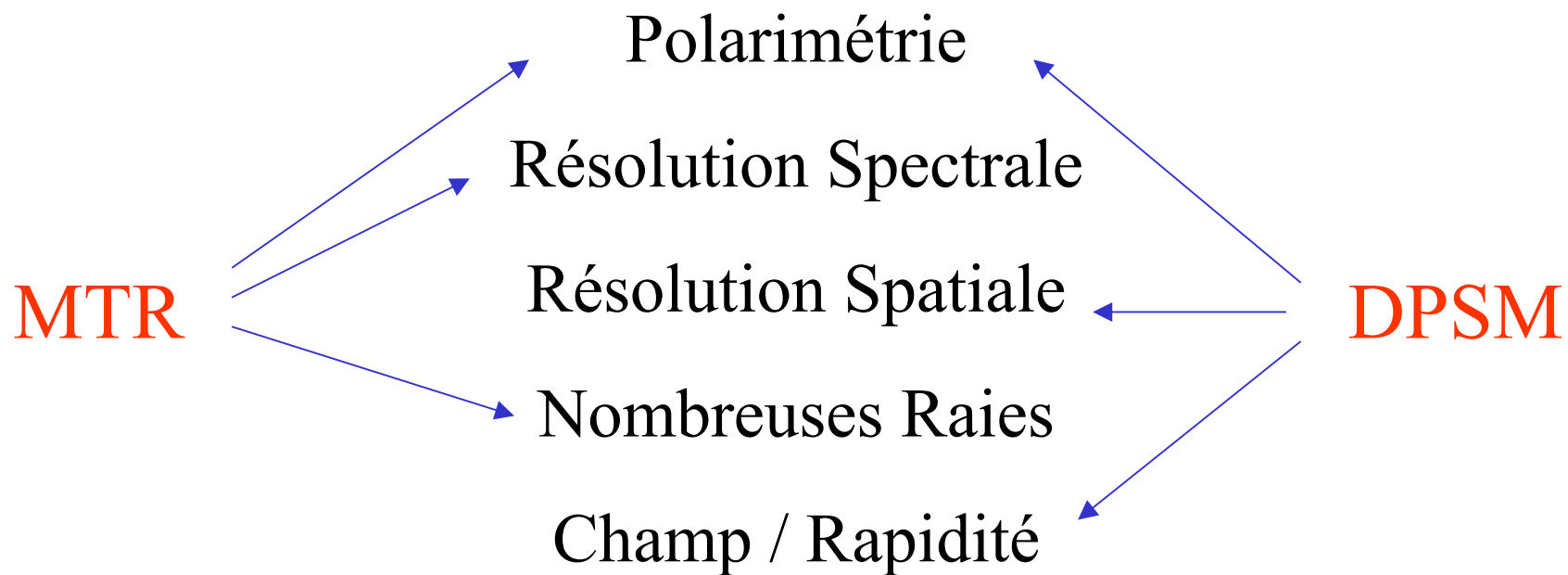


Différence entre fentes de 318 et 168 mÅ

Différence entre fentes de 318 et 168 mÅ



Polarization of the Na I D₁ line at 589.6 nm (from Bommier & Molodij 2002, A&A, 381, 247)



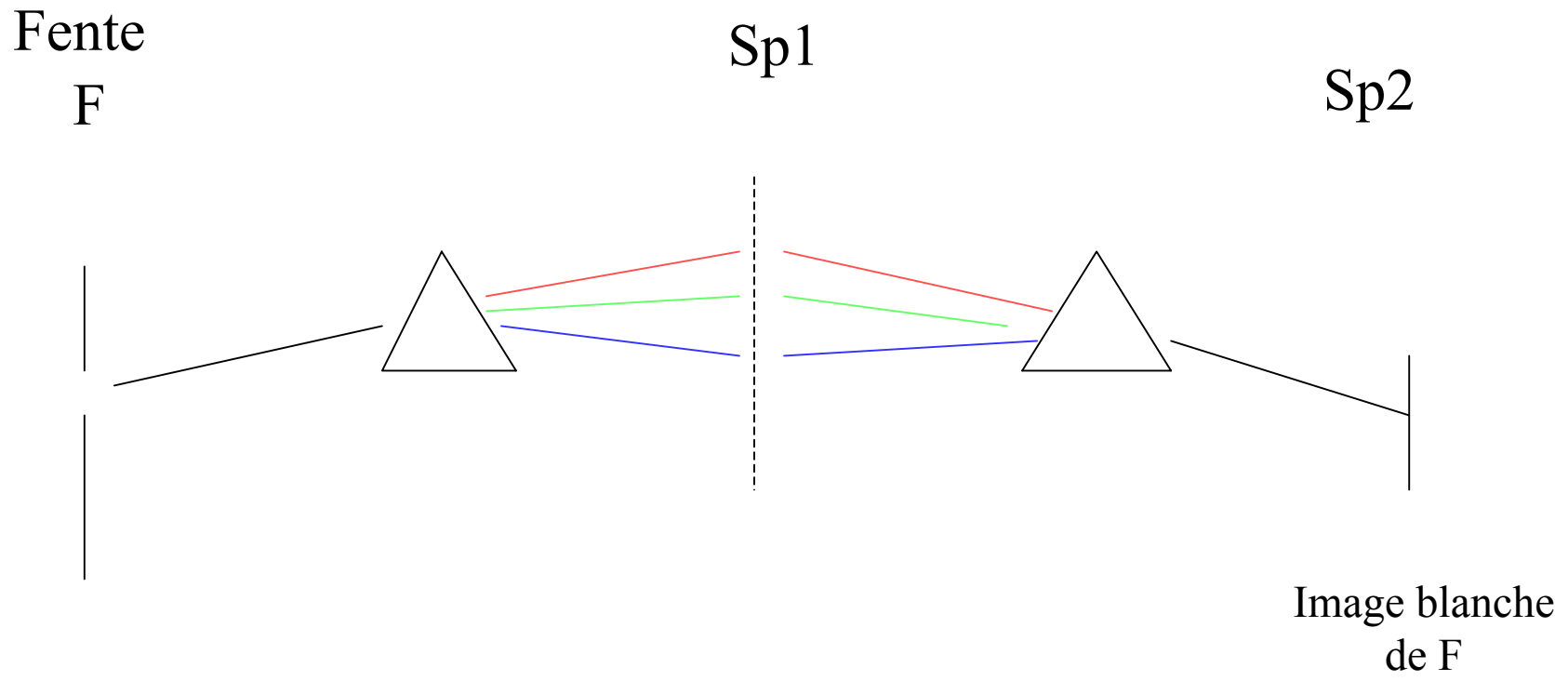
Les **DPSM** (MSDP)

Double Passage Soustractif Multicanal

P. Mein

Tour Solaire de Meudon	1977
Lunette Jean Rösch du Pic du Midi	1981
Vacuum Tower Telescope allemand de Tenerife	1989
Grand Coronographe de Wroclaw (Pologne)	1993
THEMIS (Tenerife, Espagne)	1997

Double Passage Soustractif 1D



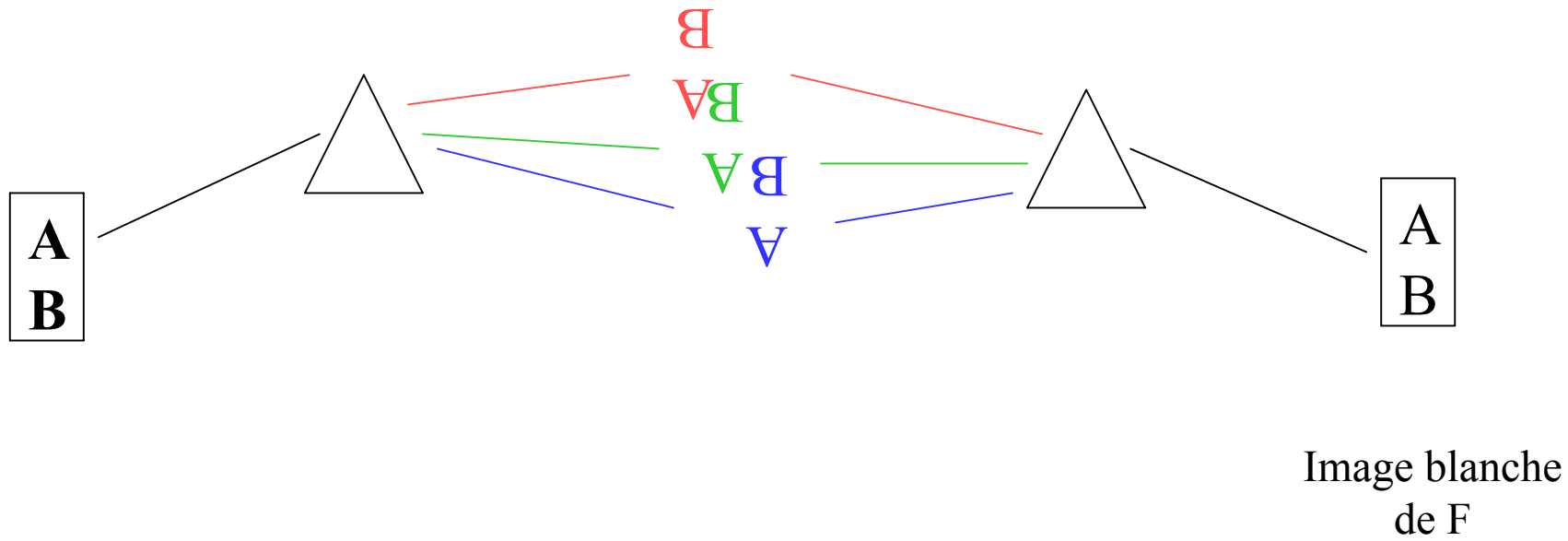
Double Passage Soustractif 2D

Fenêtre

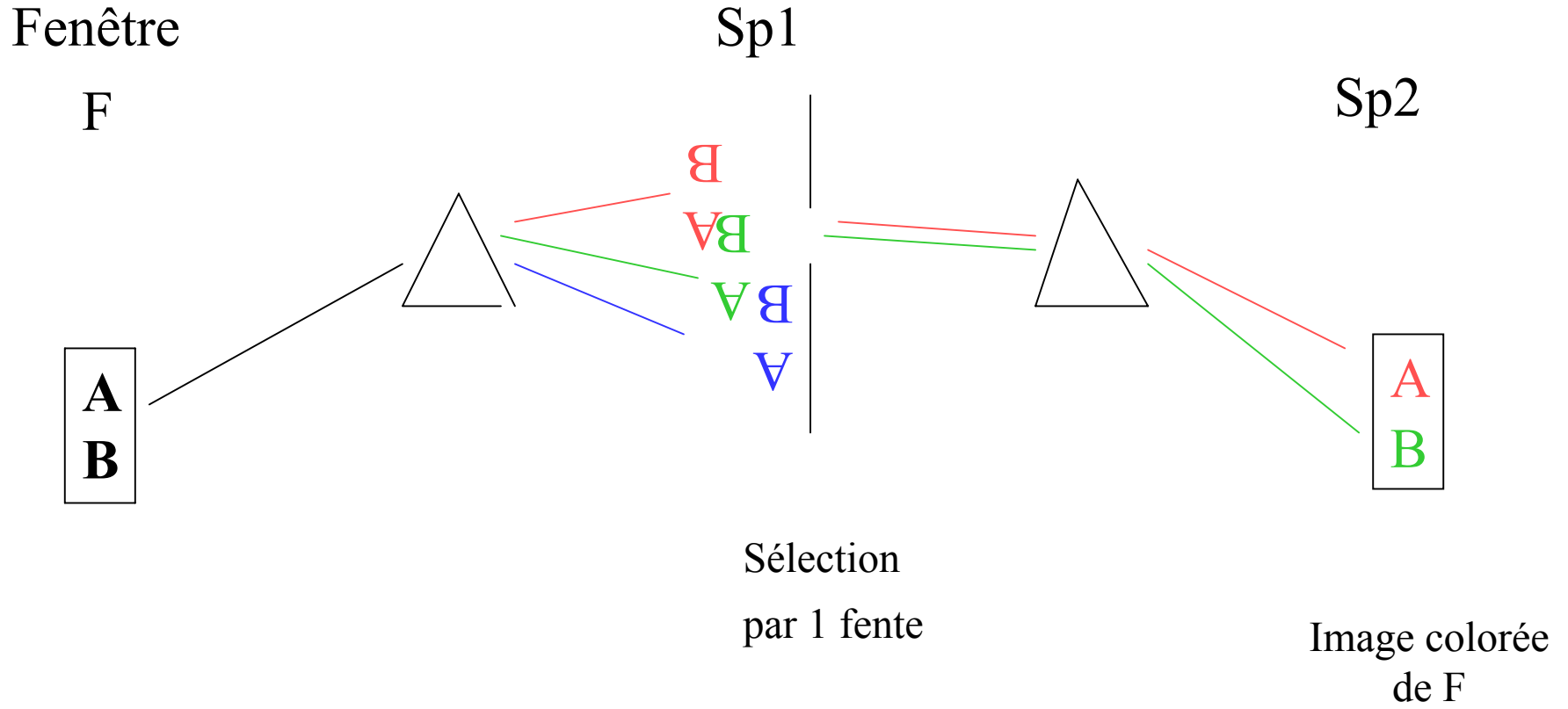
F

Sp1

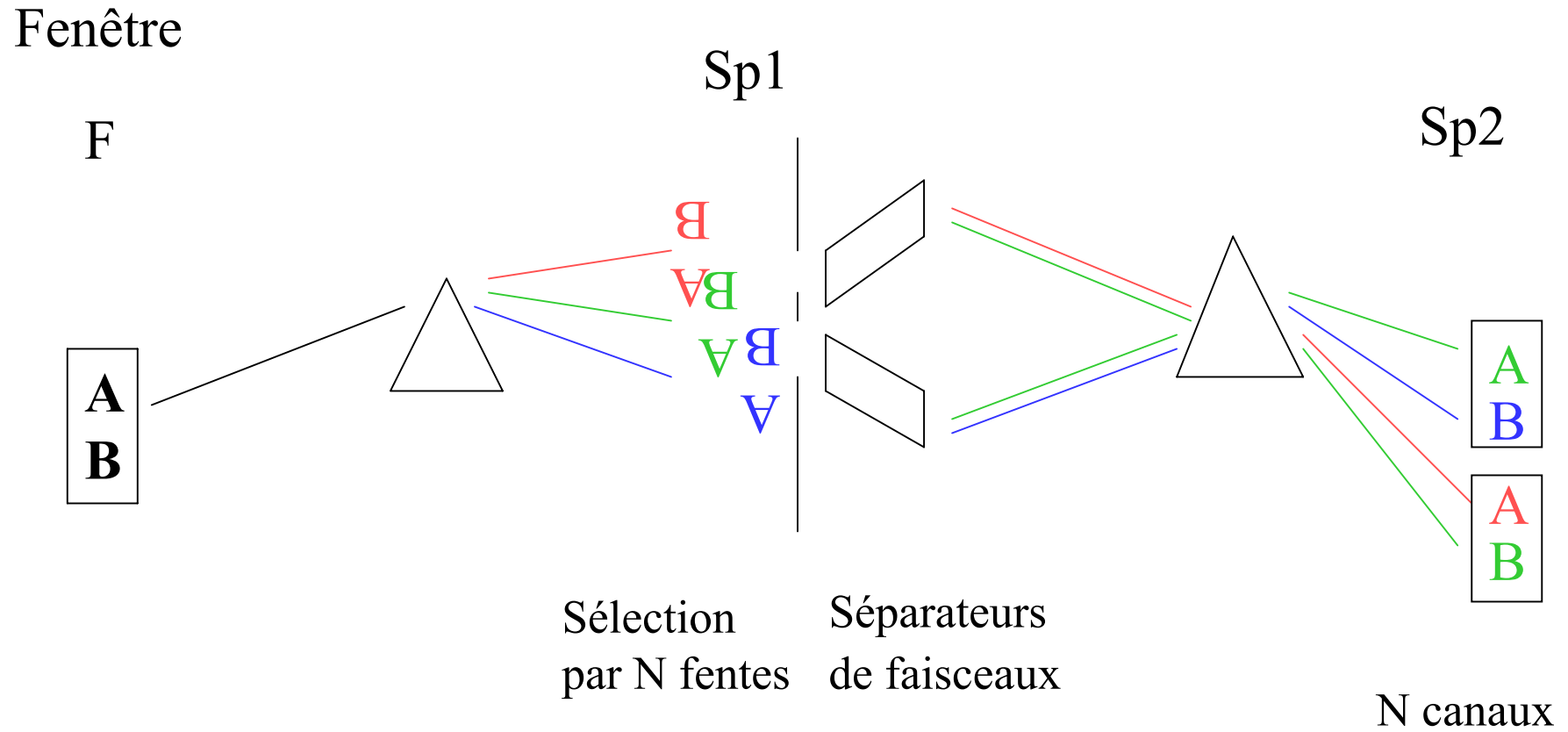
Sp2



Double Passage Soustractif 2D



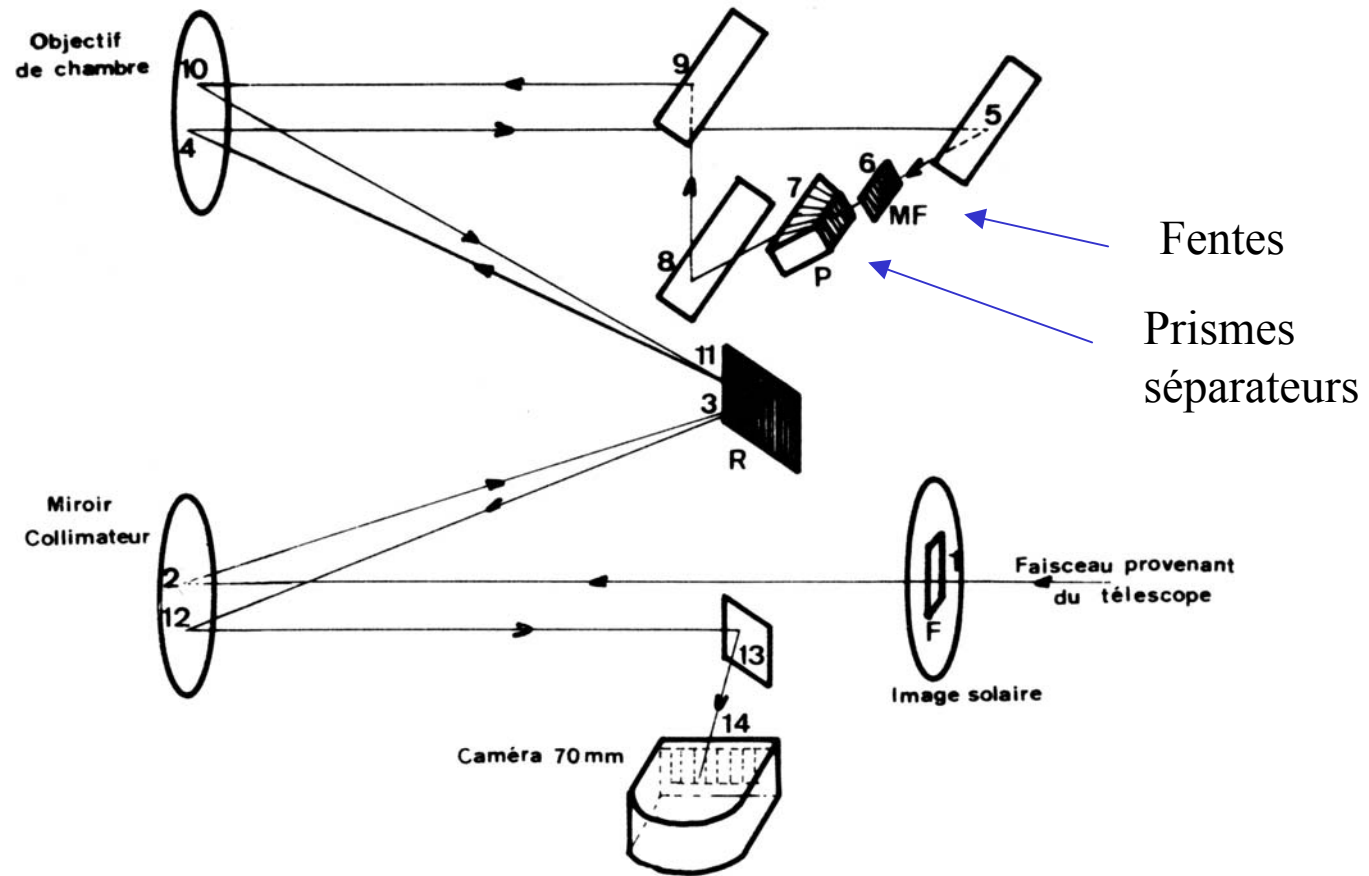
Double Passage Soustractif Multicanal

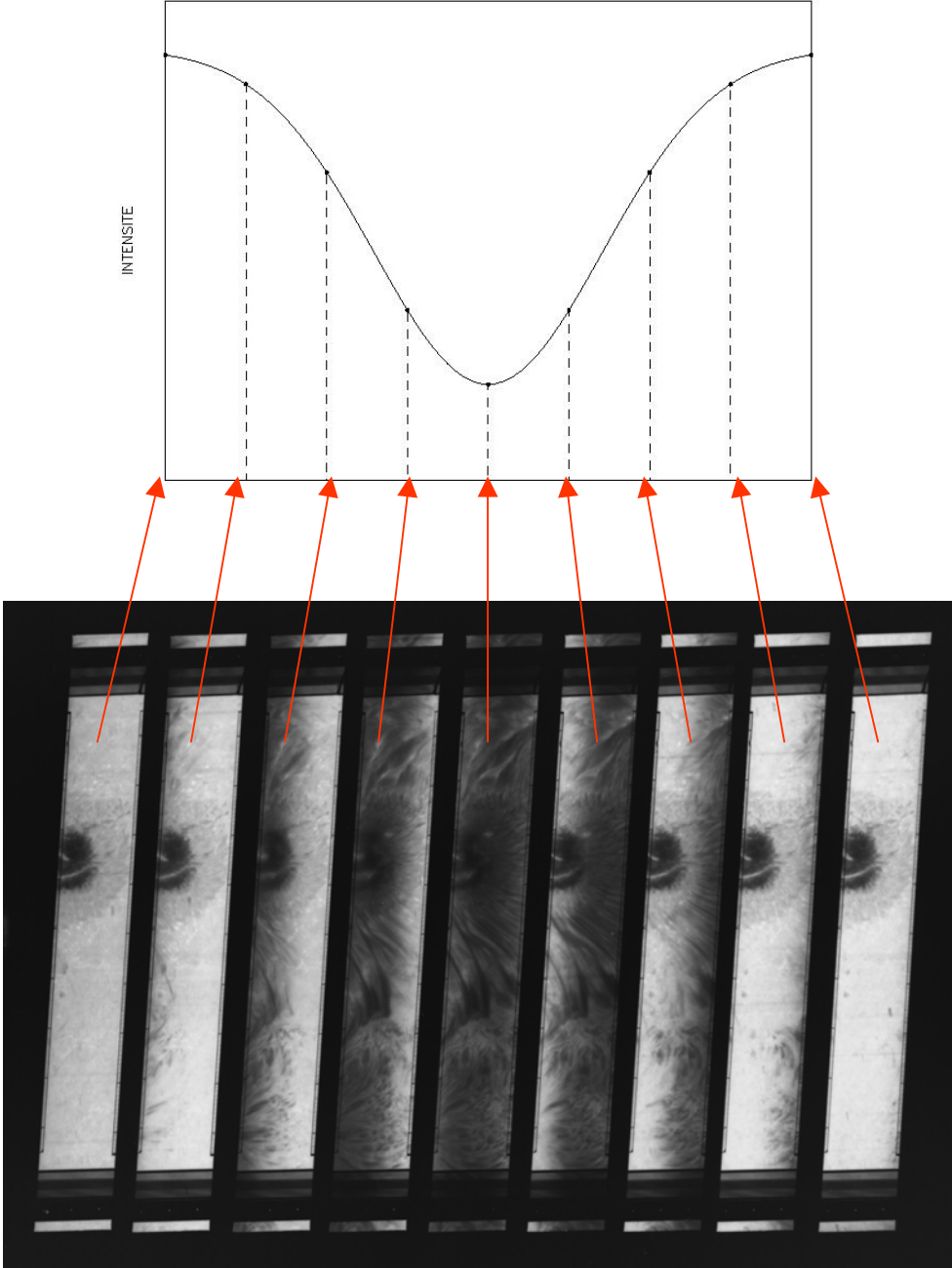


VTT/DPSM, raie $H\alpha$, 19 Mai 1990, image des 9 canaux



DPSM de la Tour Solaire de Meudon

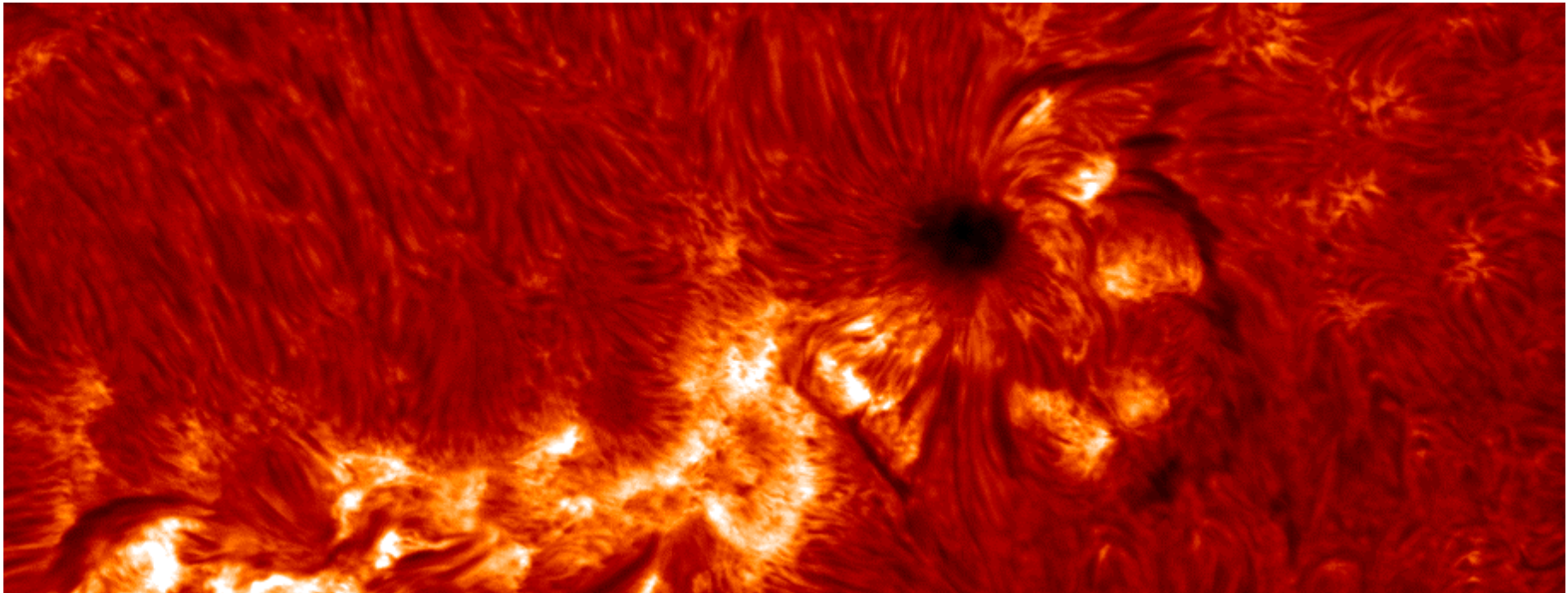




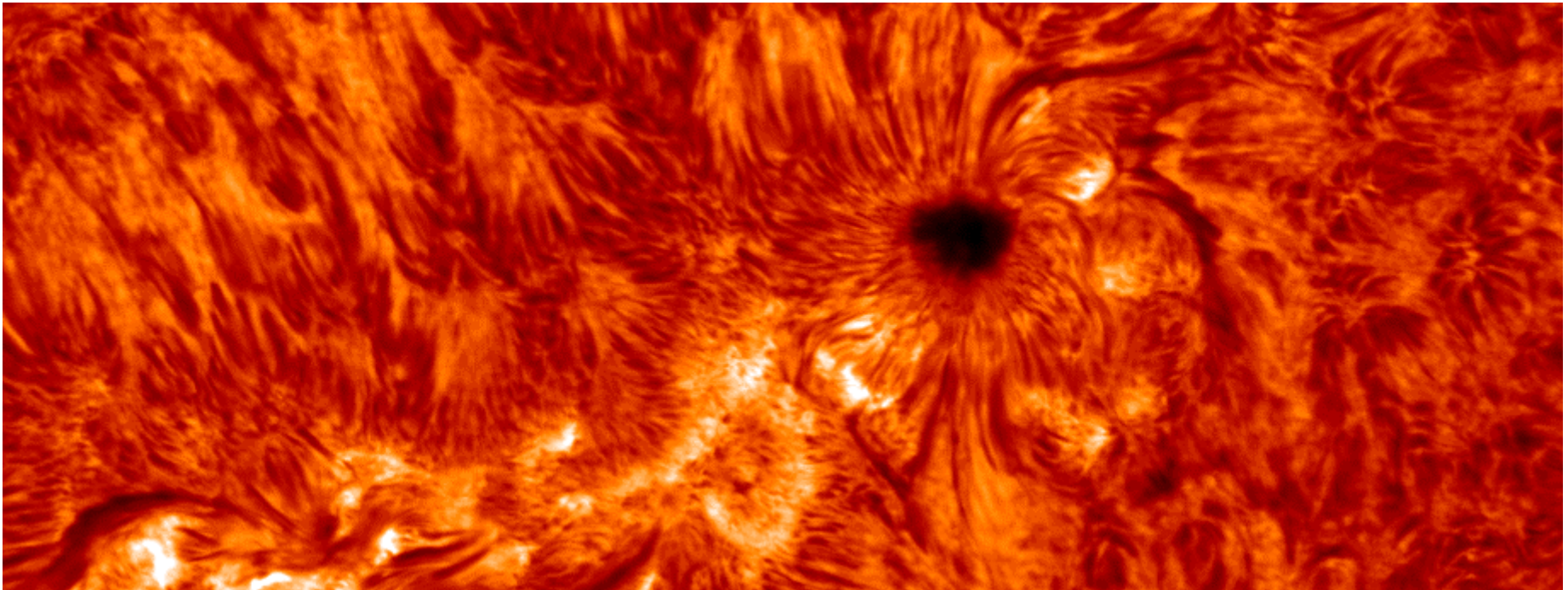
DPSM / VTT

Raie $H\alpha$

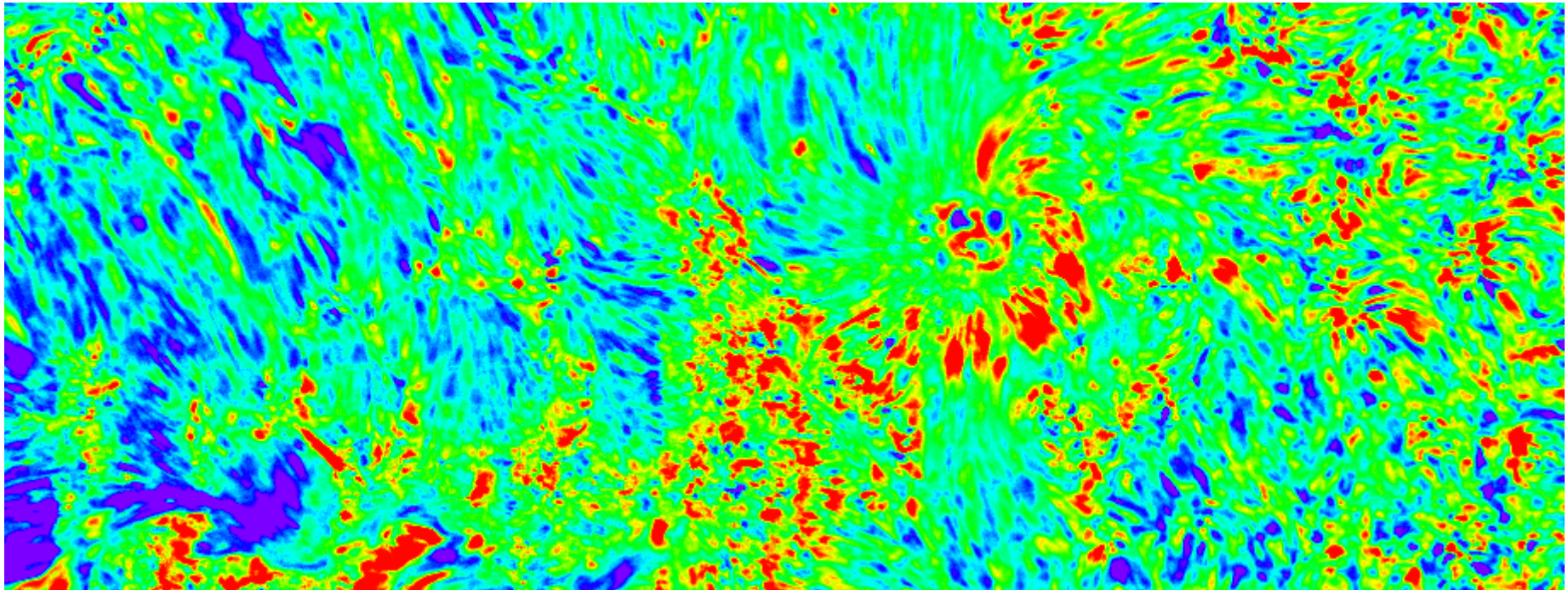
Intensité centre raie



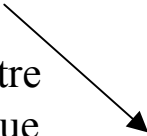
Intensité +/- 0.29 Angst



Vitesse +/- 0.29 Angst



Centre
disque



Lunette Jean Rösch au Pic du Midi

Malherbe J.-M., Meunier, Müller R., Rondi S., Roudier Th., Coutard Ch.



UNIVERSITÉ
PAUL
SABATIER



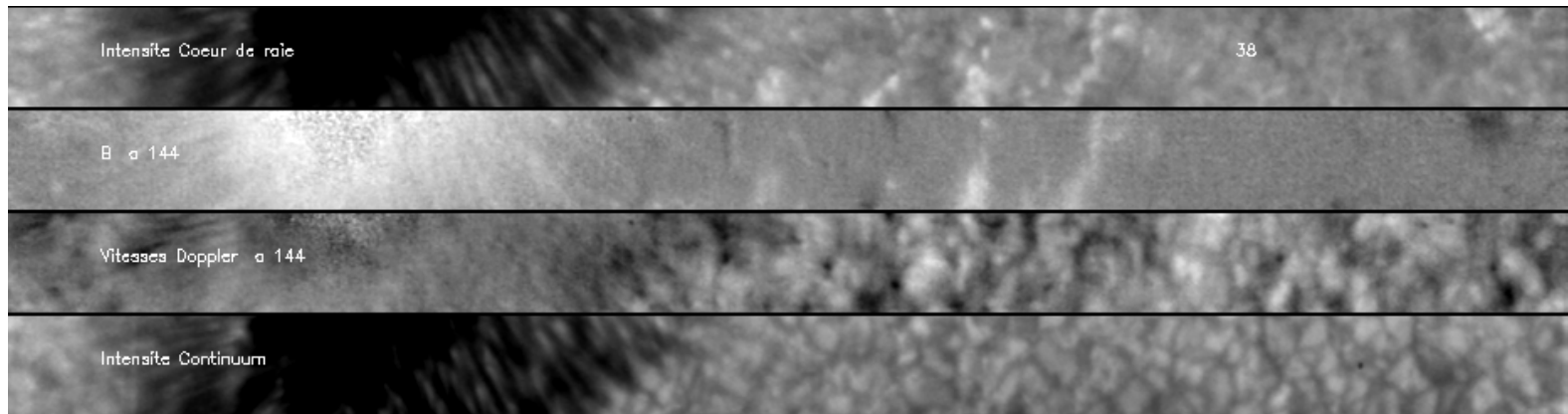
TOULOUSE III

DPSM / LJR

Polarimétrie (images successives)

Polarimétrie raie Na D1

(1)



(2)

(3)

(4)

- observations successives I+V et I-V

- recalage

- profil de raie en chaque point

- en chaque point:

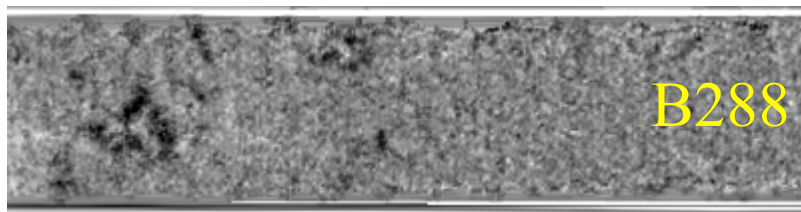
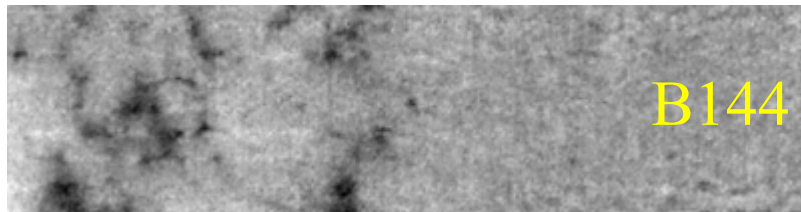
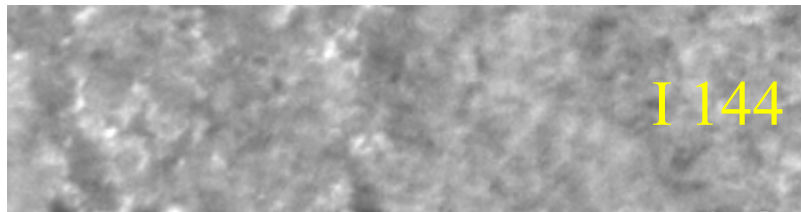
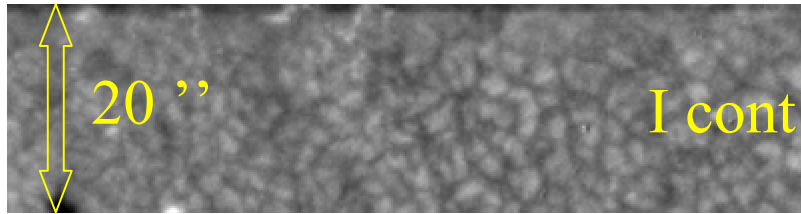
intensités centre raie et continuum (1 et 4)

décalage Zeeman (2)

décalage Doppler (3)

DPSM / LJR

Quantification des concentrations de champ magnétique



région magnétique

région calme

La spectro imagerie permet un diagnostic en altitude

à 144 mA (basse chromosphère):
Points brillants dans la raie

à 144 mA (basse chromosphère):
 $\langle B \rangle = -420 \text{ G}$ $\langle V_{//} \rangle = -590 \text{ m/s}$

à 288 mA (haute photosphère):
 $\langle B \rangle = -630 \text{ G}$ $\langle V_{//} \rangle = -950 \text{ m/s}$

THEMIS / DPSM

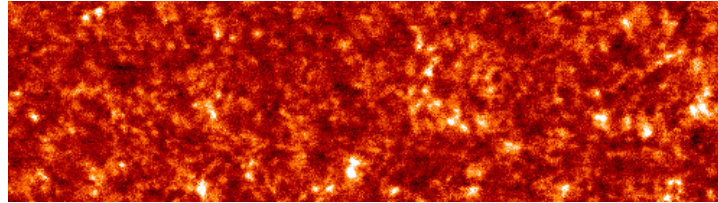
Granulation velocity field

Vertical dynamical structure

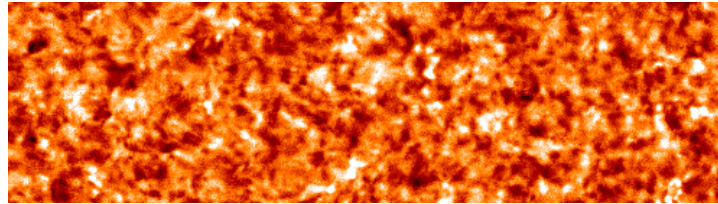
Sodium D line, 8 Sept 2000, 150''×40''

Malherbe, Roudier

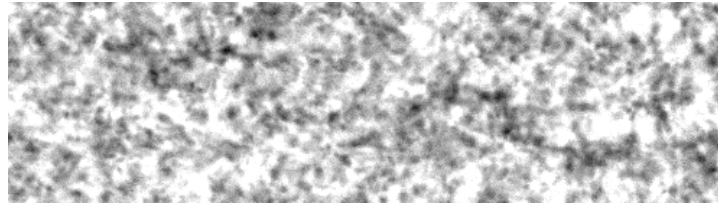
I_0



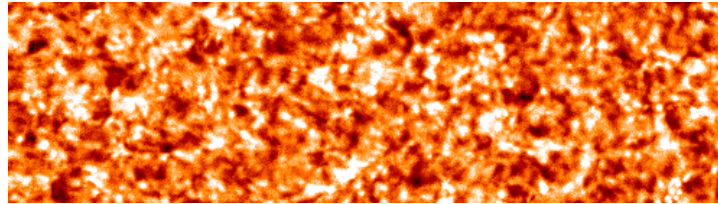
$I_1 (\pm 0.16 \text{ \AA})$



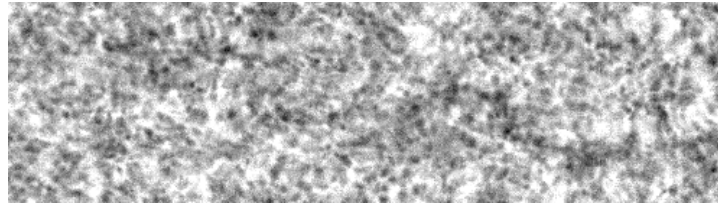
velocity_1



$I_2 (\pm 0.32 \text{ \AA})$



velocity_2



THEMIS / DPSM

Evènements rapides: ondes dans les taches

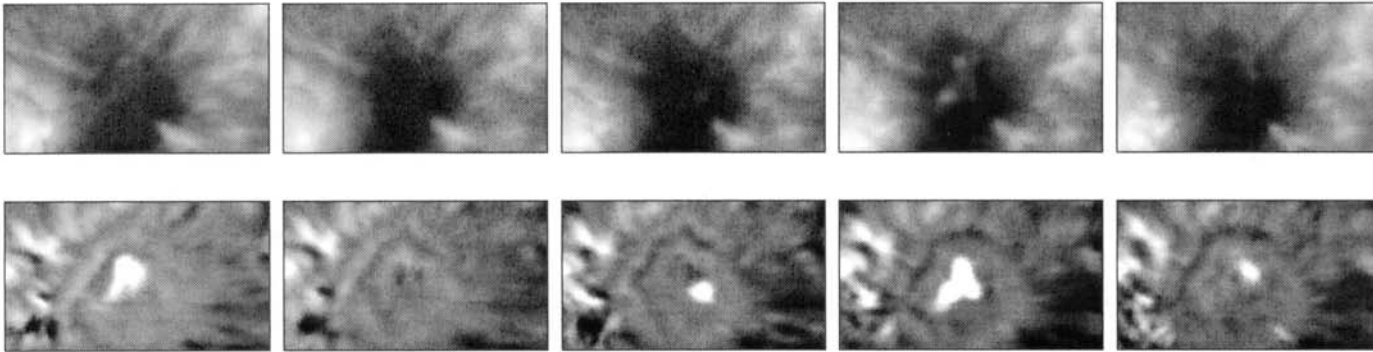
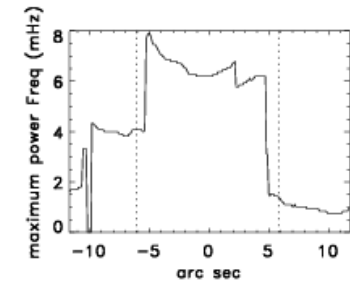
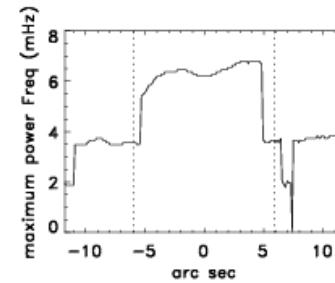
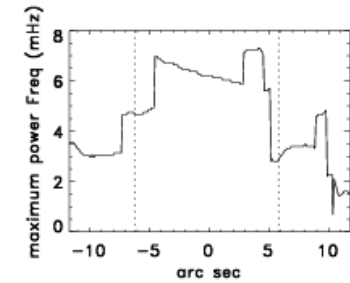
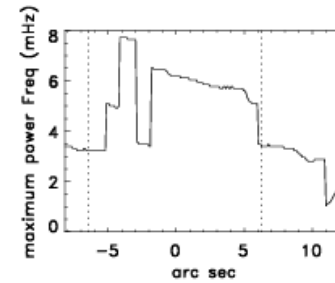
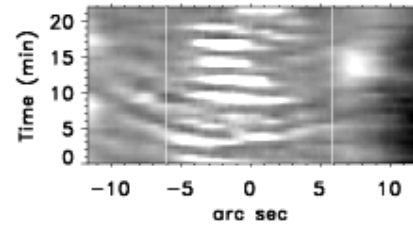
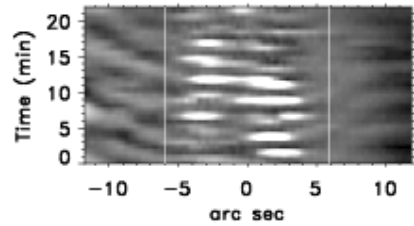
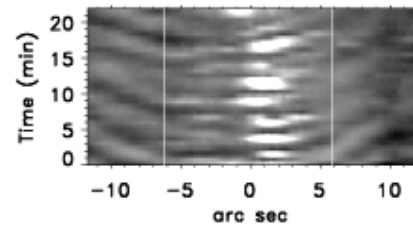
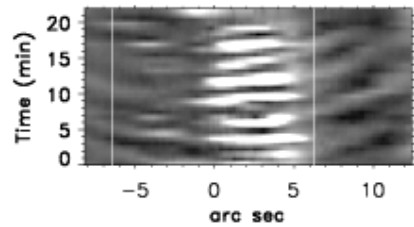


Figure 2. A sequence of five intensity (first row) and Doppler shift images (second row) of a sunspot which was observed with a cadence of 46 s. The field of view is 39.15×22.20 arcsec. Both intensity and Doppler shifts were calculated at ± 0.12 Å from the line center of the CaII 8542 Å line.

Fast events

Sunspot oscillations

Power spectra of umbral flashes and penumbral waves
CaII 8542 Å, 21 Aug 2000, step 46s (Stokes I,V)
Tziotziou et al., 2002, A&A 381,279.



THEMIS / DPSM

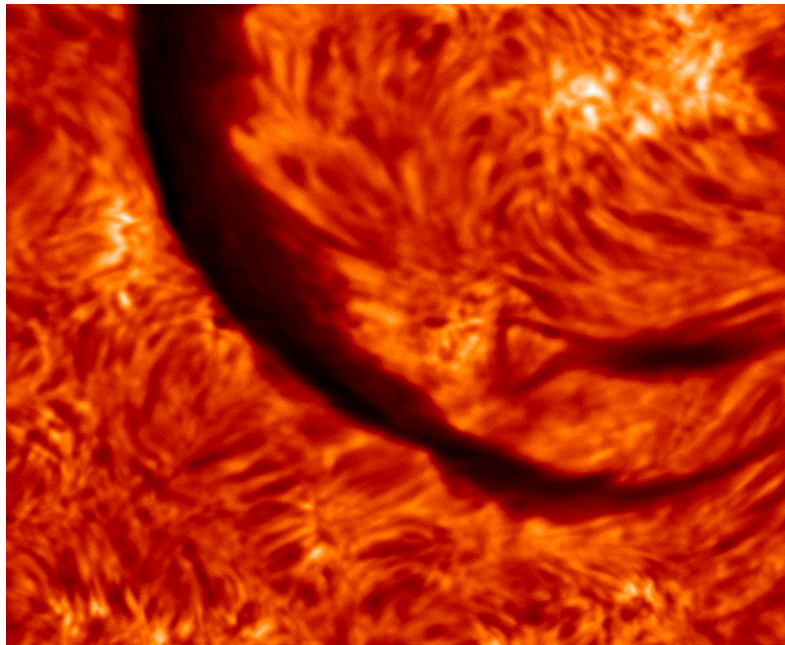
H α Filaments and Mottles

Dynamical evolution (30s time step)

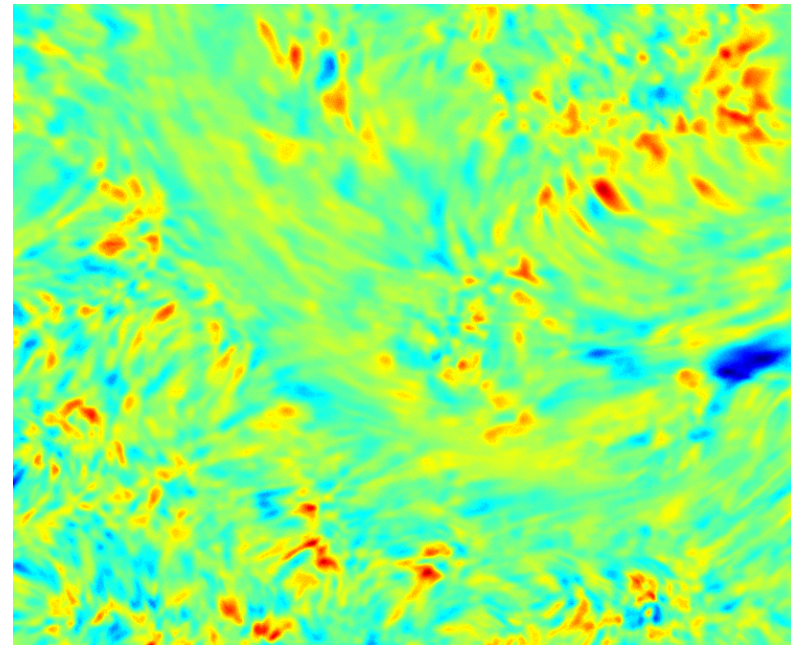
14 May 2000

Regnier thesis

Intensity



Doppler velocity



DPSM / THEMIS

Polarimétrie (images simultanées)

- 16 canaux alternés
- Grille au premier foyer devant Analyseur et Séparateur

Foyer Sp1

Foyer Sp2

Foyer F1

2

K. TZIOTZIOU *et al.*

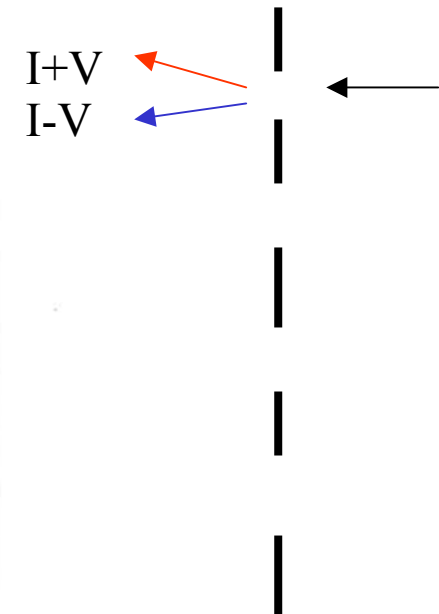
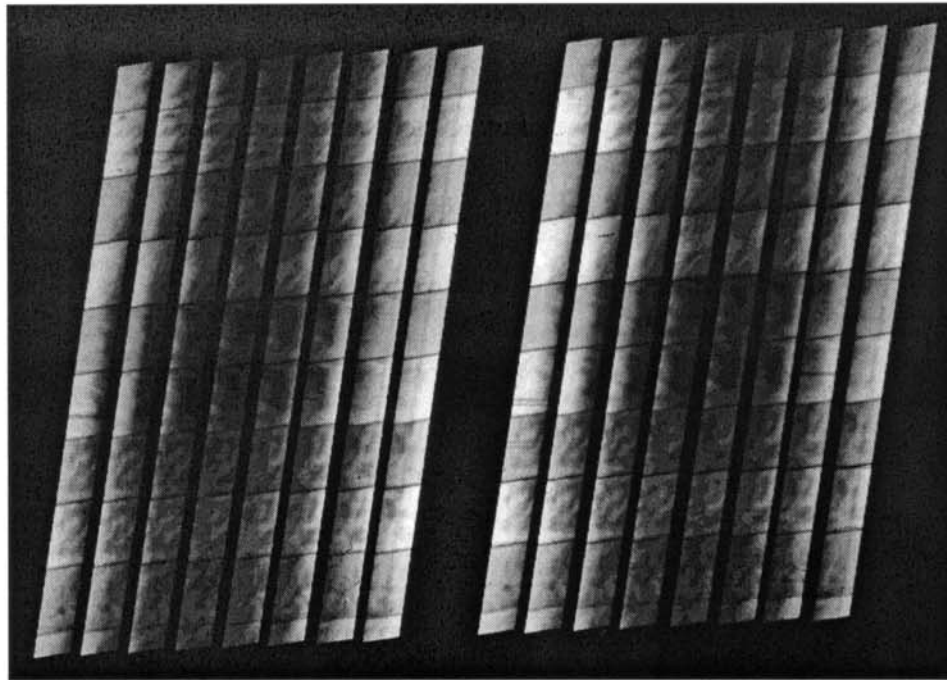
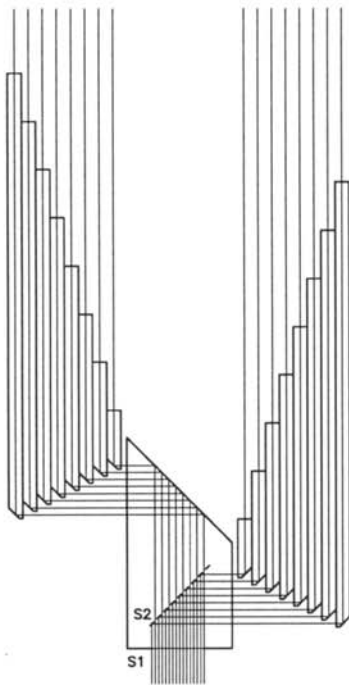
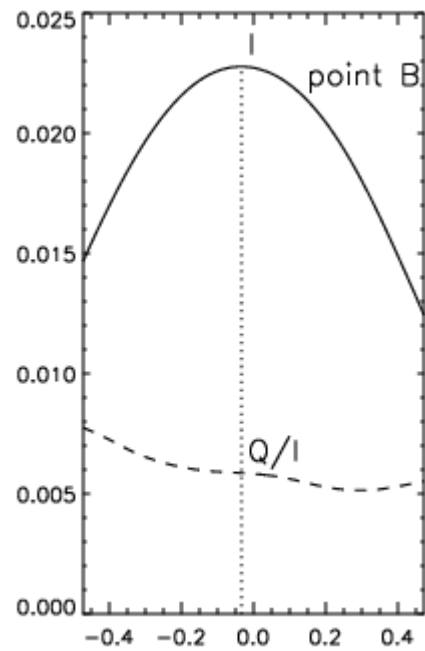
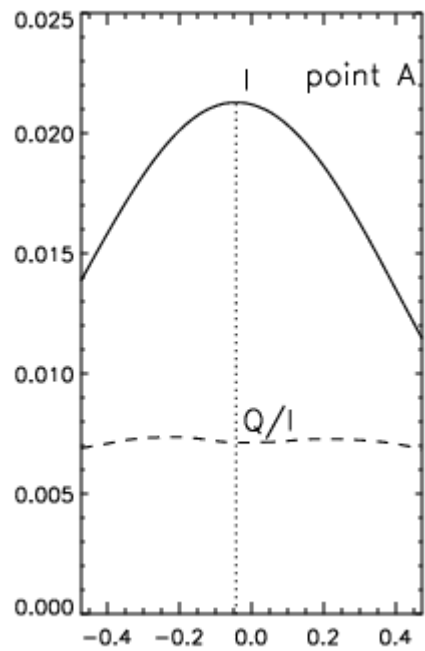
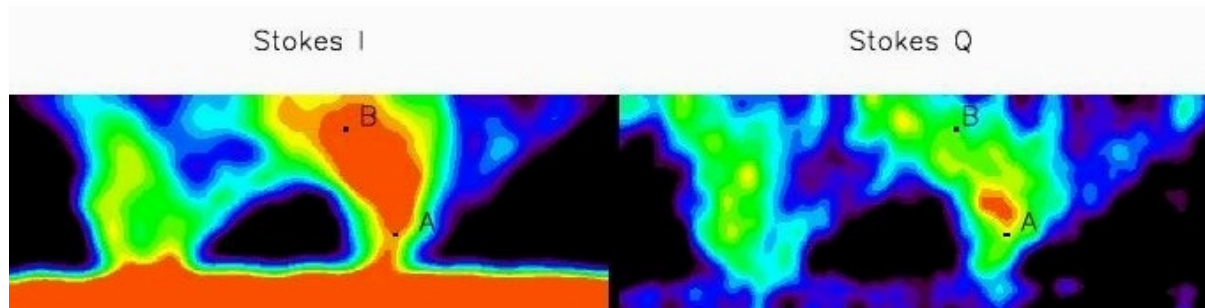


Figure 1. Left part: Schematic overview of the MSDP beamshifter where S1 and S2 represent multiple slits used for wavelength selection. Right part: An MSDP image as it is recorded on the CCD camera.

DPSM / THEMIS

Polarimétrie des protubérances

a) Protubérance H α du 18 juillet 2004-09-04

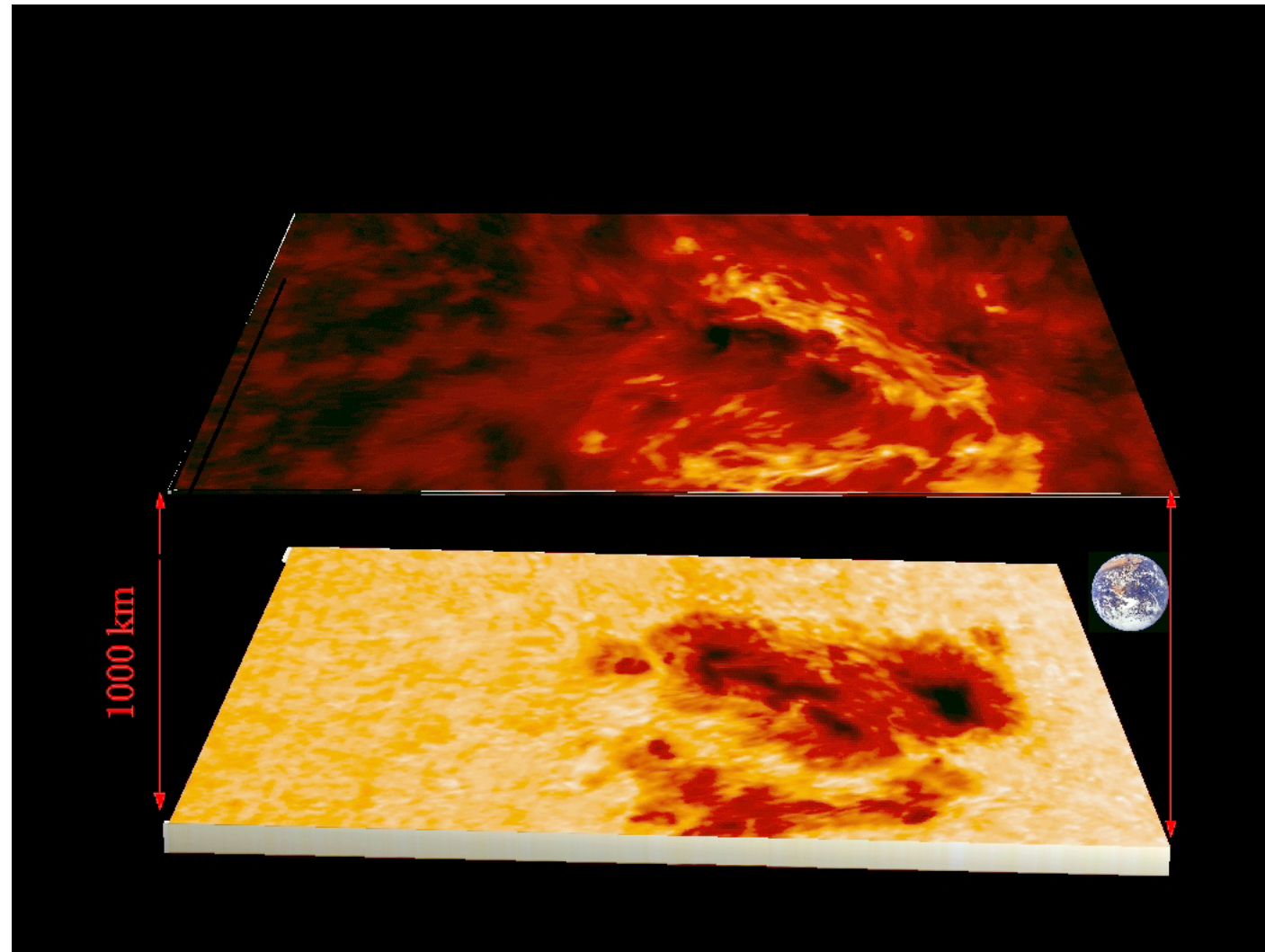


THEMIS / DPSM

Raies différentes = Altitudes différentes

8542 CaII

5896 NaD1



Eruptions Solaires - Observations multi-longueur d'onde

Data: 22-Oct-2002, M1.0 flare at 15:29 UT
Berlicki et al., A&A, 423, 1119 (2004)

