

RATIONALE FOR A MID- RESOLUTION+POLARIMETER MODE

ANA I. GÓMEZ DE CASTRO & PABLO MARCOS-ARENAL

AEGORA RESEARCH GROUP – UNIVERSIDAD COMPLUTENSE DE MADRID

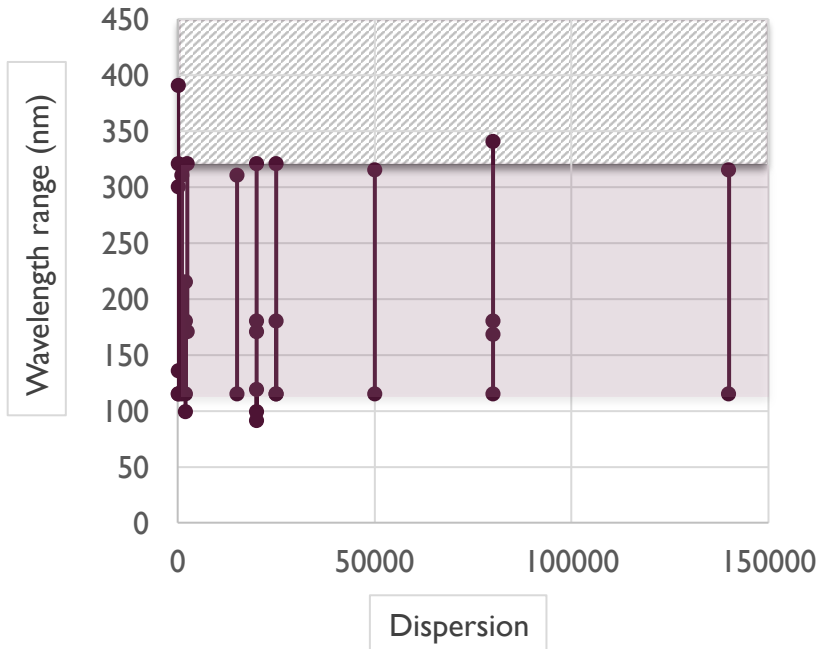


"AVAILABLE" SPECTROSCOPIC INSTRUMENTS IN LUVOIR DESIGN STUDY.

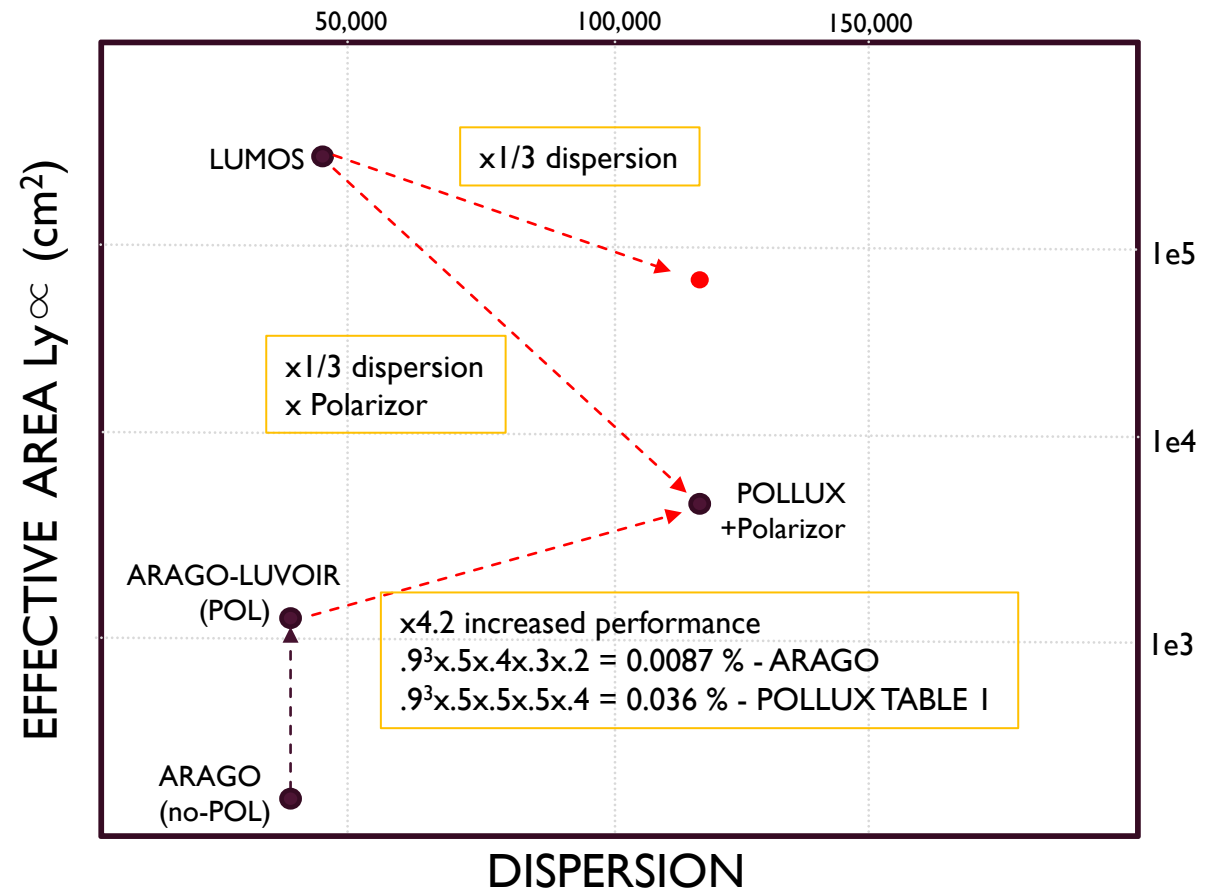
- LUMOS wide field imaging spectroscopy capability.
 - Dispersion: 30,000
 - Range: 900-3000 Angstroms
 - Spatial Resolution: 60 mas (FoV: 1.6x3 arcmin)
 - Resolving power: 40,000
 - Sensitivity: Effective Area (120nm: 1.2e5cm² – 150nm: 5e4cm² – 210: 3e4cm² - 250nm: 2e5cm²)
Sensitivity: 1e-19 erg/s/cm-2/A G120M/G150M in conditions similar to COS reach 1e-17 erg/s/cm-2/A
- POLLUX
 - Dispersion: 120,000
 - Range: 900-4000 Angstroms
 - Spatial Resolution: N/A
 - Sensitivity with polarizer: Effective Area (120nm: 5.26e3 cm²)
 - Sensitivity without polarizer: Effective Area (120nm: 1.05e4 cm²)

DISCOVERY SPACE

FLOWN SPECTROGRAPHS



No (efficient) spectropolarimetry
No simultaneity in the 115-315 nm range

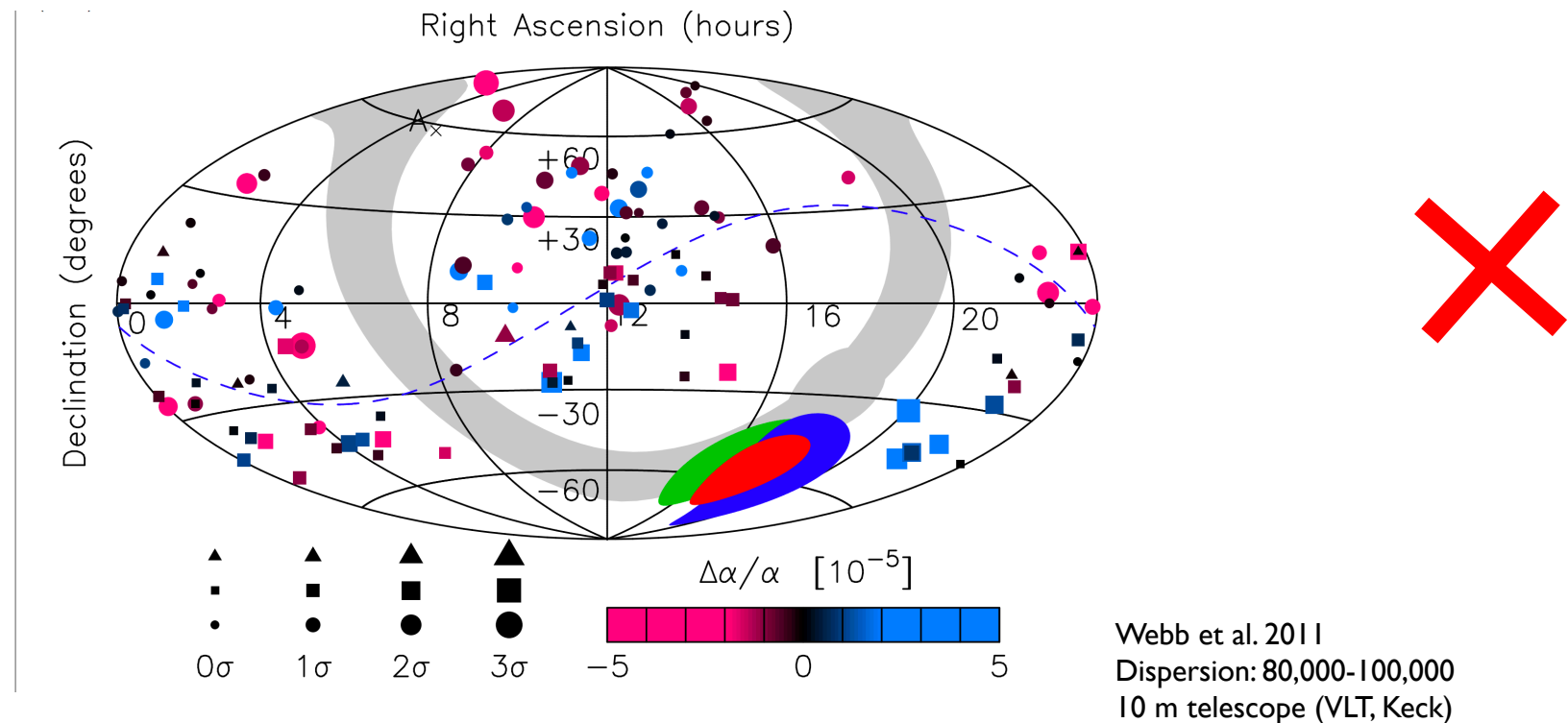


CRITICAL ISSUES

- SCIENCE I: As designed is not possible to have an **efficient** “non-polarization” mode.
- SCIENCE II: As designed is not possible to reduce the dispersion to 30,000 (ARAGO-like) with polarization.

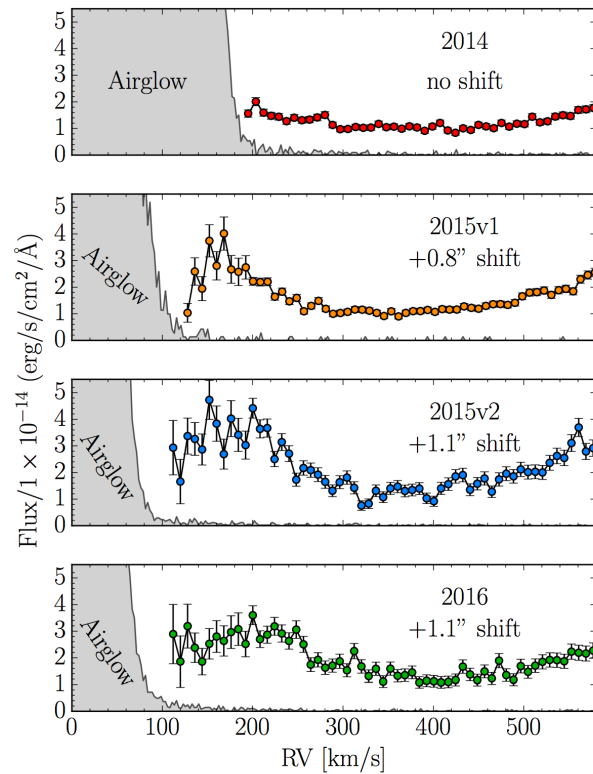
SCIENCE I: “LOW” EFFICIENCY HIGH DISPERSION SPECTROSCOPY (WITHOUT POLARIZERS)

■ VARIATION OF THE COSMOLOGICAL CONSTANTS WITH TIME AND GRAVITY



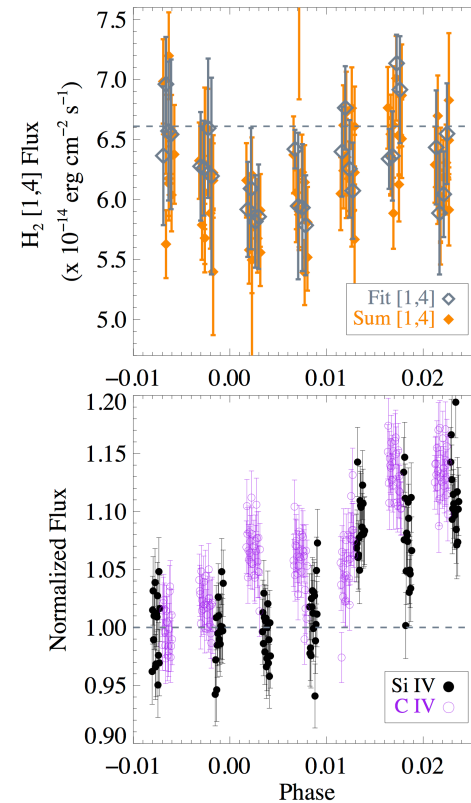
SCIENCE I: “LOW” EFFICIENCY HIGH DISPERSION SPECTROSCOPY (WITHOUT POLARIZERS)

■ Detection of structures in young planetary disks



V = 3.86
A6V
F = 1e-14 erg/s/cm²/A
COS – 2 orbits/per frame

β Pic
Wilson et al. 2017

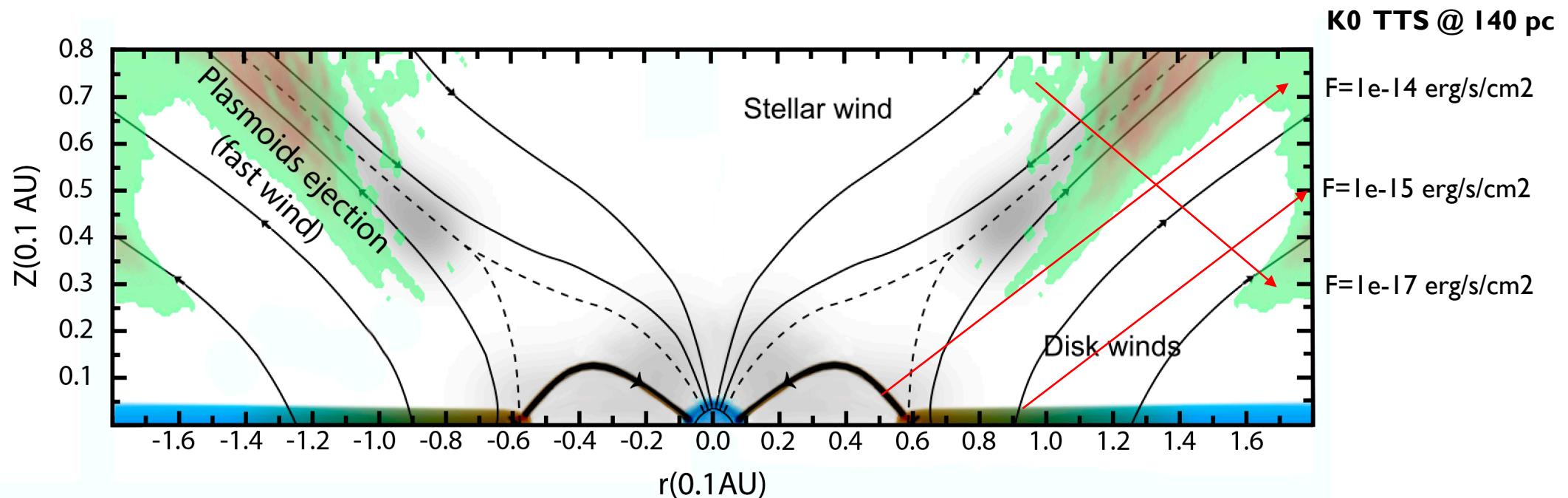


V = 9.00
F5V
F = 1e-14 erg/s/cm²/A
COS – 1000 s/5 lines

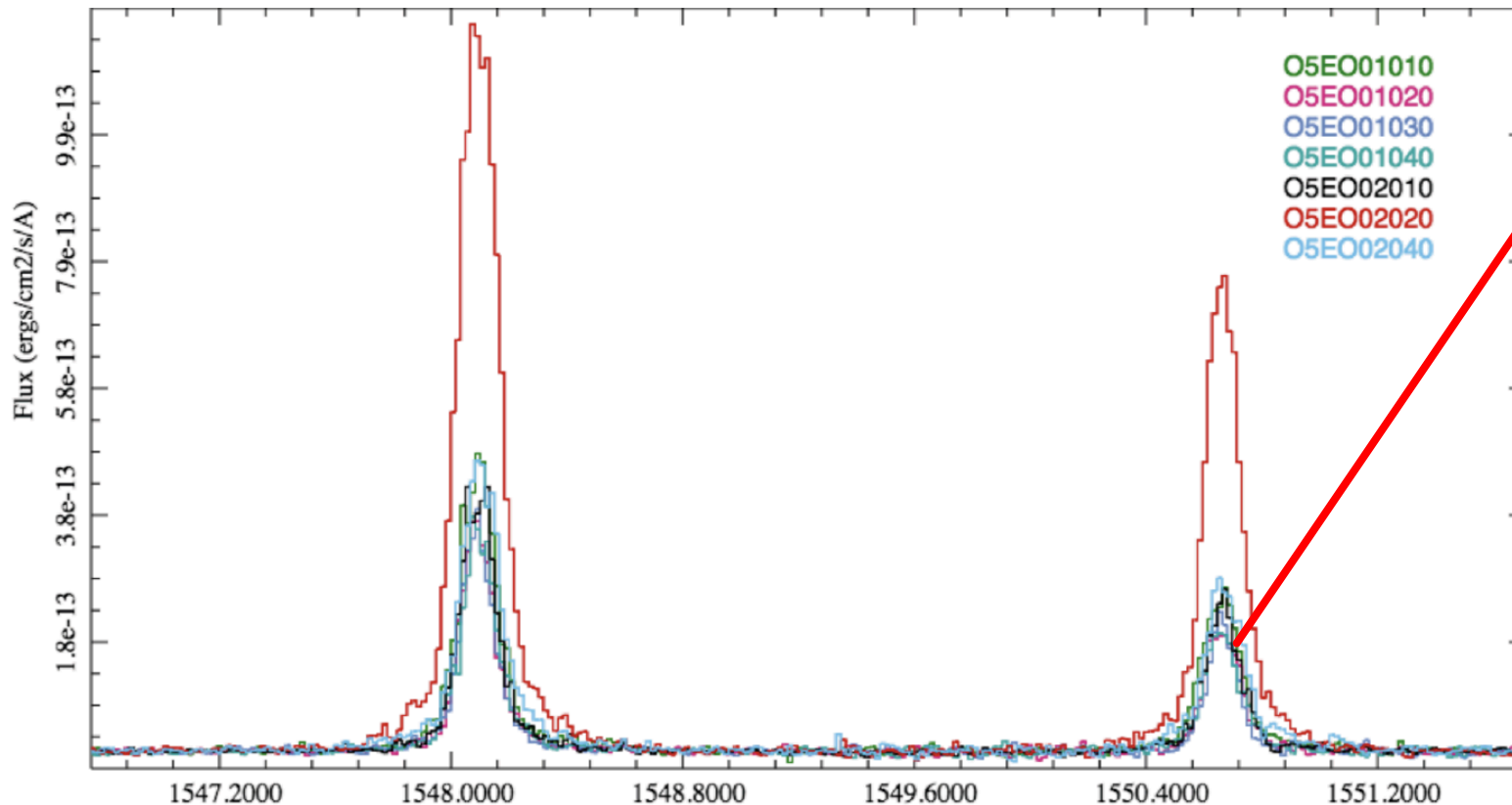
AK Sco
Gomez de Castro et al. 2015

SCIENCE II: AS DESIGNED IS NOT POSSIBLE TO REDUCE THE DISPERSION TO 30,000 FOR SPECTROPOLARIMETRY.

- Cool stars magnetic fields evolution



SCIENCE II: AS DESIGNED IS NOT POSSIBLE TO REDUCE THE DISPERSION TO 30,000 FOR SPECTROPOLARIMETRY.



V*V645 Cen,
flare star: M6Ve
V=11.3
F= 3.4×10^{-14} erg/s/cm²
FWHM=0.16 \AA

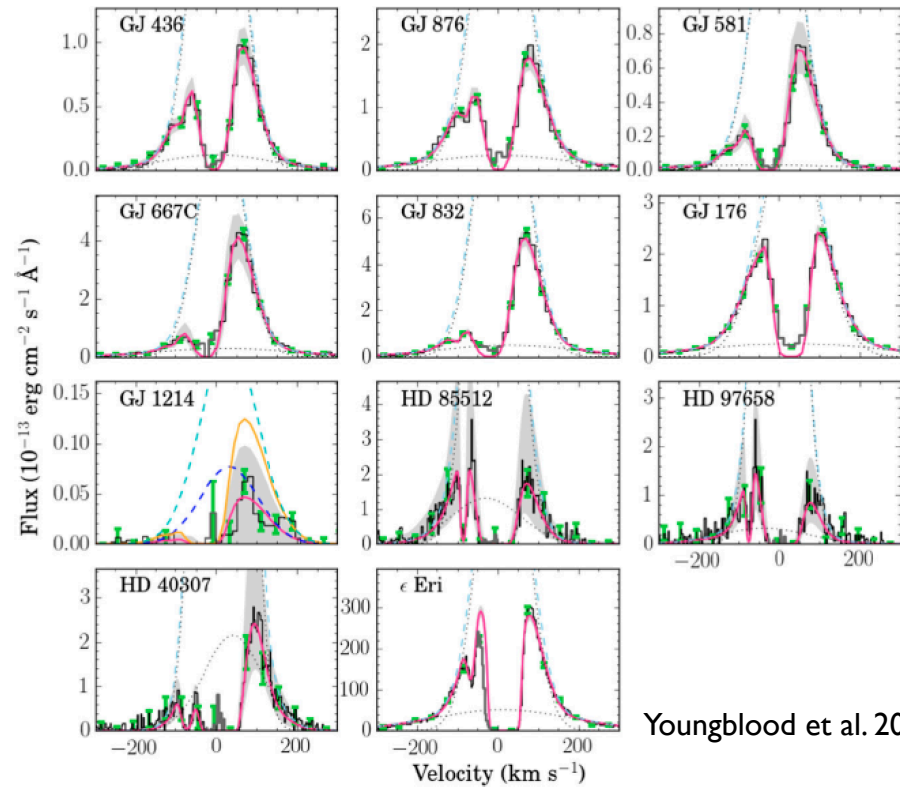
Tex_p=60 min
Primary: 10 m
Throughput: 0.019
Counts: 1.25e5

D=120,000 ($\delta\lambda = 0.013 \text{\AA}$) / 2.5 pix = 5.2×10^{-3}
32 pixels in λ & 2.5 pixels cross
Counts/pixel = 1.3×10^3 counts/pix
SNR=36 in 60 min

SCIENCE II: AS DESIGNED IS NOT POSSIBLE TO REDUCE THE DISPERSION TO 30,000 FOR SPECTROPOLARIMETRY.

THE ASTROPHYSICAL JOURNAL, 824:101 (18pp), 2016 June 20

YOUNGBLOOD ET



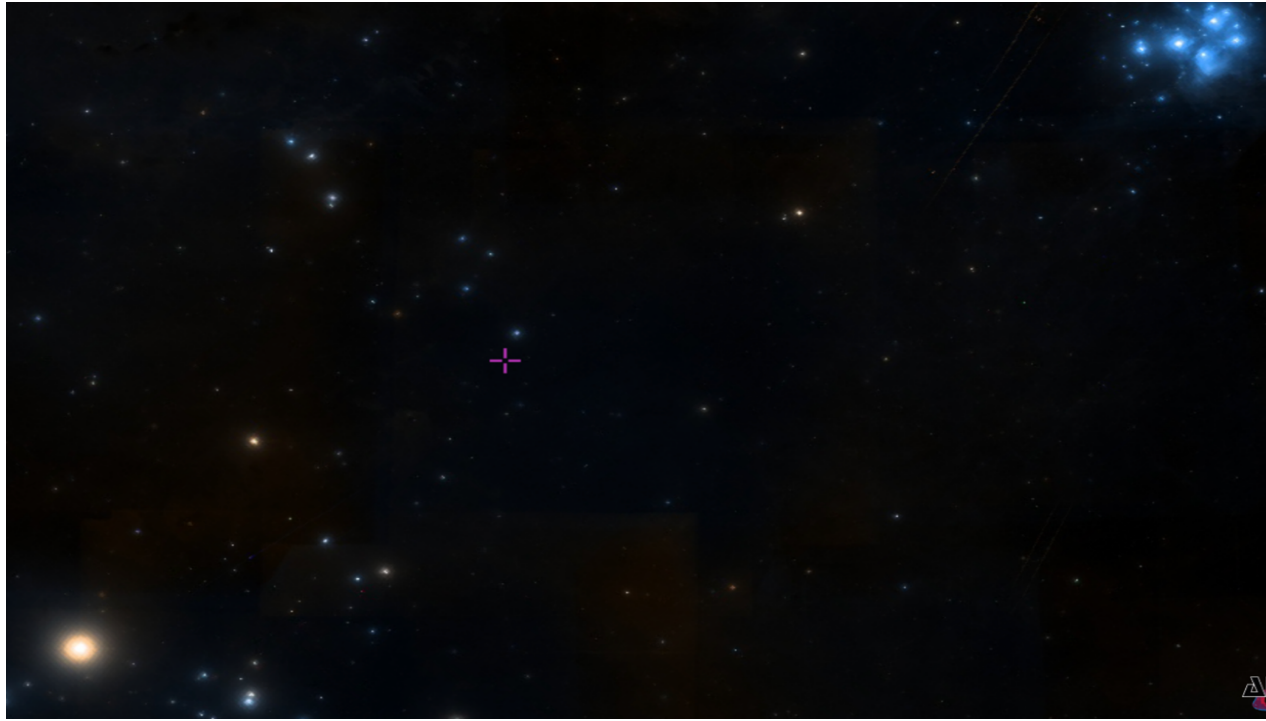
Youngblood et al. 2016

The MUSCLES sample

Ly α (instead of CIV)

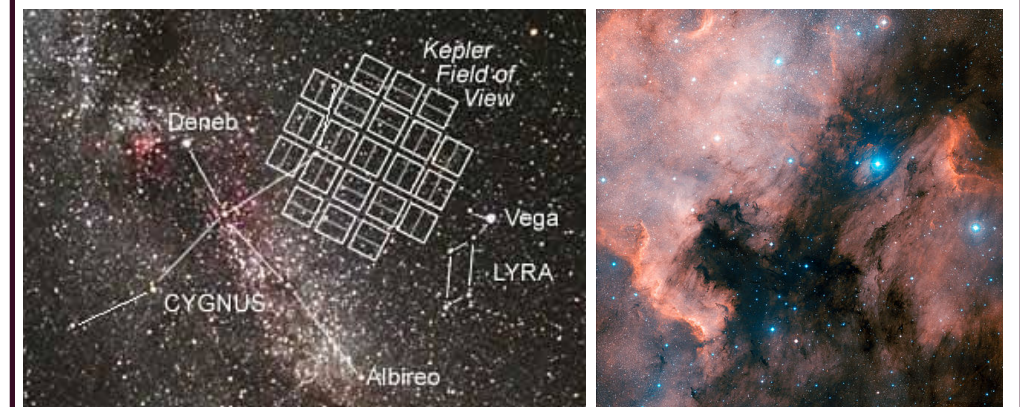
SIGNATURE SCIENCE CASE (100 H): MAGNETIC FIELDS IN COOL STARS FROM PRE MAIN SEQUENCE

The Hyades (d=47 pc, McArthur et al. 2011), the Pleiades (d=136 pc,) and the Taurus star forming complex (d=140pc) span an area of 18° in the sky.



Contents:

cool stars from the pre-main sequence to the white dwarf stage



Another possibility: the Kepler field and the North America/Pelican Nebula Complex