

Early type stars in the Wing of the SMC

Rainer Hainich

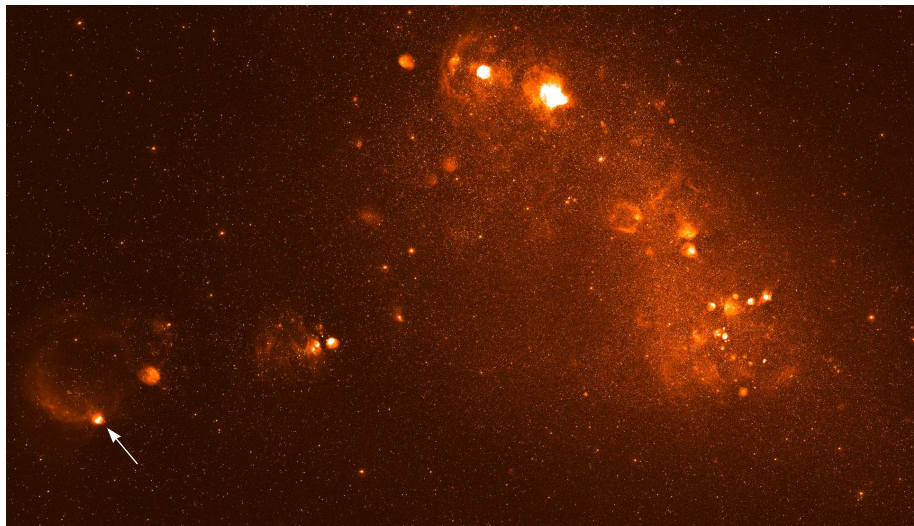
Universität Potsdam
Institut für Physik und Astronomie



27. March 2012

UK-Germany National Astronomy Meeting – Manchester 2012

Small Magellanic Cloud



Cerro Tololo Inter-American Observatory – NOAO [O III]

NGC 602

- young stellar cluster
- at least four distinct clusters
- NGC 602a is embedded in the N90 emission nebula



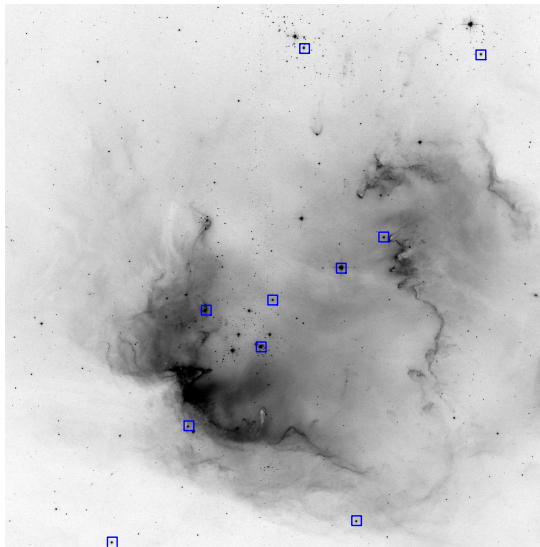
<http://hubblesite.org/newscenter/archive/releases/2007/04/>

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Stellar sample

- 2 O-type stars
- 8 B-type stars



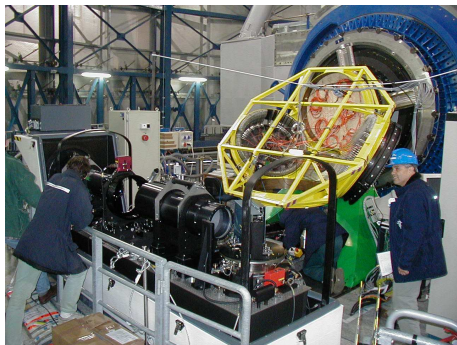
HST ACS/WFC F658N (H α + [N II])

FLAMES observation of NGC 602

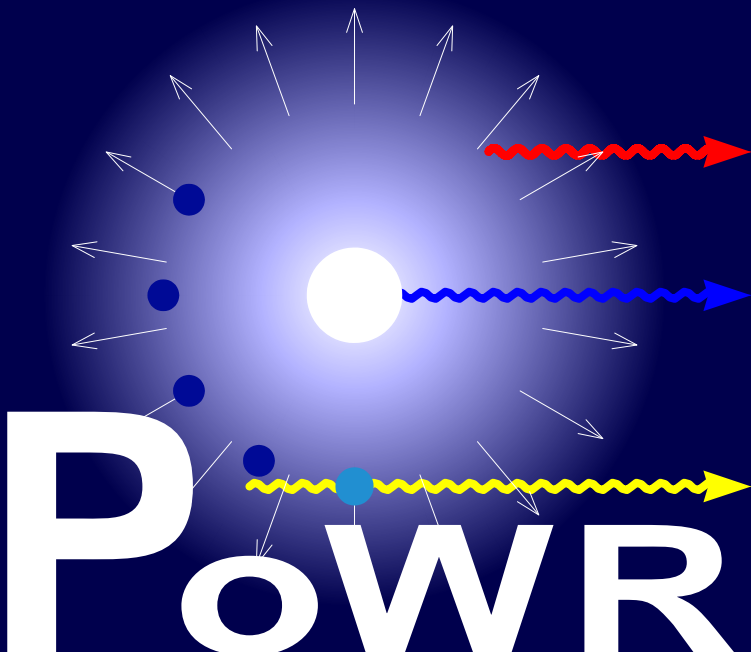
ESO-VLT FLAMES:

- multi-object instrument of the VLT
- GIRAFFE: medium-high resolution spectrograph for the visible range

| | wavelength range [\AA] | resolving power |
|-------|--------------------------------------|--------------------|
| LR02 | 3960 - 4564 | 7000 |
| LR03 | 4499 - 5071 | 8500 |
| HR15N | 6442 - 6817 | 16000 |



<http://www.eso.org/sci/facilities/paranal/instruments/flames/inst/Giraffe.html>



PoWR – Potsdam Wolf-Rayet model atmosphere code

Features:

- Full Non-LTE calculation of population numbers
- Radiative transfer in co-moving frame
- Pressure broadening
- Iron line blanketing
- Micro-clumping

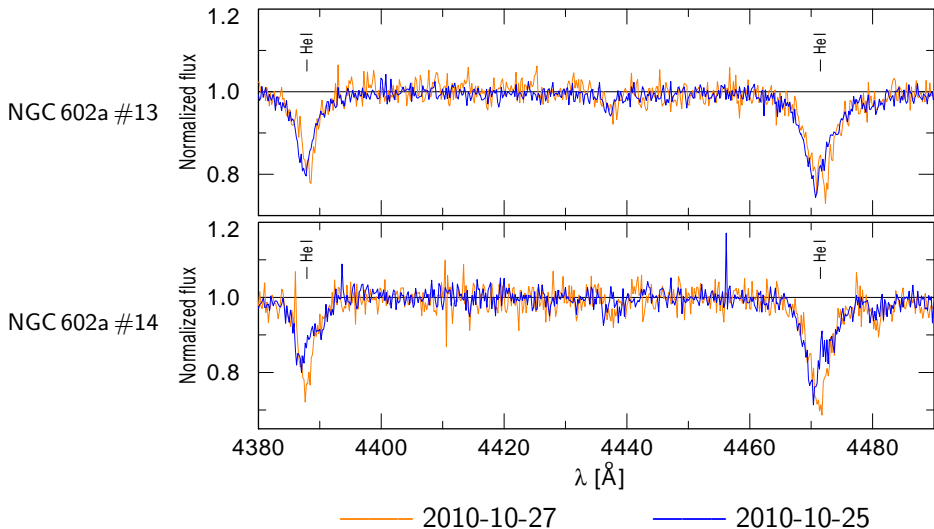
Parameters:

- $L_* = 4\pi R_*^2 \sigma T_*^4$
- Surface gravity: $\log g$
- Mass-loss rate: \dot{M}
- Terminal wind velocity: v_∞
- Chemical composition: X_i



Are there interesting stars in NGC602?

Are there Binaries in NGC 602?



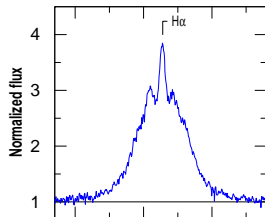
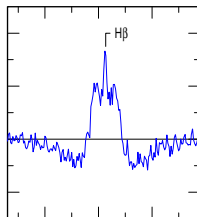
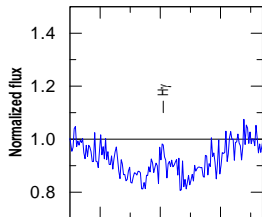
- small line-shifts and asymmetric line profiles

Be-type stars

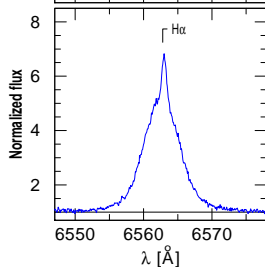
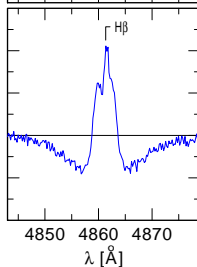
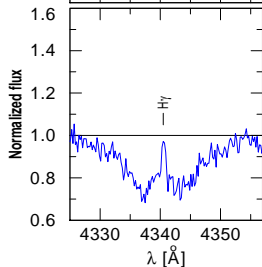
A dearth of Be-type stars in NGC 602?

- so far only one Be-type star was known in this region

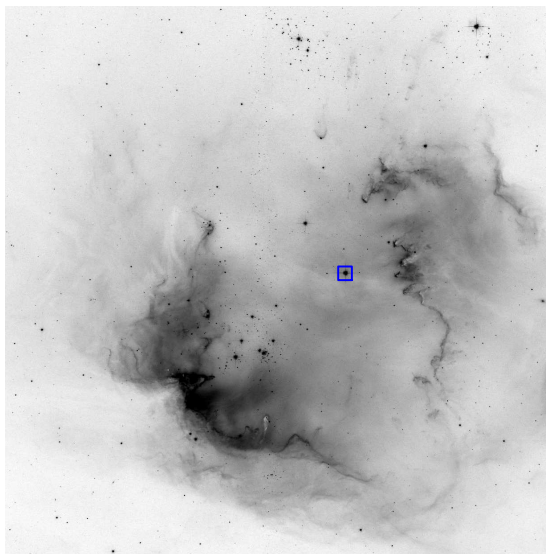
NGC 602a #15



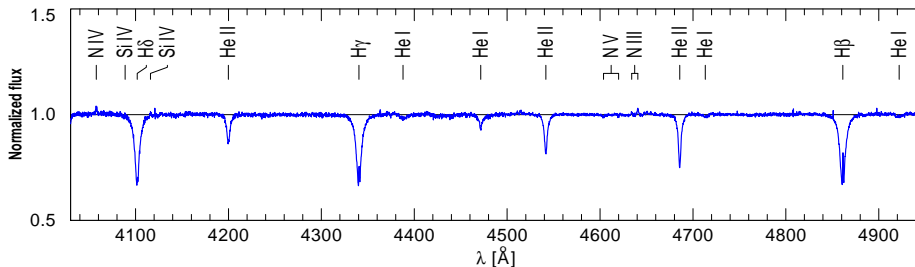
Cluster A #1



SK 183

HST ACS/WFC F658N (H α + [N II])

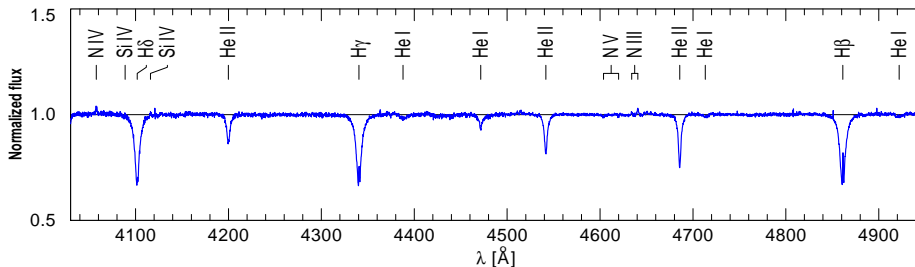
SK 183: O3 V((f*))z



Classification

- Hutchings et al. (1991): O6
- reclassified as O3 V((f*))z (Evans et al. in prep.) based on Walborn et al. (2002)
- N IV λ 4058 \gtrsim N III $\lambda\lambda$ 4634-41-42, strong He II absorption

SK 183: O3 V((f*))z

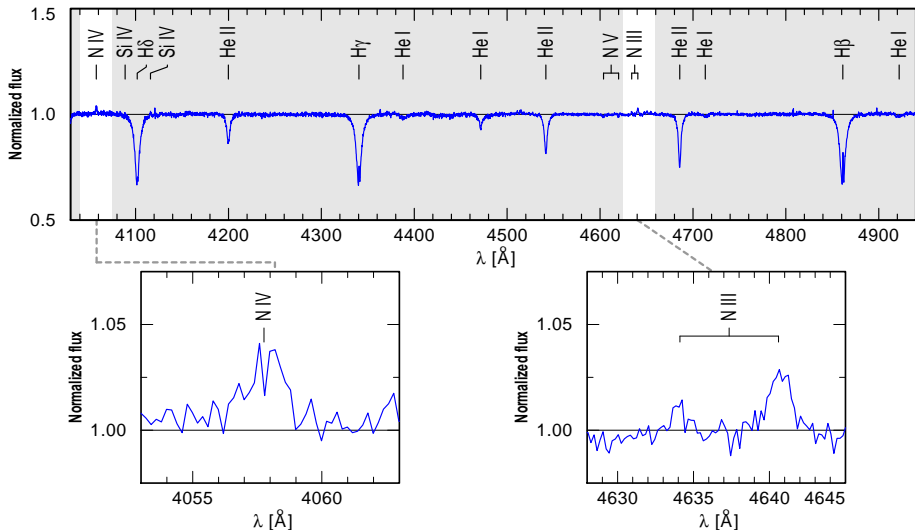


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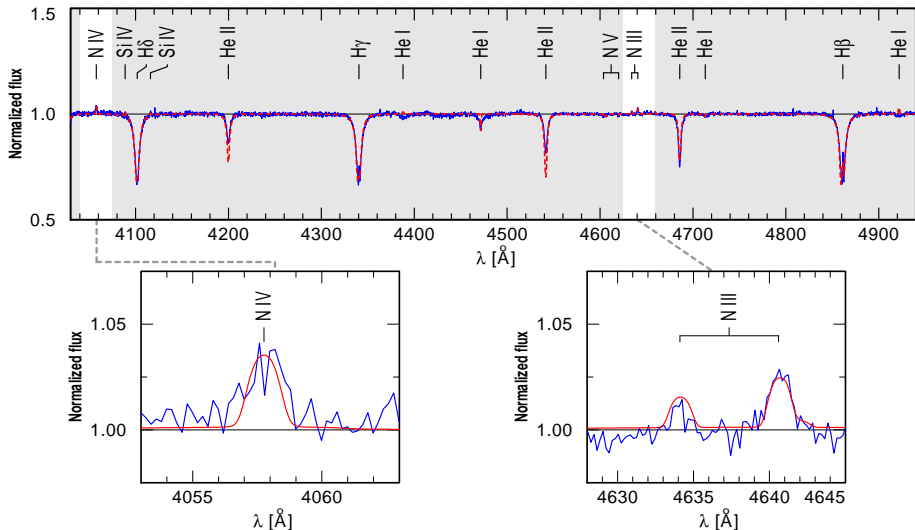
It is the first star earlier than O4 in the SMC which is outside of NGC 346.

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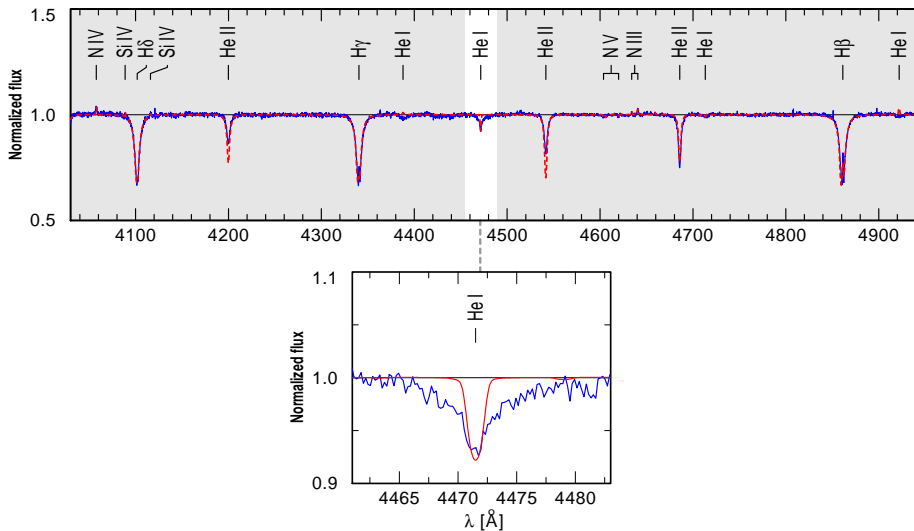
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Analysis - Fit



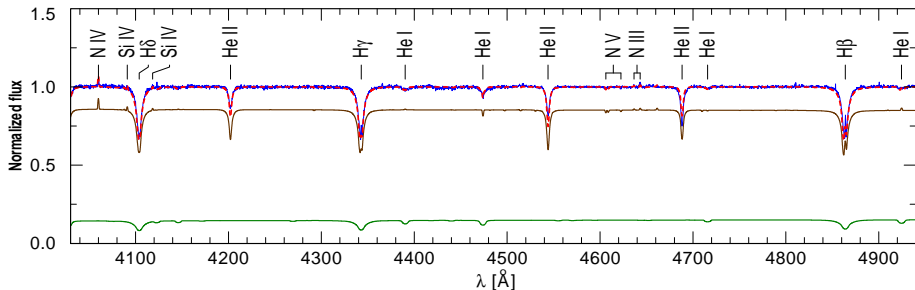
Stellar Parameters: $T_* = 46$ kK, $\log \dot{M} = -7 \frac{M_\odot}{a}$, $12 + \log([N/H]) = 7.73$

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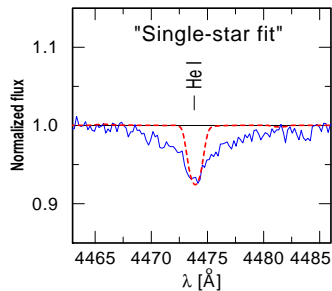
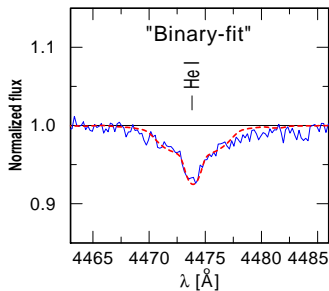
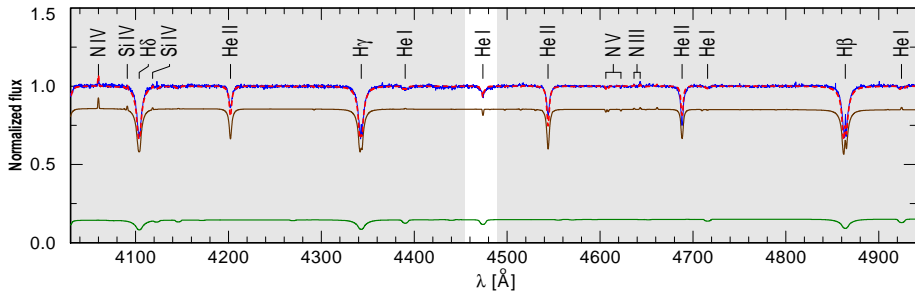
SK 183: O3 V((f*))z + OB



— composite spectrum — O-type star — companion

- continuum fluxes are scaled such that the composite spectrum reproduces the observed SED
- assumption: fast rotating mid B-type dwarf
- the binary-fit has some advantages compared to the single-star-fit
 ↔ improved fit of the He I- and He II-lines

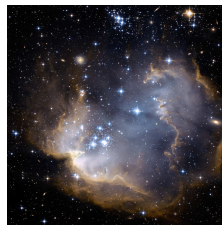
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Summary and Conclusions

discoveries

- a rare O3 V((f*))z star
- two spectroscopic binary candidates
- two Be-star candidates



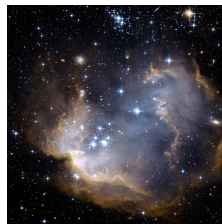
Sk 183

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- dominant source of hydrogen-ionising photons
- primary influence driving the star formation within the N90 nebula

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Thanks for your attention.