Remarks on the History of SUMER and Indications of a Two-photon Emission from the Sun

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Introduction

- Ian Axford's support of a normal-incidence VUV spectrometer on SOHO.
- 24 September 1986, 09:00 at Verrières: Discussion with Alan Gabriel and Philippe Lemaire on optical design options and cooperations. Traffic jam on Boulevard Périphérique. Alan a few cars in front of me.
- SUMER meeting 14–16 January 1987 with our coats on. Werner Curdt and Hans-Jürgen Meyer made it all the way from California to Paris airport, but, because of the weather situation, not to Verrières.
- CDS/SUMER proposal preparation, 23 and 24 April 1987, Paris Observatory (famous scientists looked at us).
- July 1987, initial SUMER proposal: PL and KW Co-PIs.
- January 1988, revised SUMER proposal: Lindau took on more tasks and KW PI.
- Christian Becker died on 6 January 1991.
- Turbulent times with MAMA and XDL detectors.

Viewgraphs and Comments

1. SUMER investigators.
2. Utu and Enmerkar.
3. Zikkurat.
4. Optical diagram with aperture-stop options.
5. Final optical design: Lyot stop, pre-slit, more radiation traps and baffle vanes, and rear-slit camera.

(•) Objections by eminent solar physicists:

- Slit focussing not possible with fixed distance between telescope mirror and collimator.
  Answer: sensitivity on collimator side much less than on telescope side.
- The coma of the paraboloid primary mirror results in limited FOV.
  Solution: telescope scan-mechanism design.

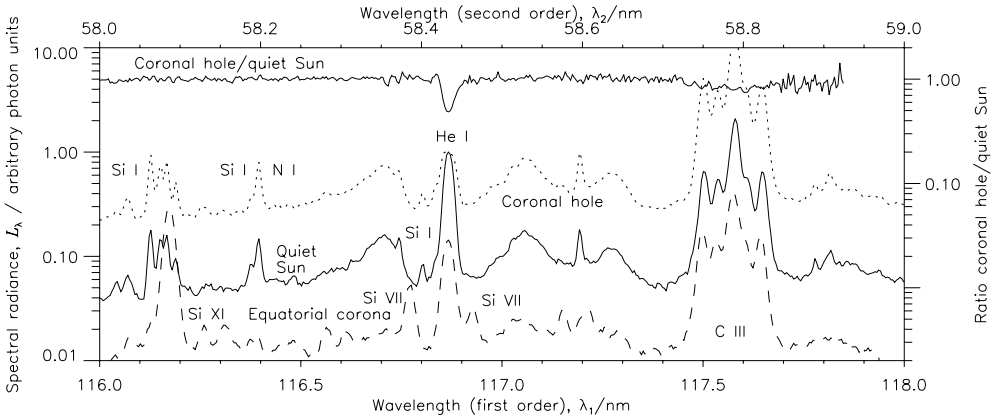
6. Full Sun in C IV
   - Raster scans of the full Sun will not give reliable irradiance values: achieved 10 % to 15 % relative uncertainty (verified by comparison with SOLSTICE).
   - Contamination problems will lead to rapid loss of responsivity for NI optics.
     Solution: procedures resulting in extreme cleanliness (note the changes during SOHO attitude loss).
7. Dirt generator.
8. SOHO in cleanroom.
9. Radiance variations (solar effects and those after loss of attitude).
   - Gain variations of MCP will not allow maintaining a radiometric calibration.
     Solution: work in saturation and with threshold.
10. SOHO Calibration Book
    SUMER: 15 % relative uncertainty, 30 % after loss of SOHO attitude.
11. O II/O III multiplet

- A pixel resolving power of max. $\lambda/\Delta\lambda = 80/0.002 = 40\,000$ would not permit Doppler velocity measurements down to 1 km/s considering that $c_o = 300\,000$ km/s.
  Answer: line shifts can be measured with sub-pixel precision (≈ 1 km/s achieved).

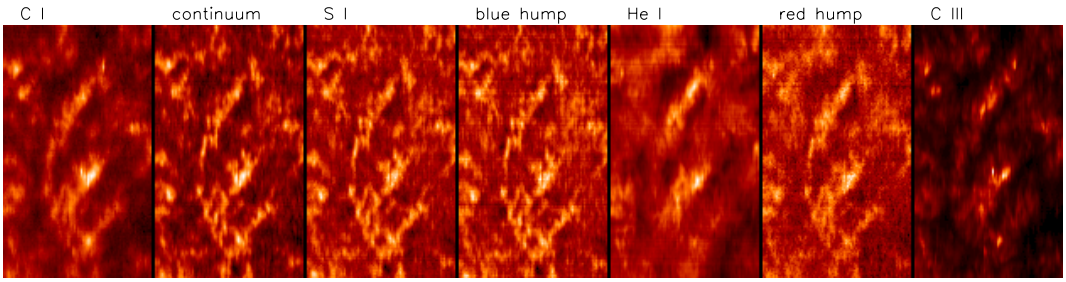
12. Outflow in coronal hole seen in Ne VIII.

- Most off-limb observations would be dominated by scattered radiation.
  Answer: spectra show many coronal lines.

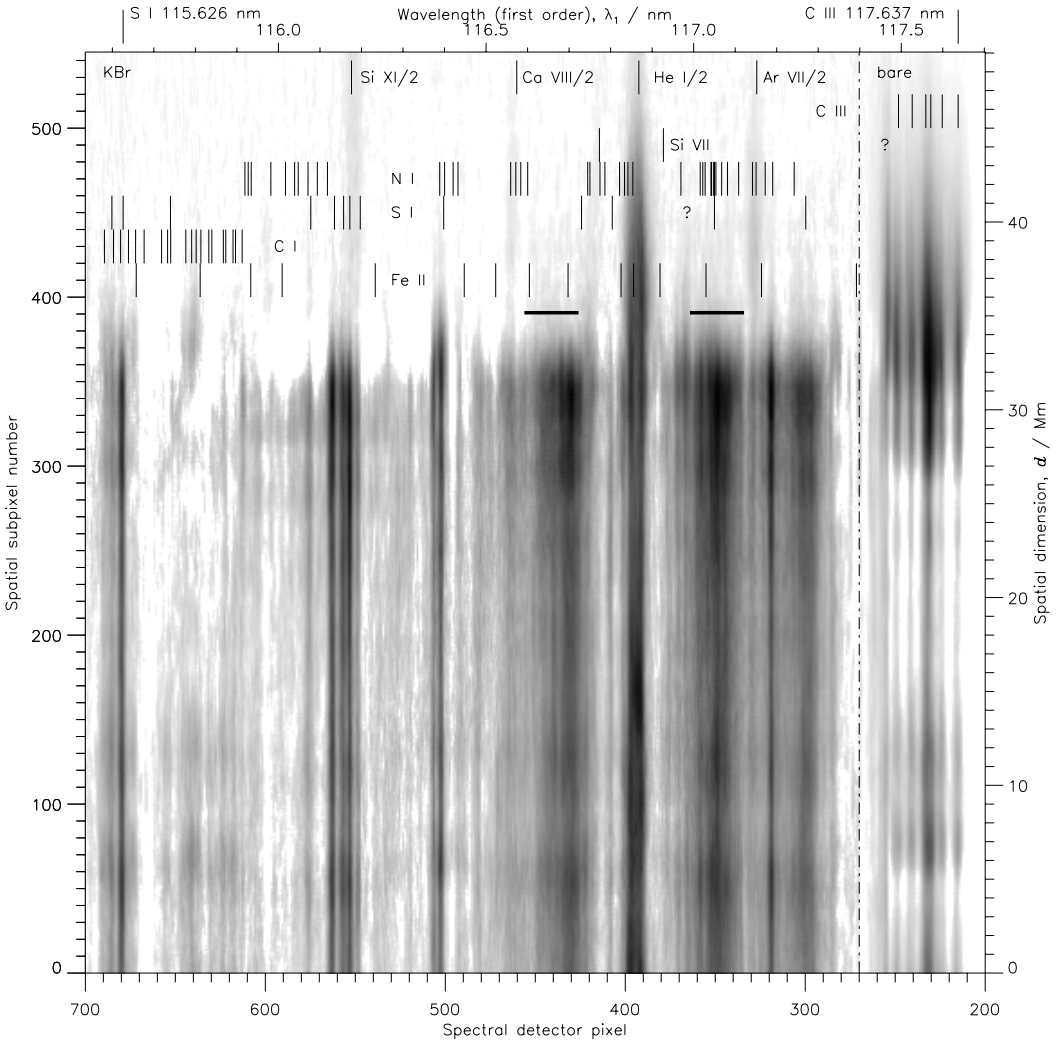
13. Two-hump spectrum near He I 58.4 nm line in the second order.



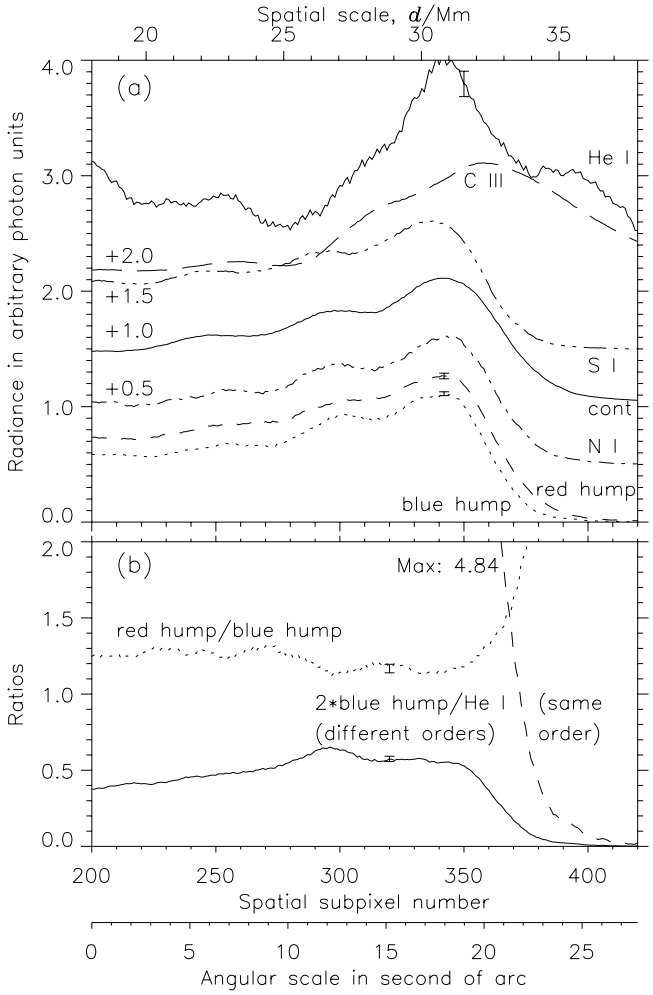
14. Maps of the chromospheric network in the selected ranges.



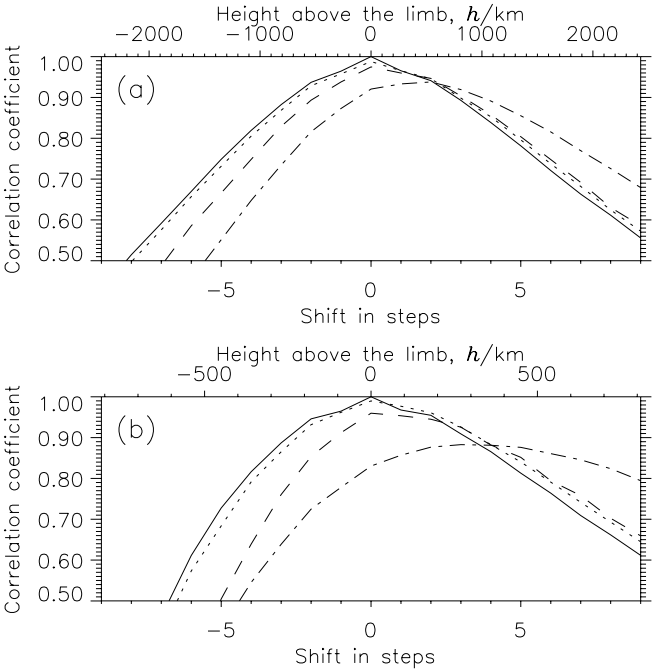
15. Stigmatic spectrum with spatial sub-pixel resolution.



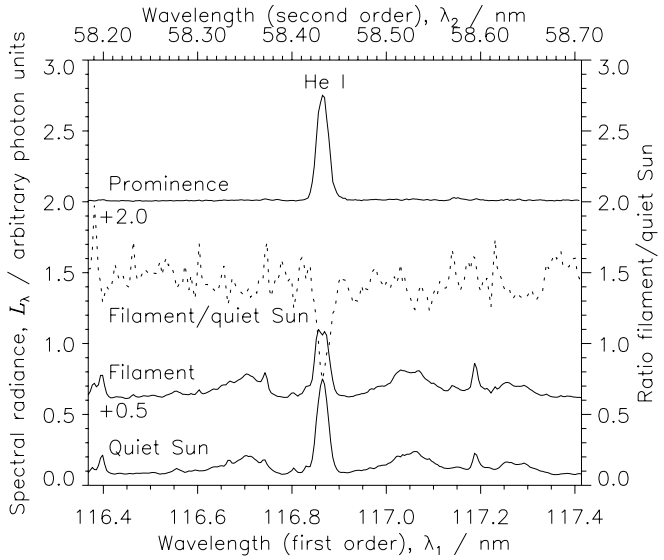
16. Limb scans.



17. Correlation analyses of limb scans (solid line: blue hump; dotted line: red hump; dashed line: SI; dash-dotted line: continuum).



18. Filament and prominence spectra.



19. Grotrian diagram of helium.