Massive stars in the Galactic center

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Outline

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- initial mass $M_{\text{init}} > 8\ \mathrm{M}_\odot$ ($> 20\ \mathrm{M}_\odot$!)
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KEY PLAYERS in COSMIC RECYCLING!

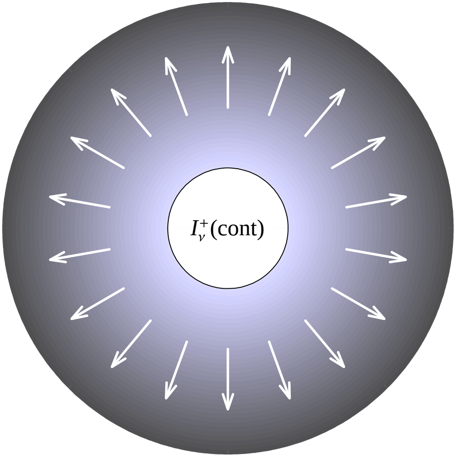
1. Motivation
   - Massive stars

2. Stellar Winds
   - Basic ideas
   - Model atmospheres

3. The Quintuplet Cluster
   - The Galactic Center region
   - The Observations
   - Massive evolved stars

Stellar winds

- Castor, Abbott and Klein - CAK theory 1975 radiative pressure on spectral lines in the atmosphere



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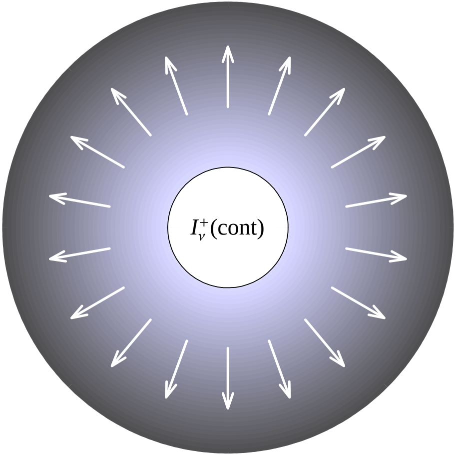

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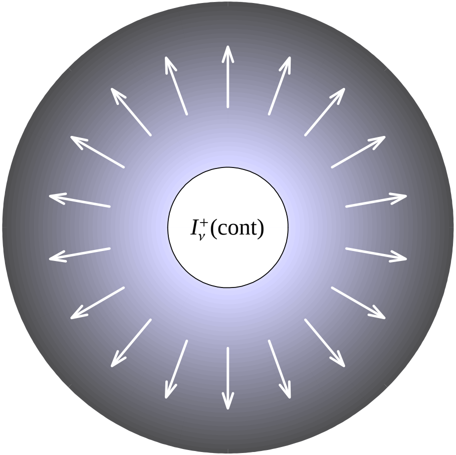
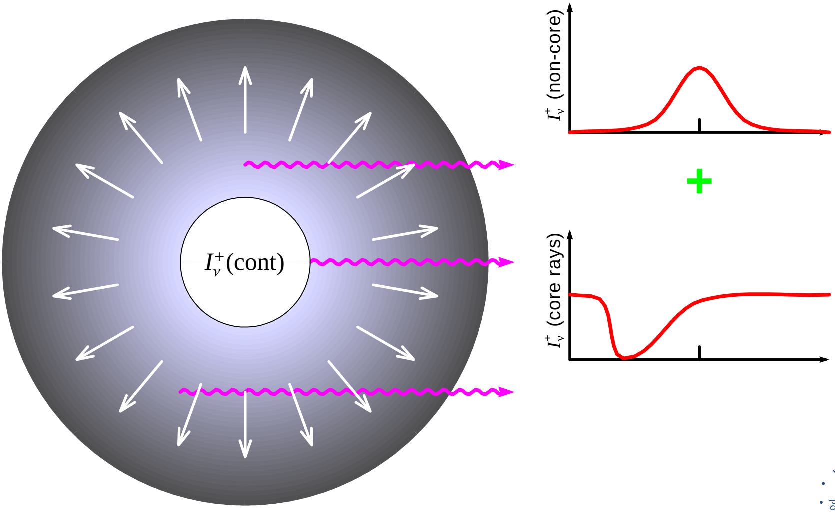
- Nugis & Lamers 2000: WN stars $\dot{M} \sim L^{1.7}$



Observational evidence - P Cygni line profiles



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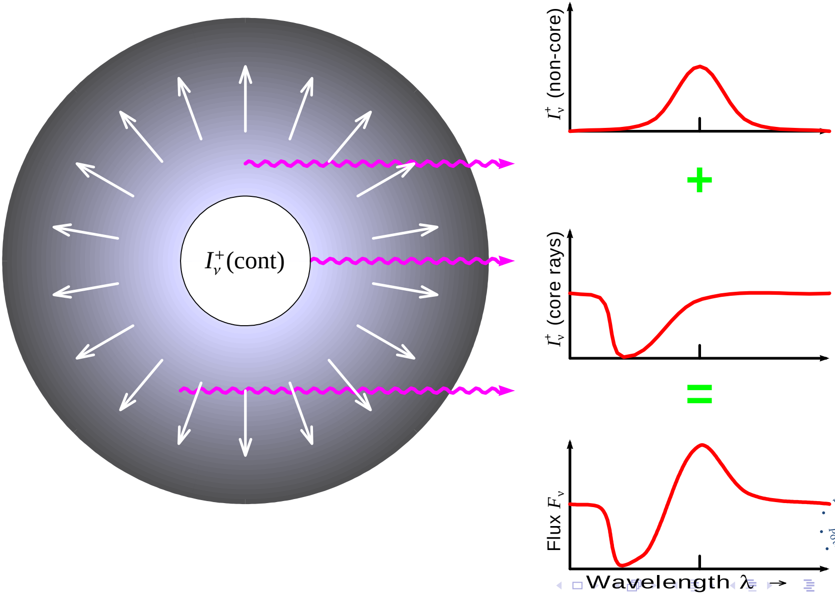

observed stellar winds:

- A and B supergiants - absorption lines (Kudritzki!)
- O/Of stars - emission lines + UV resonance lines as P Cygni
- WR stars - emission lines + P Cygni

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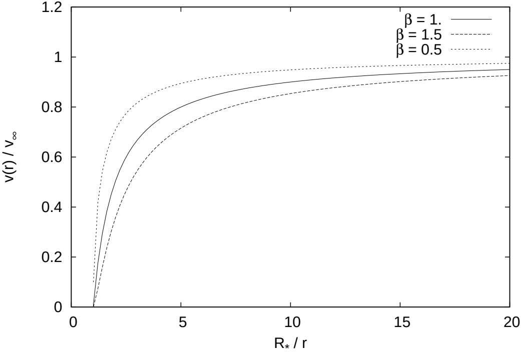

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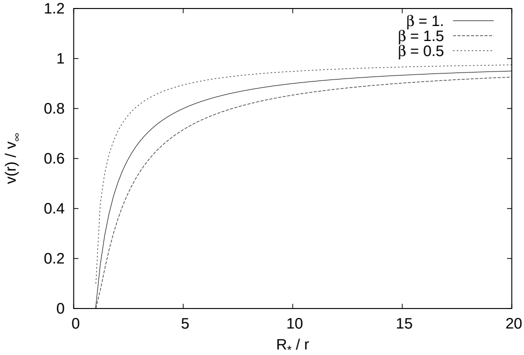

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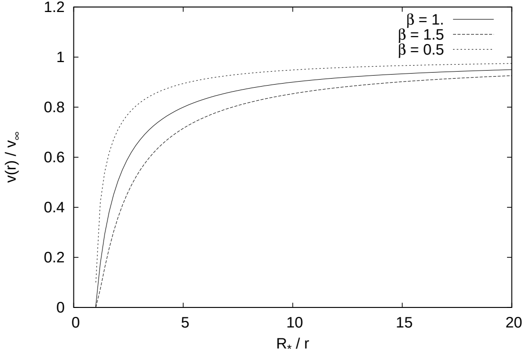
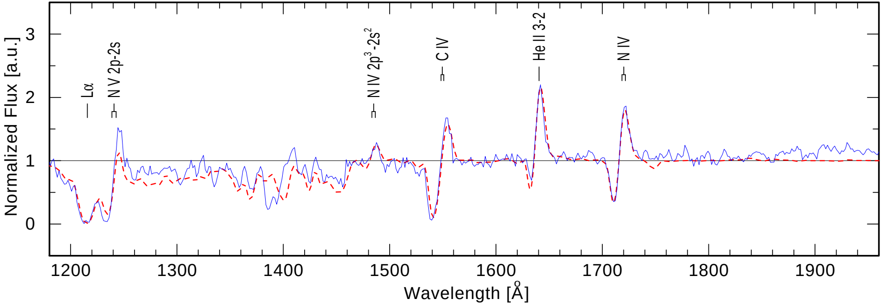
$\Rightarrow$ model grids

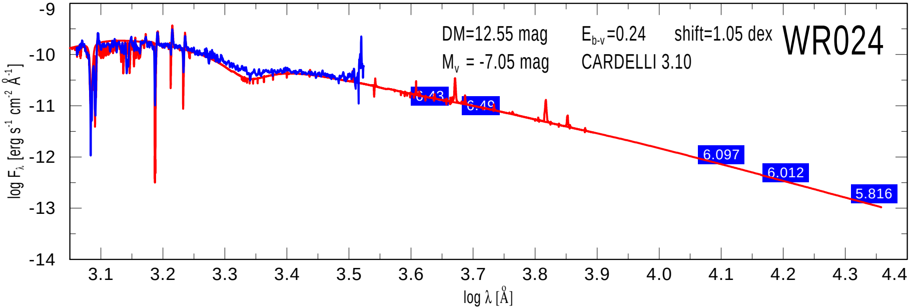


Fitting an emission line spectrum



Hamann et al. 2006

Fitting a spectral energy distribution



Hamann et al. 2006

The Galactic Center

- accessible by IR and radio observations
- 3 young massive stellar clusters: Arches, Quintuplet, Central cluster
- stellar population: massive stars!

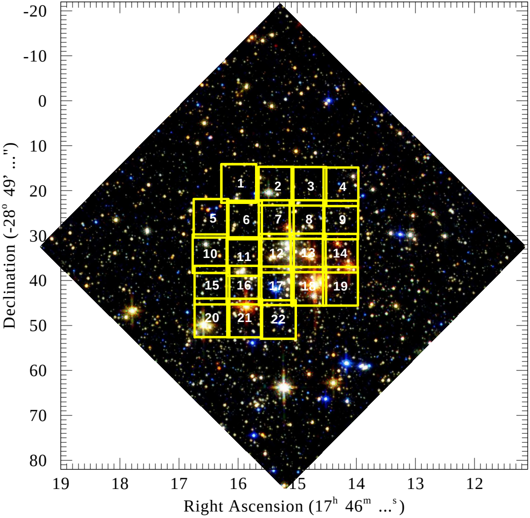
The Quintuplet Cluster

- (super)massive cluster $\sim 10^4 M_\odot$
- 30 pc projected distance from GC (Okuda et al 1989, 1990)
- 4 Million years old (Figer et al. 1999)
- cluster radius about 1 pc

- named after 5 prominent (back then featureless) stars

The Observations

- ESO SINFONI-SPIFFI (no AO)
- 22 target fields of 8×8 arcsec FOV
- K grating (1.95 - 2.45 μm)



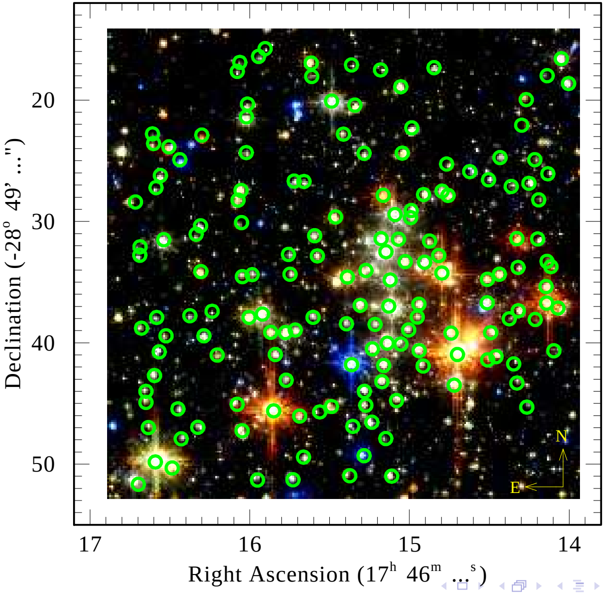
(background: HST image, PI D. Figer, STScI)

The Catalog

The Quintuplet cluster I. A K-band spectral catalog of stellar sources (Liermann et al. 2008, A&A accepted)

- 160 flux-calibrated K-band spectra
- 98 early-type stars
- 62 late-type stars
- synthetic K_s photometry

160 stars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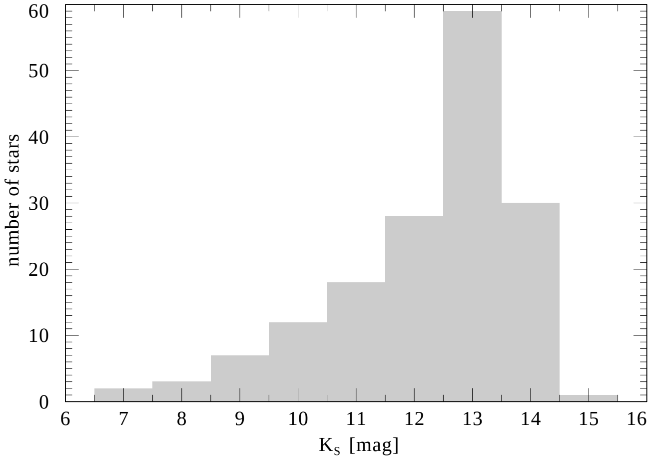

Massive stars in the Quintuplet

- evolved stars: 4 WN stars & 9 WC stars (6 WN and 10 WC in total)

⇒ to be analyzed with PoWR code:
fit emission line spectra
fit spectral energy distribution
derive stellar parameters

Thanks for your attention