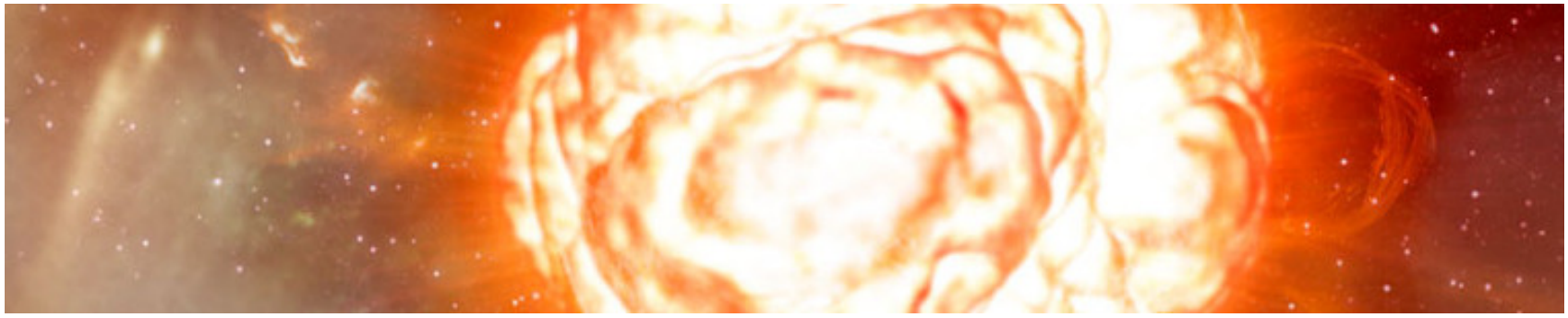

Betelgeuse workshop: linearly polarised spectrum of μ Cep

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Paris - September 2016

LUPM LABORATOIRE MONTPELLIER UNIVERS & PARTICULES

PNPS Programme National de Physique Stellaire

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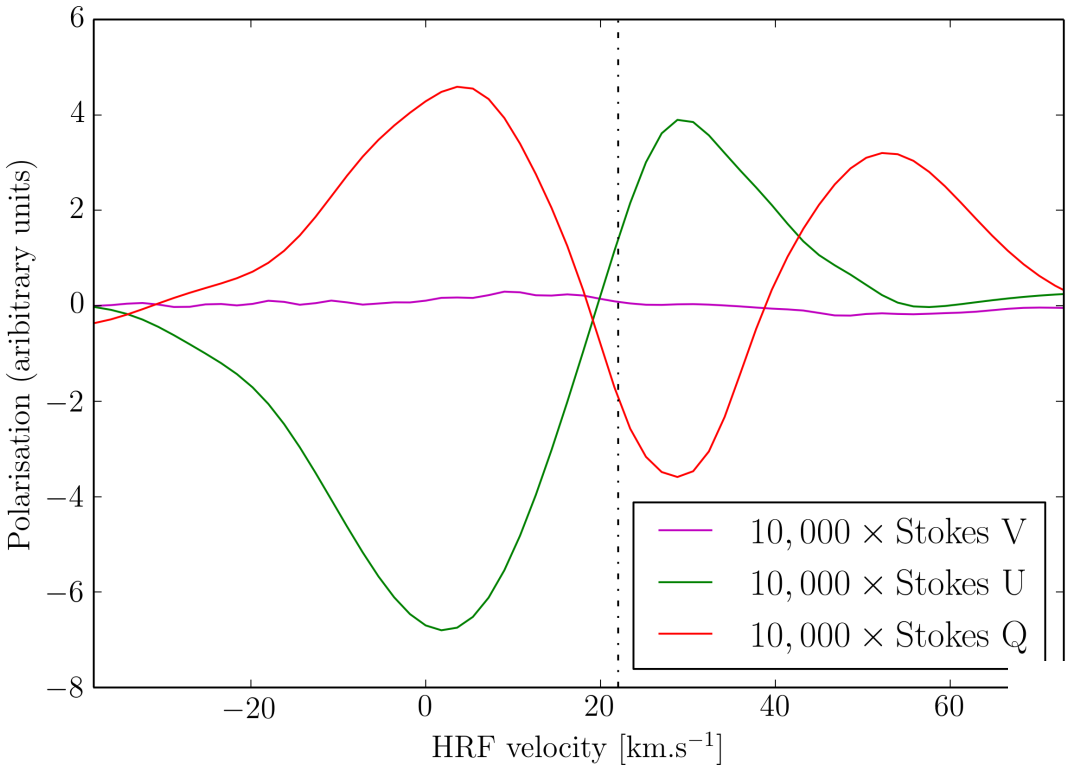
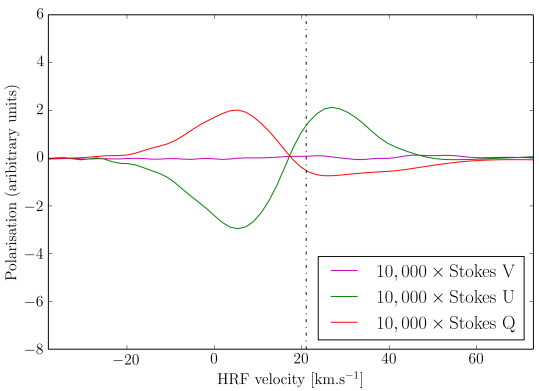
Typical polarisation scales for μ Cep



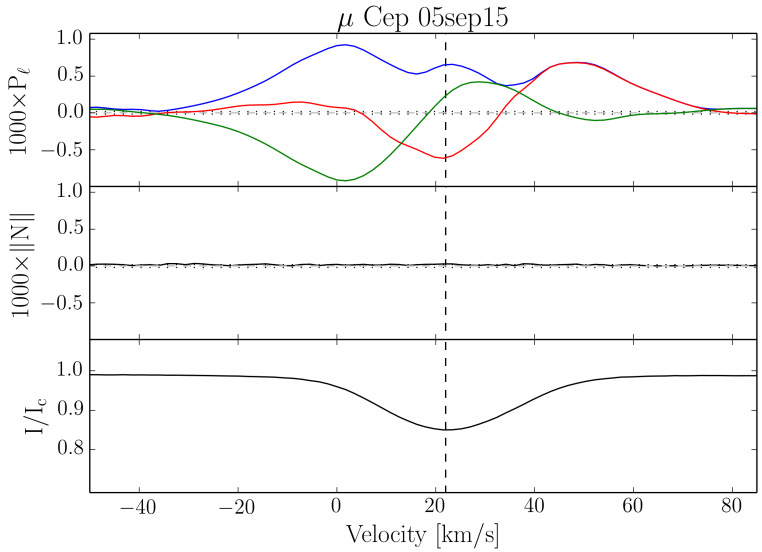
- Ratio $P_\ell^{\mu\ \mathrm{Cep}}$ / $P_\ell^{\mathrm{Betelgeuse}}$
- ➔ ~ 2.28
- ➔ μ Cep: best target to extend the depolarisation of continuum hypothesis ?

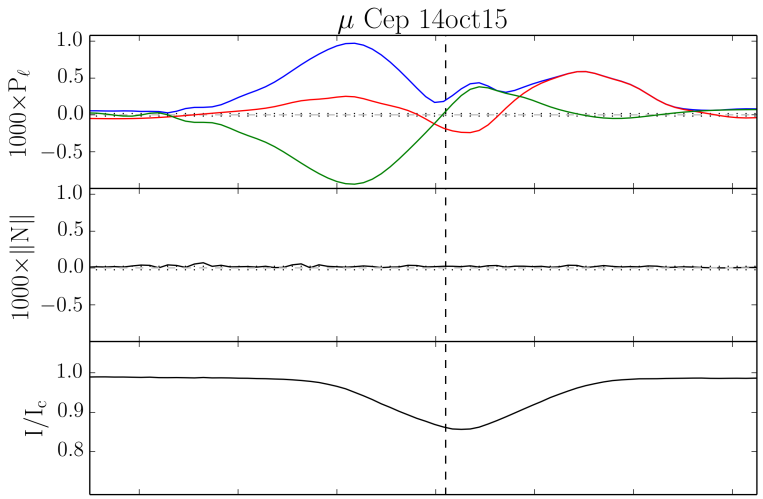


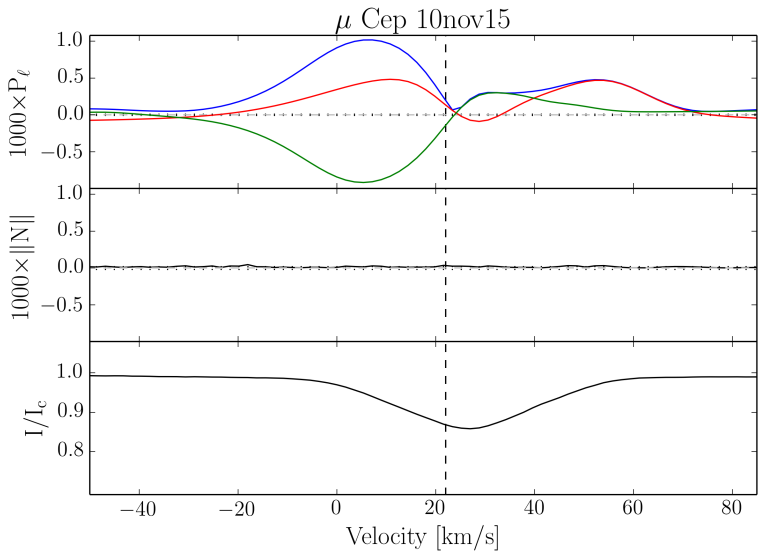
Betelgeuse polarisation scales

1- Linearly polarised spectrum of μ Cep: variability (LSD profiles* view)

**acquired during our Large Program with the Narval instrument*







- Like Betelgeuse Variability on months / weeks

➔ Consistent with convective time scales

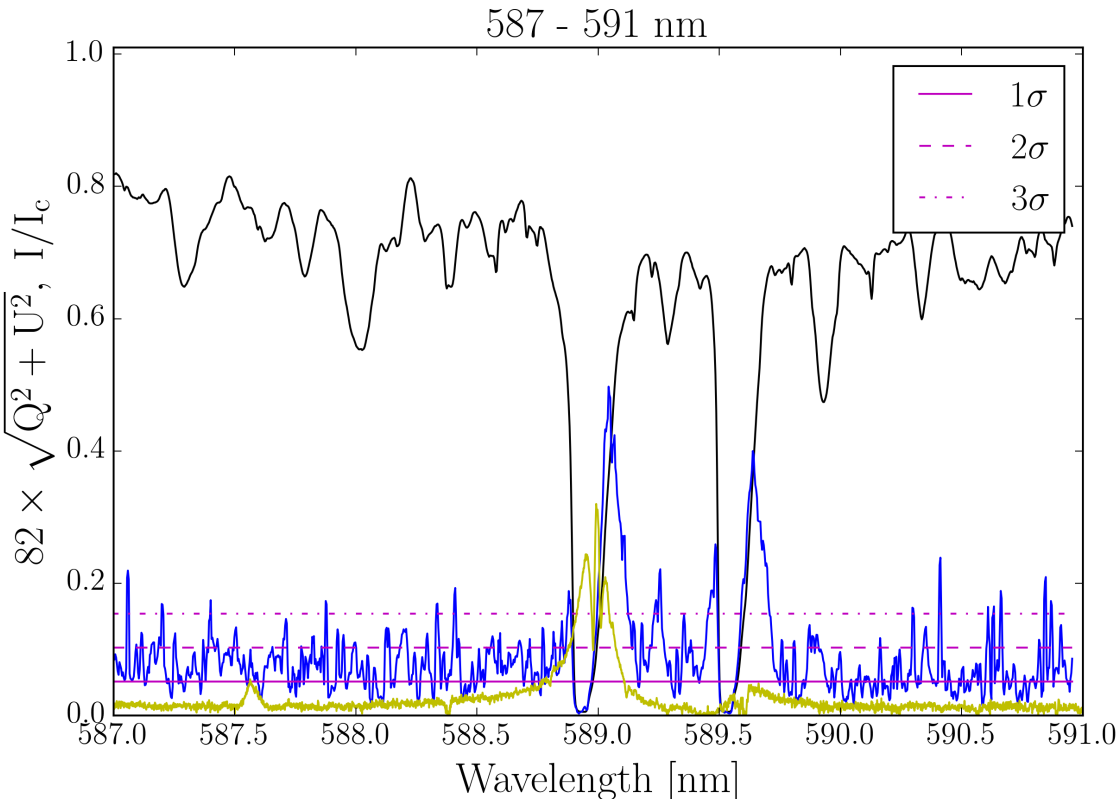
1- Linearly polarised spectrum: Origin (1/2)

Stokes Q & Stokes U

$P_\ell = \sqrt{Q^2 + U^2}$

P_ℓ sun

- Non Zeeman origin
  - ➔ Na D2 amplitude $\sim$ D1 amplitude (consistent with depolarisation of continuum)
- ➥ Interpretation for Betelgeuse seems again valid for μ *Cep*

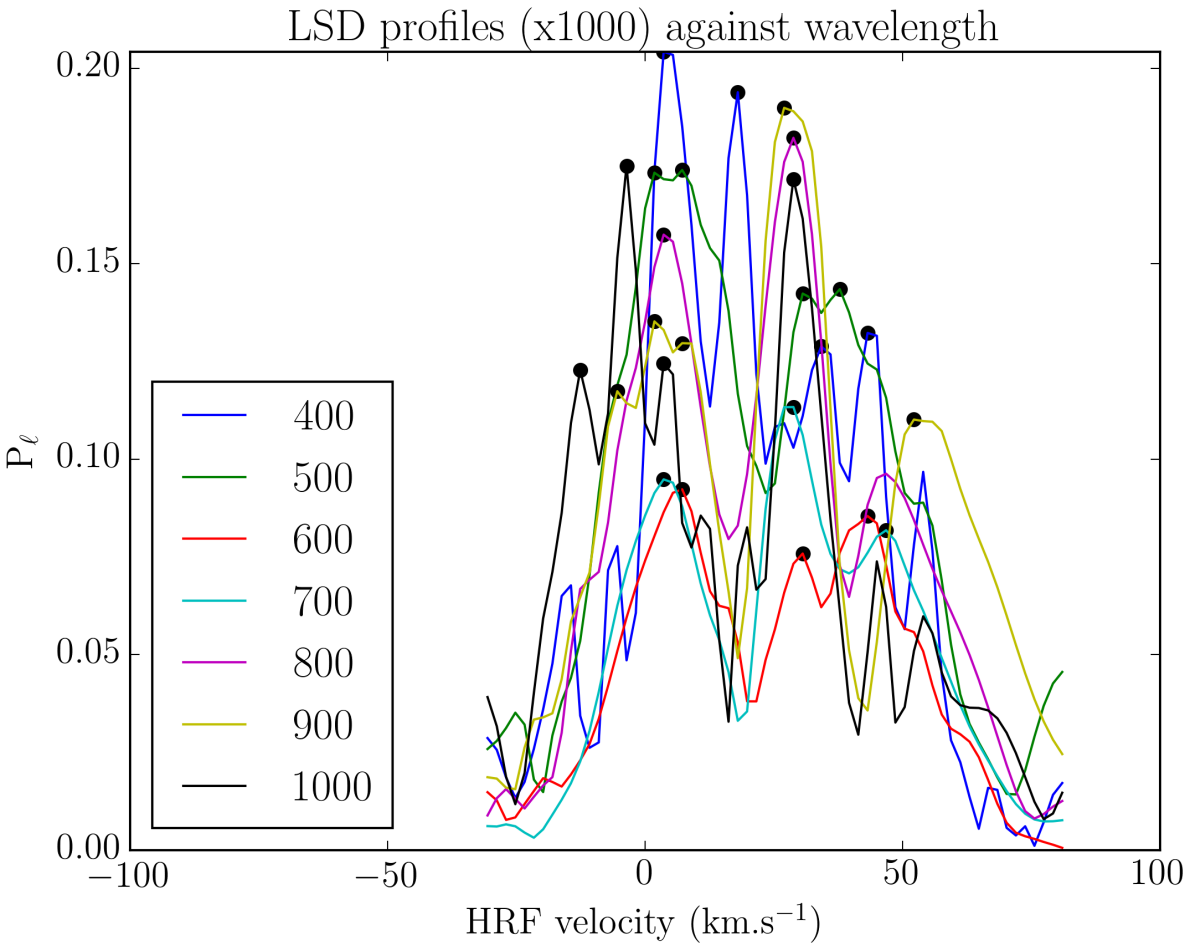


Linearly polarised spectrum of μ Cep around the Na doublet

Polarisation in spectral lines

1- Linearly polarised spectrum: Origin (2/2)

➔ **Wavelength dependence more complex**

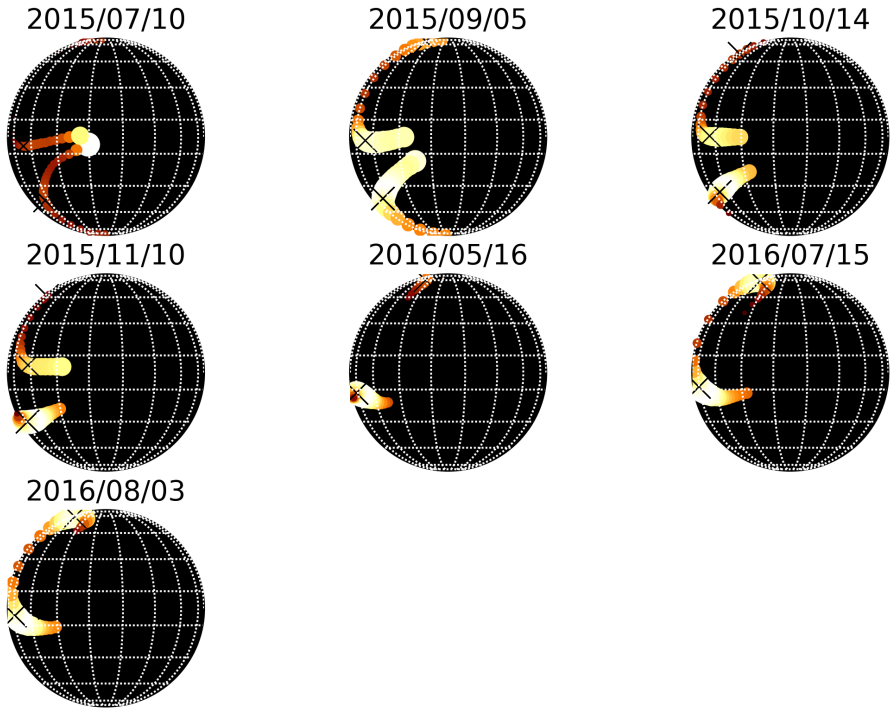


Linear polarisation variation with wavelength.

➥ *If we look at the variation of the LSD profile with wavelength at the position of a peak, the decrease with wavelength is not so obvious.*

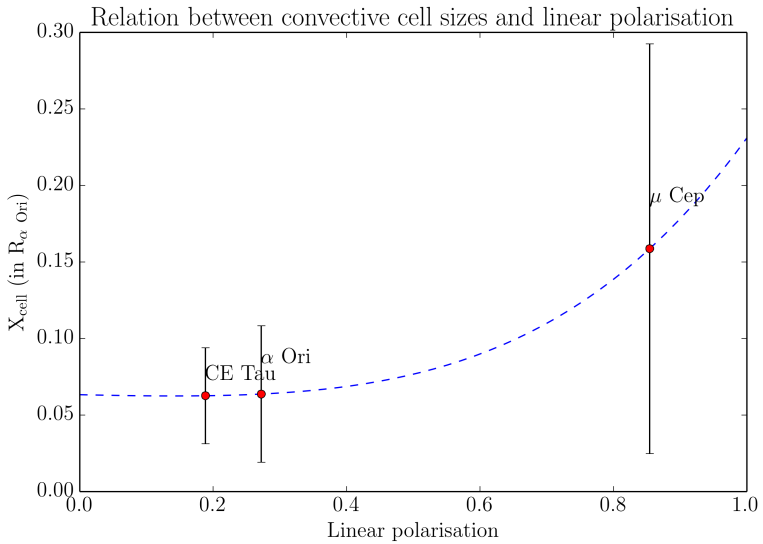
Hot spots model: variation with time

➔ Variation with time of the inferred position of "bright spots"



Opened questions: Study the surface dynamics with high resolution spectra

- Best targets to match interferometric observations (mu cep, antares ??)
- Forward modelling of the Q/U signals –> models for spectropolarimetry
- From the models: constrains the relation $\mathrm{P}_\ell \propto \mathrm{x}_{\mathrm{cell}}$: infer stellar parameters, continuum polarisation
- Relation with mass loss ?



Stellar parameters from Josselin & Plez 2007 are used and P_ℓ values come from our LP.