VISION:
The next Generation Beam Combiner for the NPOI

Eugenio Victor Garcia, March 25th, 2014

The VISION Team

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Outline

- NPOI
- Specifications of VISION
- VISION Control System
- Stellar Surface Imaging: Red Super Giants & Rapid Rotations
- Current & Future Work

The Navy Precision Optical Interferometer

Flagstaff, AZ

Array Layout

Longest Baseline = 100 m

Shortest Baseline = 16.8 m

New stations:

E10, W10 (432 m)

W4, E4 (~12 m)

VISION Specifications

- MIRC @ Visible Wavelengths + EMCCD
- Visible wavelengths: 550-850 nm
- R=200 and R=1000 spectral resolution
- Fringes made directly on the detector
- 6 way simultaneous combiner
- Single mode fibers
- Two EM CCDs: Fringing Camera & Photometric Camera

VISION Layout

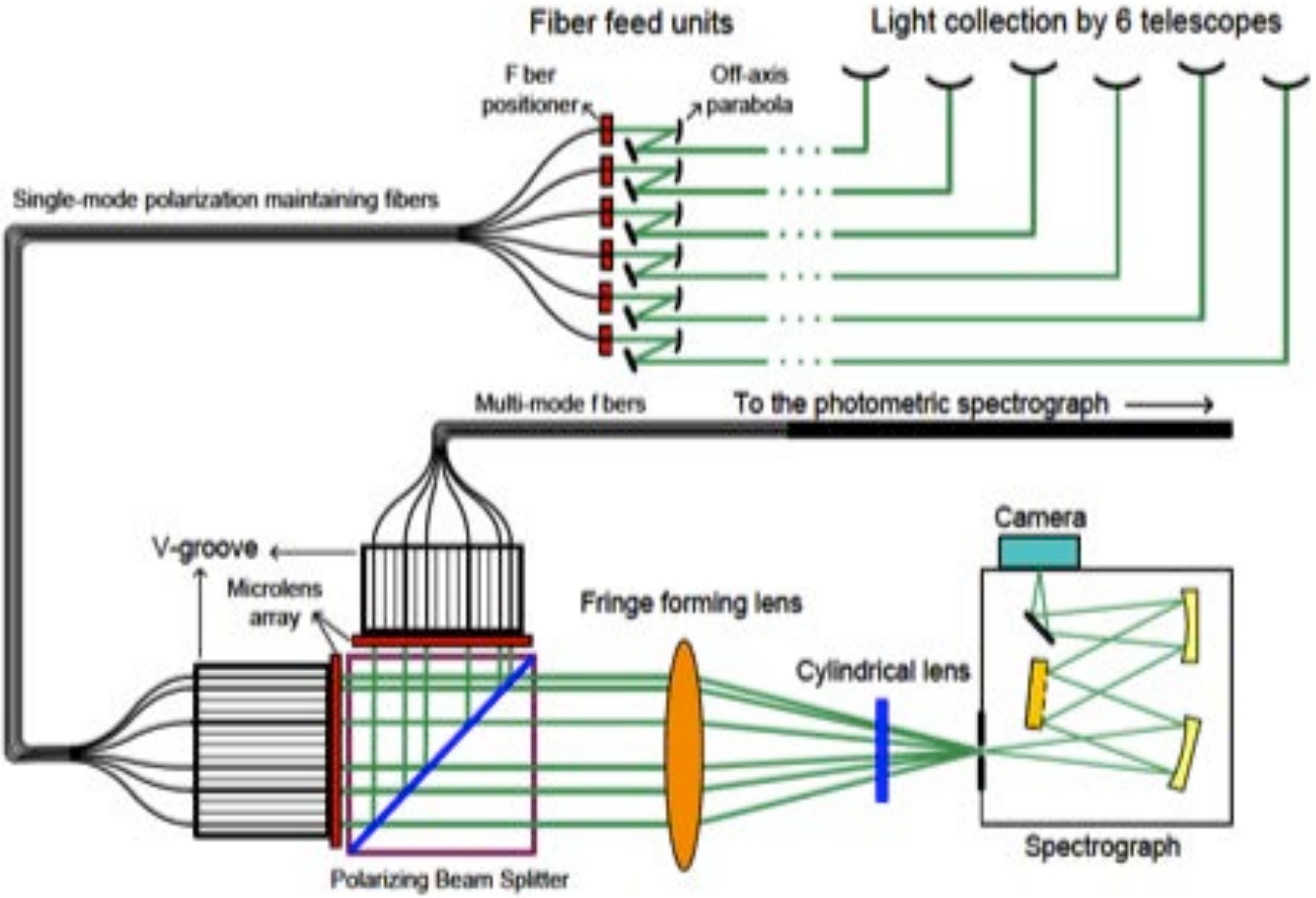
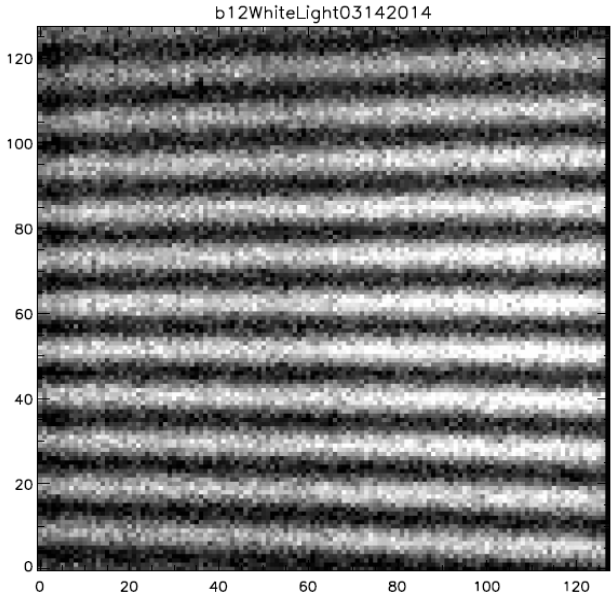


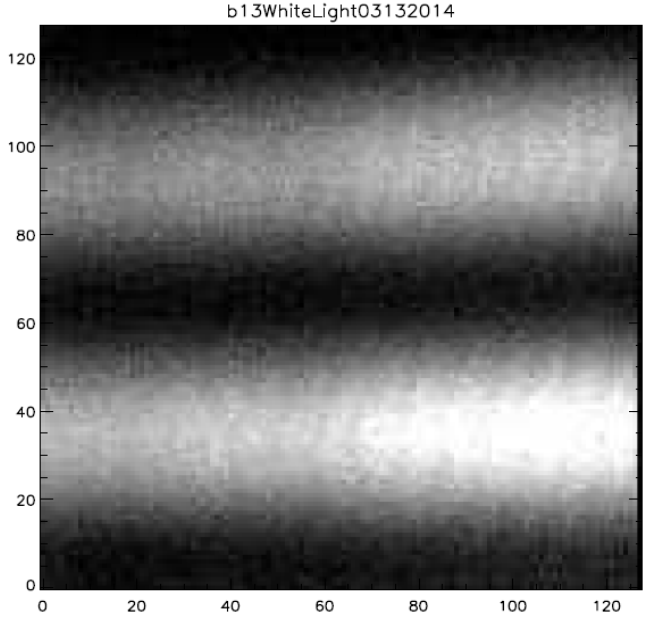
Figure 1. Schematic layout of VISION.

Example of Internal Fringes

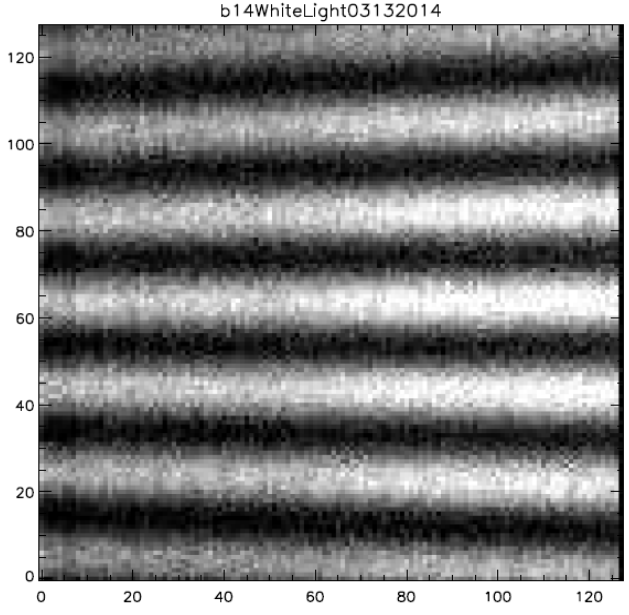
Beam 1+2



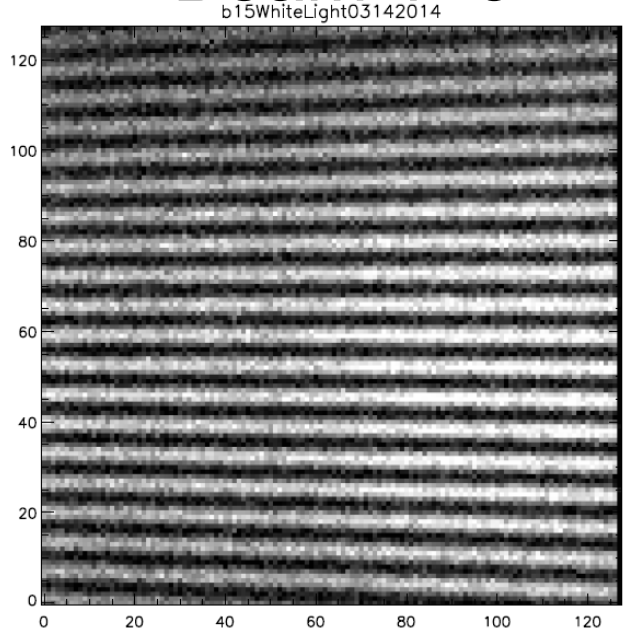
Beam 1+3



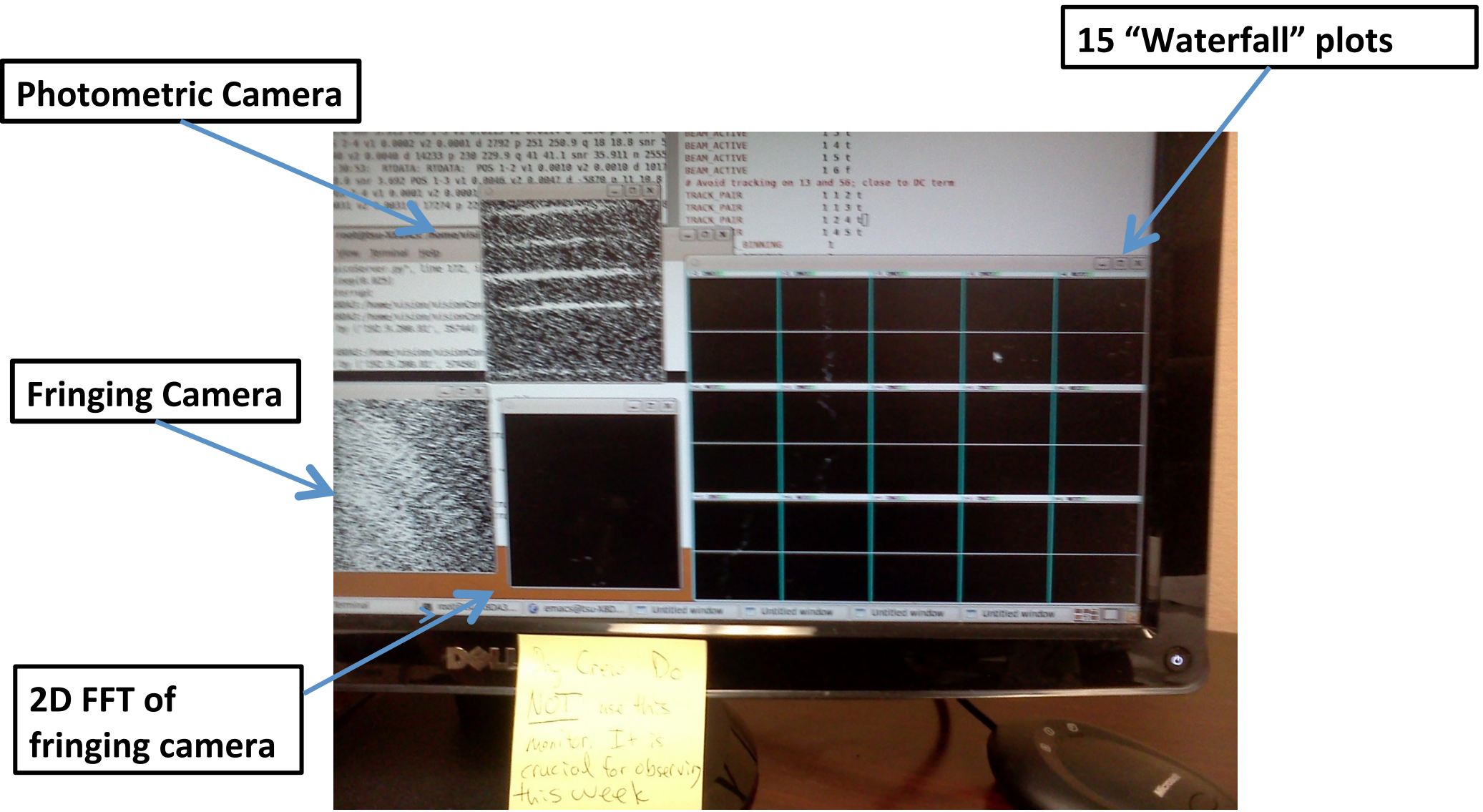
Beam 1+4



Beam 1+5



VISION Control System

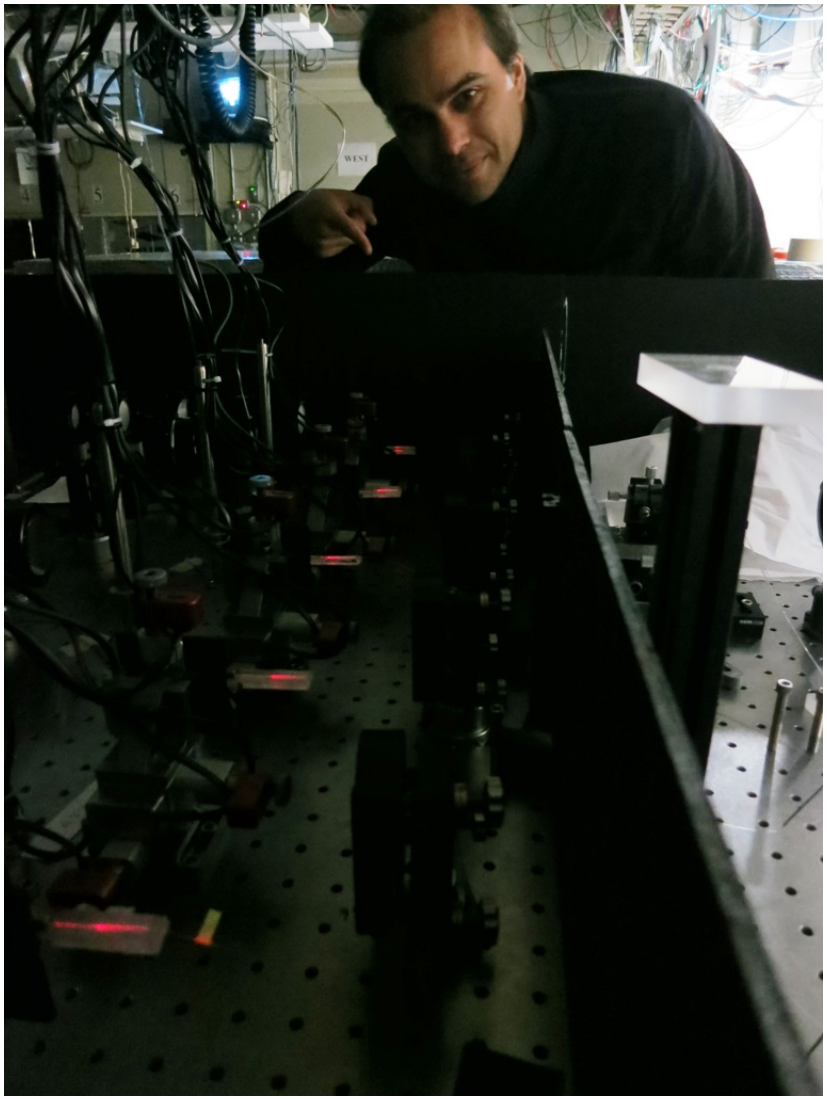


VISION multi-baseline tracking of Regulus

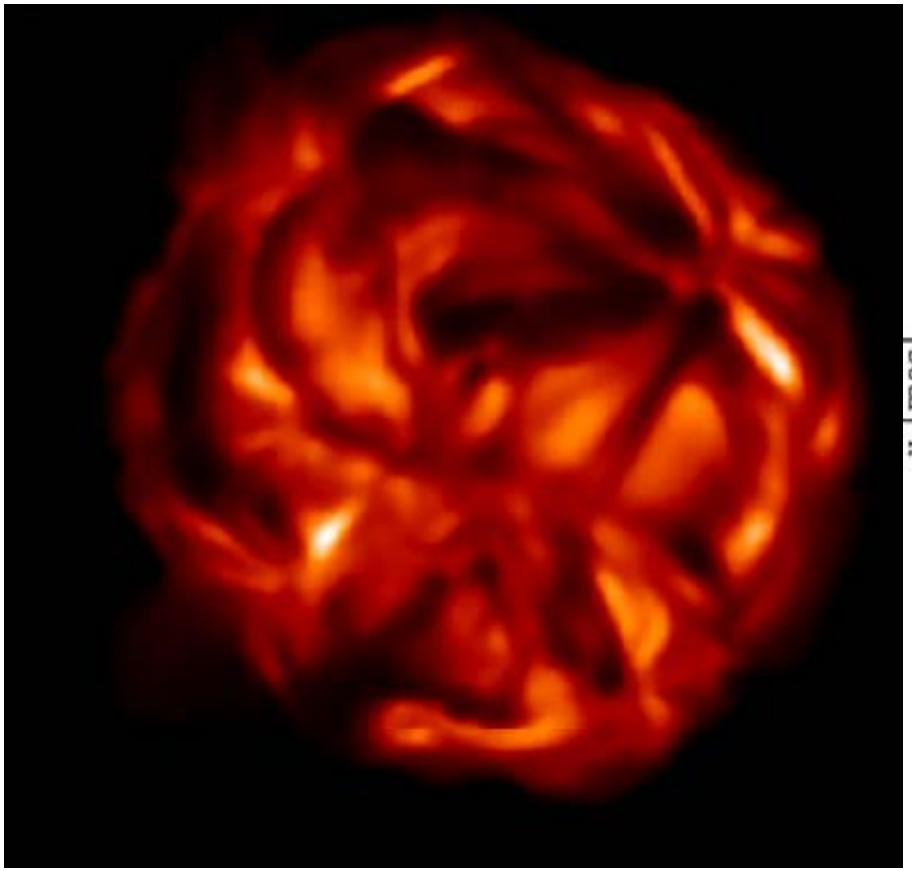
Fringing Camera: Fringes from all 10 baselines

Simultaneous output from photometric camera

Multi-baseline tracking achieved!

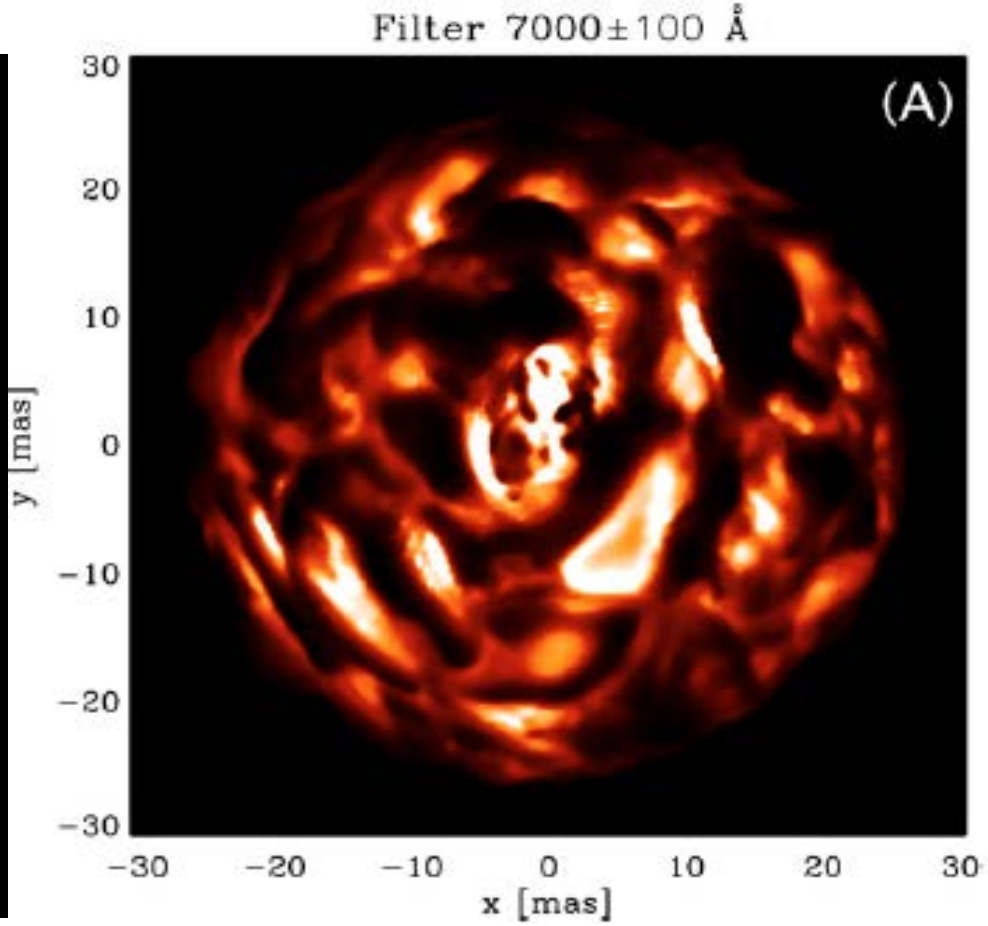


Targets: Red Supergiants



Infrared

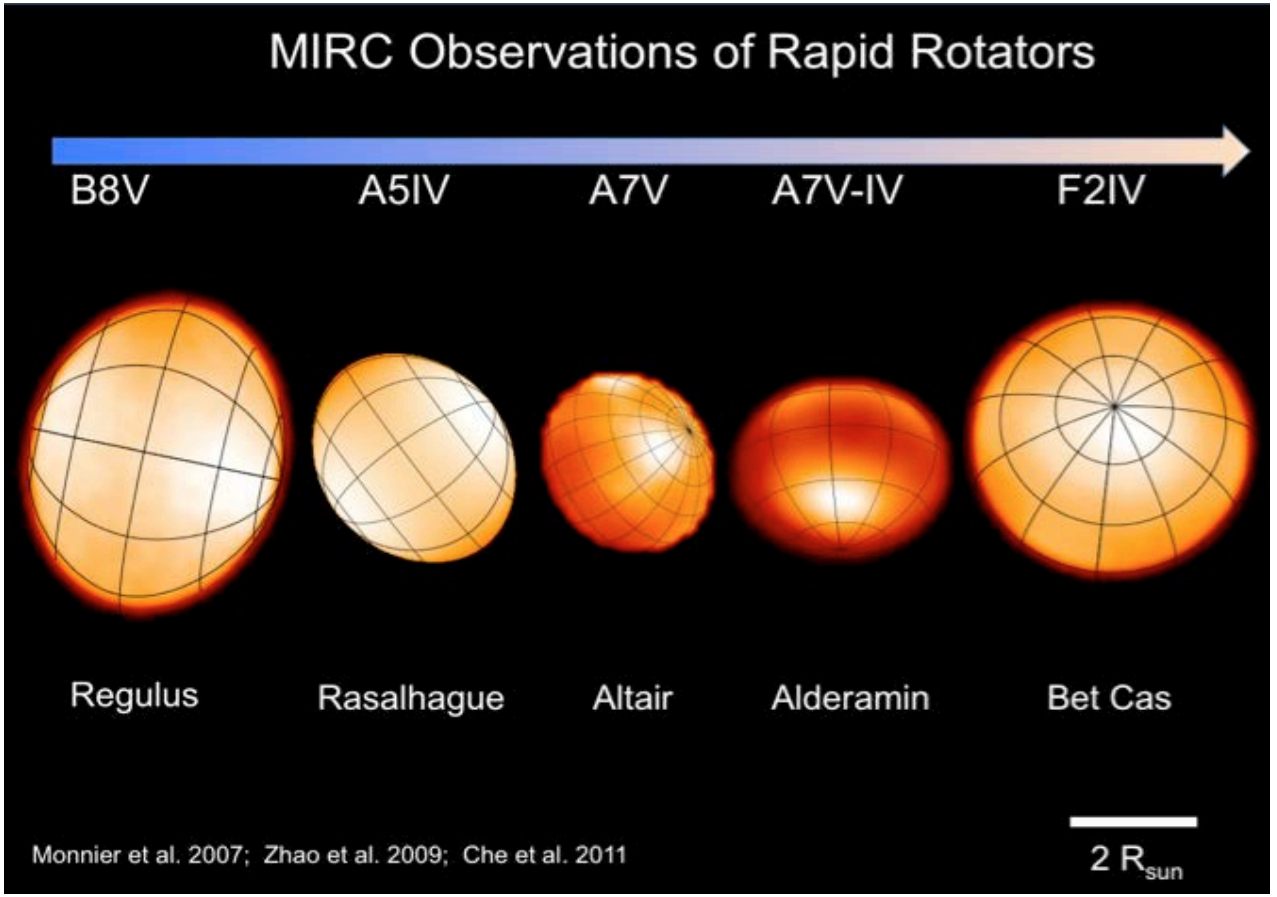
Chiavassa et al. 2010



Visible

Chiavassa et al. 2010

Targets: Rapid Rotators



- Redo MIRC observations in visible wavelengths
- Perk of VISION: $T\downarrow pole - T\downarrow eq$ larger than in IR

Current and Future Work

- Measure visibility and closure phase of unresolved targets
- Adapt the MIRC data reduction pipeline for VISION.
- Implement a GUI.
- Carefully do a polarization alignment.
- Fully characterize the effects of CIC on visibility.
- Push towards fainter targets (Current limit Rmag ~ 4)

Conclusions

- VISION is on its way!
- VISION will help constrain 3D radiative-hydrodynamic models of RSGs.
- VISION will help constrain models of rapidly rotating stars.