Shedding (Polarized) Light on Long Duration Gamma Ray Bursts

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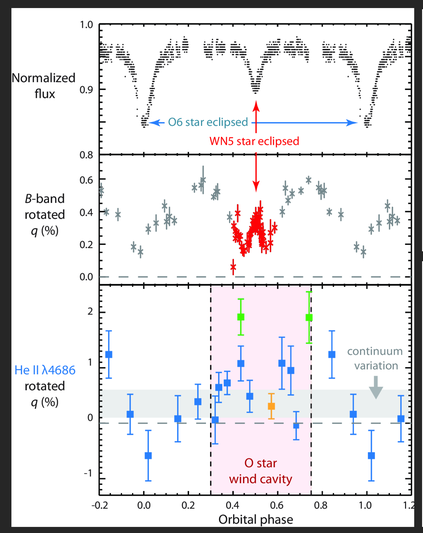
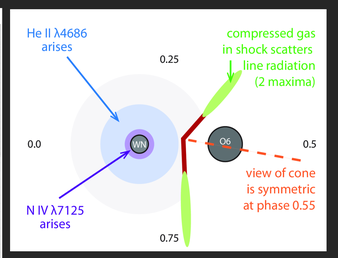
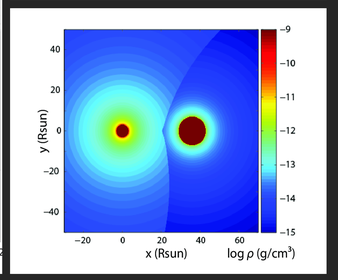
V444 Cyg

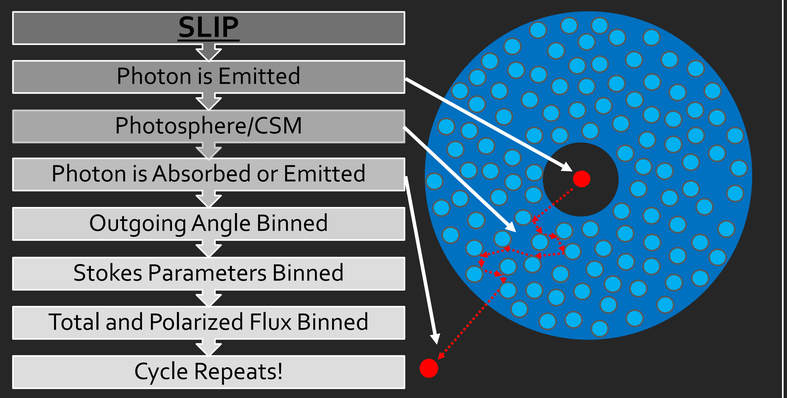




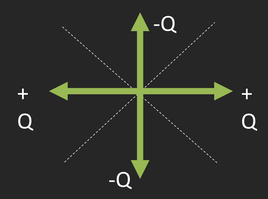


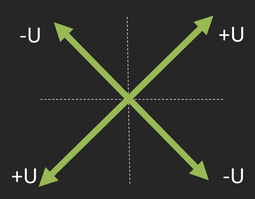
Top left: Eris & Ekmekci 2011, *Astonomische Nachrichten, 332*, 616
Middle Left: St.-Louis et al. 1993, *ApJ*, 410, 342
Bottom Left: Hoffman et al. 2017, *American Astronomical Society Meeting Abstracts,* 229, 344.02
Top Right: Lomax et al. 2015,*A&A*, 573, A43
Bottom Right: Hoffman et al. 2017, *American Astronomical Society Meeting Abstracts,* 229, 344.02

MCRT Polarization Modelling



Stokes Q & U Polarization





The Goal

- Understand whether and how WR+O binary systems give rise to LGRB-producing supernovae (Type Ic)

The Tools

- Spectropolarimetric observations with RSS/SALT
- Monte Carlo Radiative Transfer (MCRT) modelling with SLIP code

Phase 1

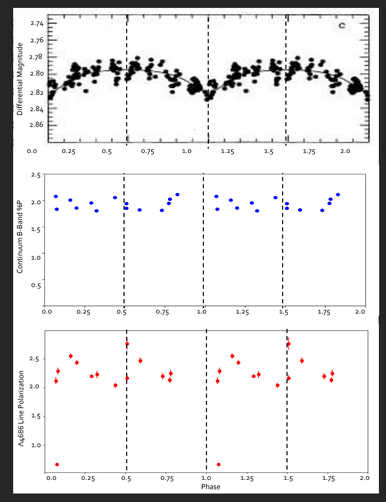
- Create geometry code for V444 Cyg
- Reproduce observed polarization (continuum and line)
- Calculate mass loss/transfer within system

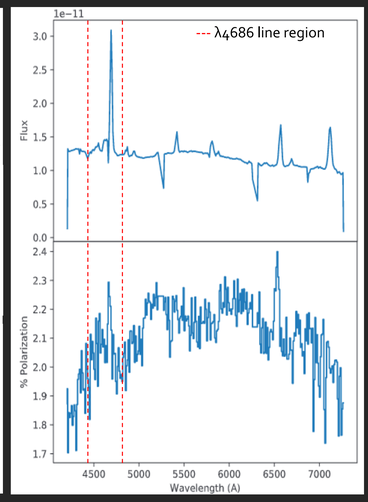
Phase 2

- Refine cavity geometry for SLIP MCRT model for V444 Cyg
- Apply code to WR+O targets of similar spectral type:

Object	Spectral Type	Observations	Instrument/ Observatory
V444 Cyg	WN5+O6II-V	30	HPOL/PBO, Ritter
WR 21	WN5+O4-6	14	RSS/SALT
WR 62a	WN5+O5.5/6	7	RSS/SALT
WR 97	WN4+O5/7V	5	RSS/SALT

WR 21

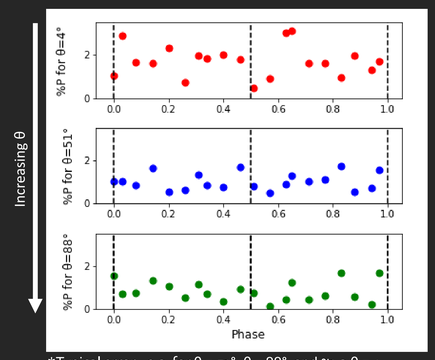




Top left: Lamontagne et al. 1996, *AJ*, 112, 2227

Phase 1: SLIP MCRT Code

Binary Sphere Geometry: Continuum Polarization



*Typical error ~0.3 for θ = 51°, θ = 88° and ~1.3 θ = 4

- The 'Binary Sphere Geometry: Continuum Polarization' plot (left) depicts the results obtained from emitting 1 million photons from a single sphere with an illuminating companion.
- The 'Preliminary Cavity Geometry for V444 Cyg' figure (below) depicts the geometry code to be added to the larger MCRT radiative transfer script, SLIP. This geometry will also include an illuminating companion.

Preliminary Cavity Geometry for V444 Cyg

Acknowledgements

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