Studies of Emission-line stars and HII-Galaxies with SALT

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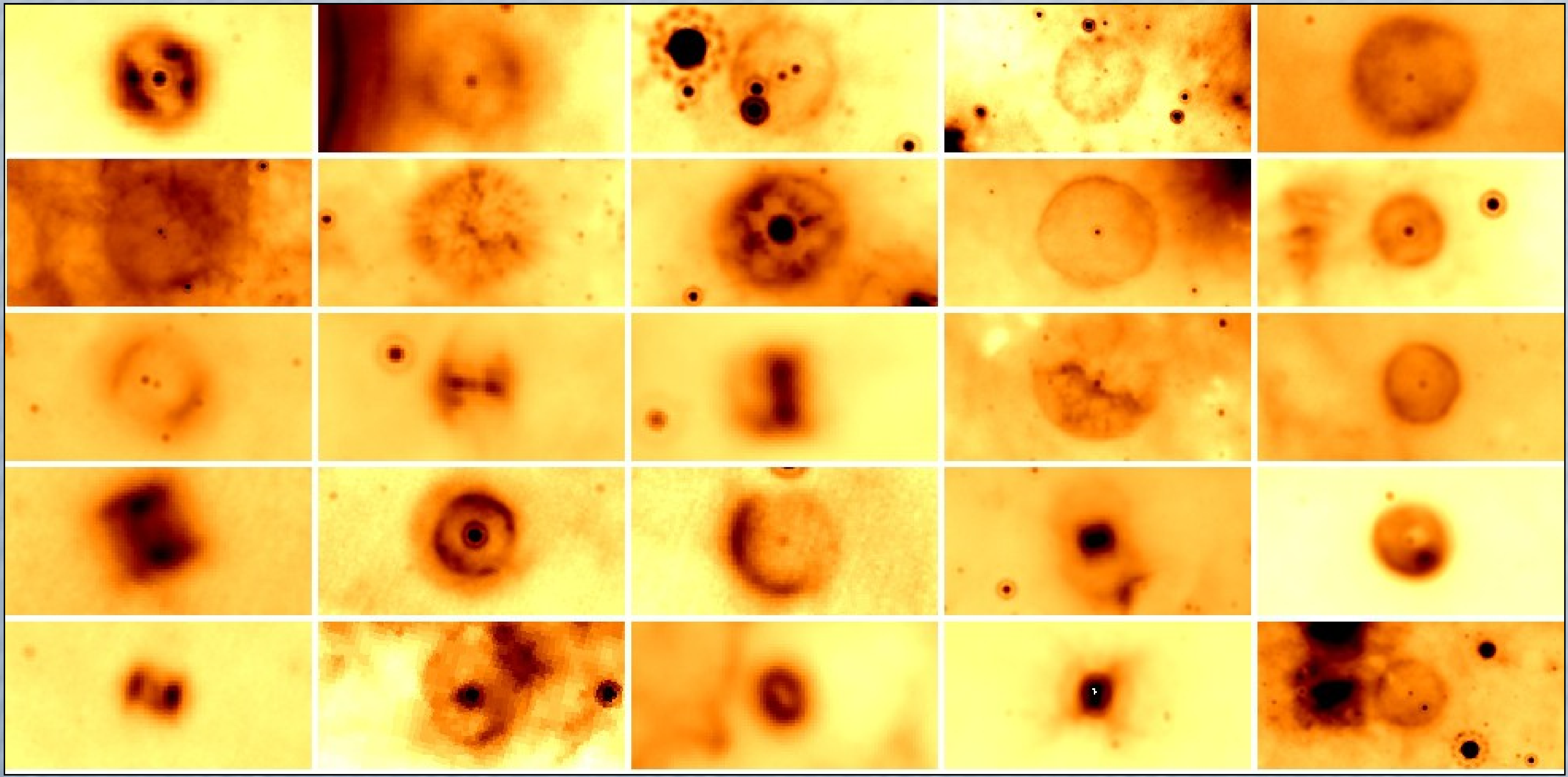
SALT Proposals:

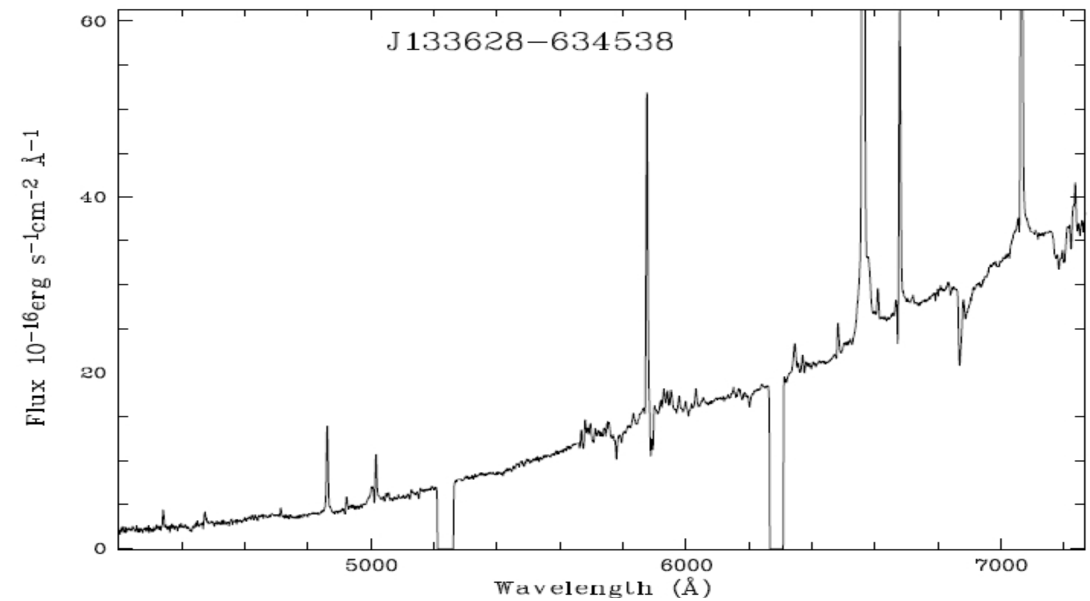
1. Optical Spectroscopy of Stars With 24 Micron Shells: Search for New Luminous Blue Variables
2. DDT proposal on SALT spectroscopy of the Nearby L/T Binary Brown Dwarf at 2 Parsecs from the Sun
3. Planetary Nebulae in the area of CMa dwarf galaxy
4. The Eridanus void galaxies: census and evolutionary status
5. Current and recent starforming sites in lenticular galaxies

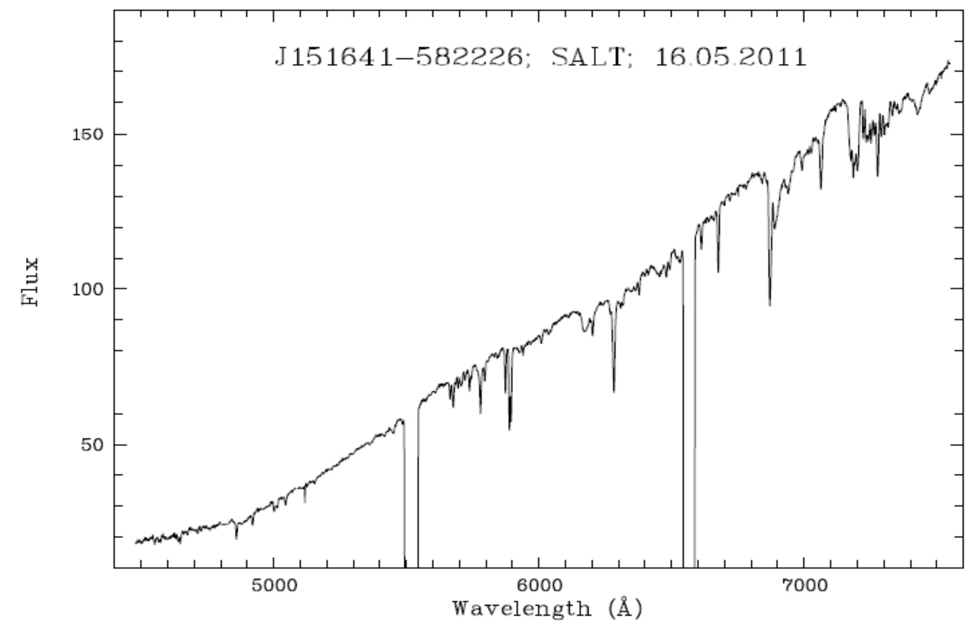
SALT spectroscopy of candidate evolved massive stars revealed with Spitzer and WISE

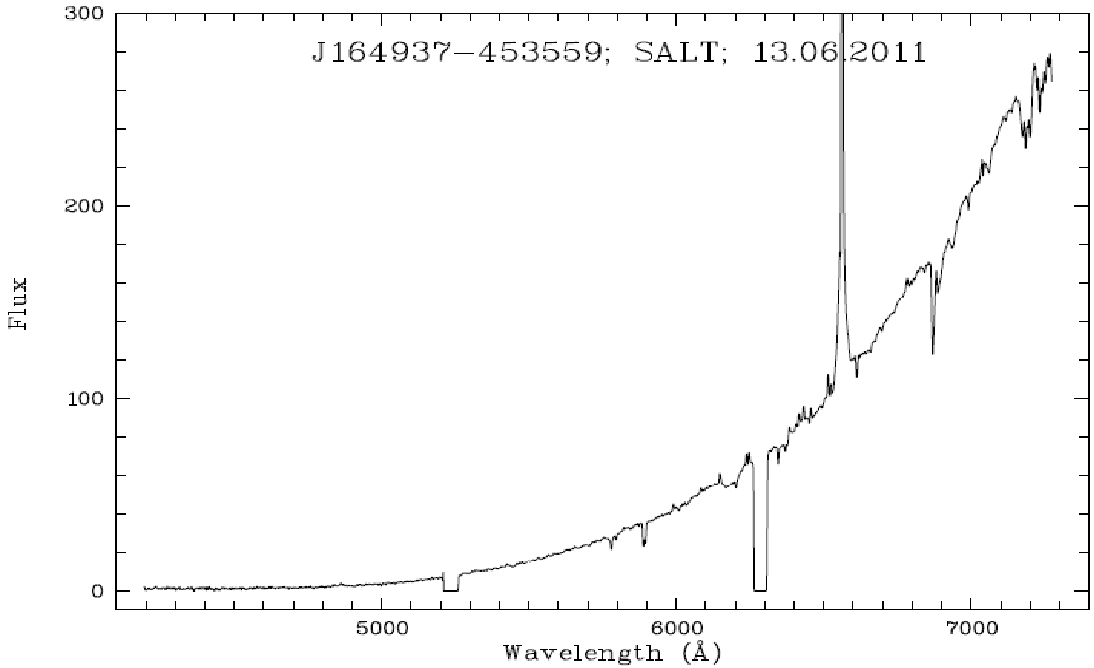


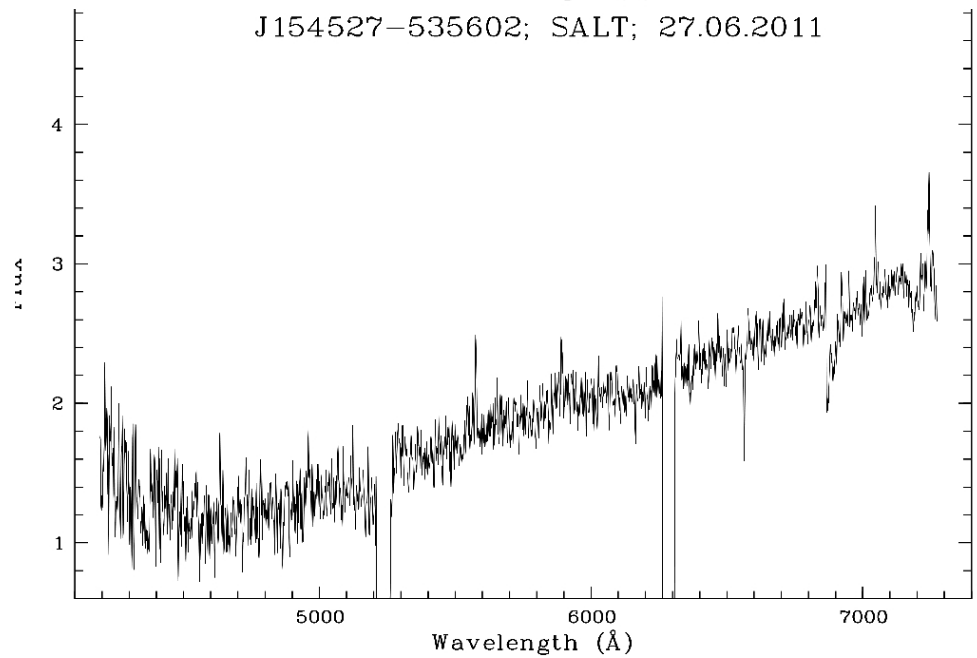
The list of found candidates was published in
Gvaramadze, Kniazev & Fabrika, 2010, MNRAS, 405, 1047

Altogether 42 different candidates were observed at SALT with different quality

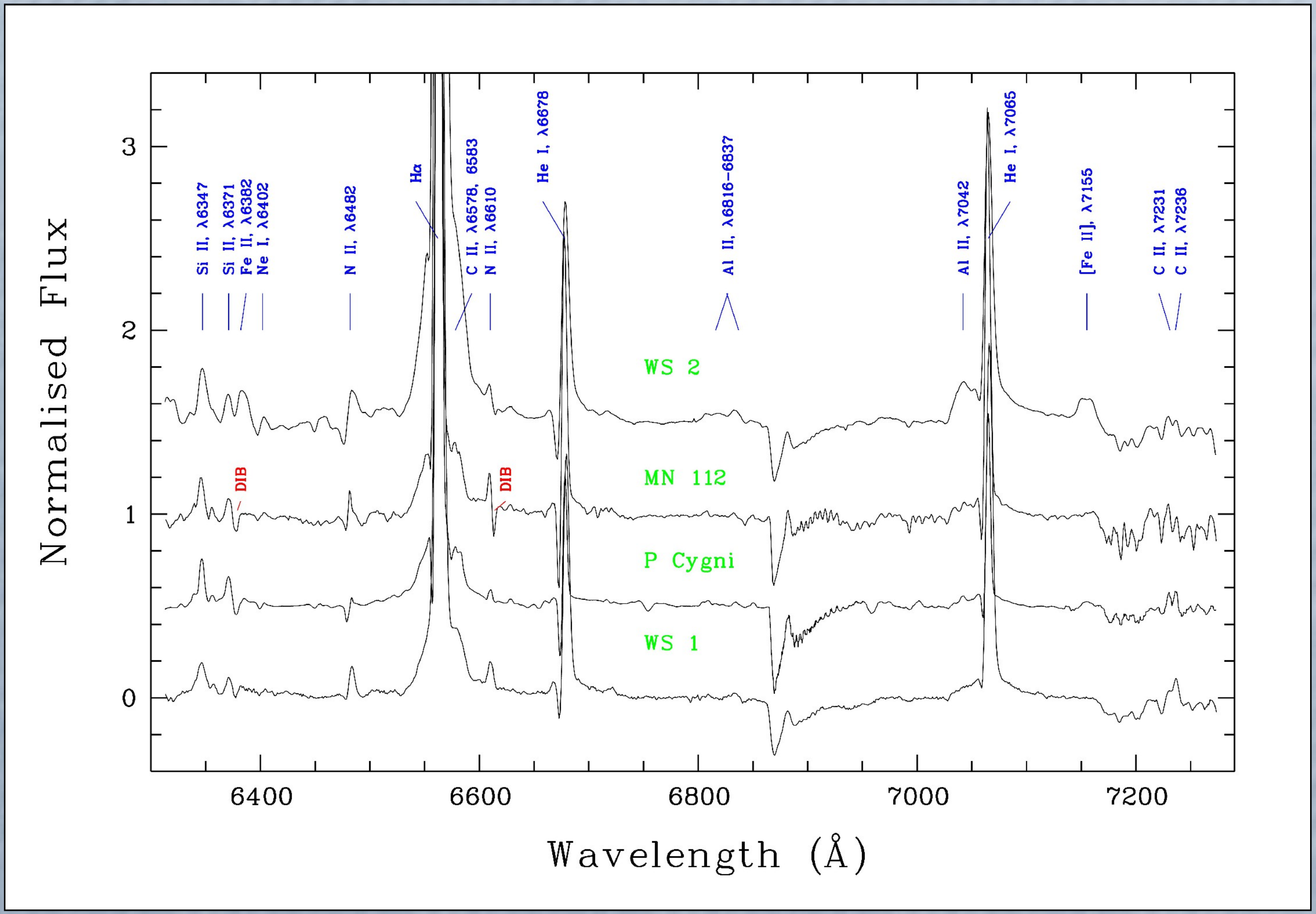






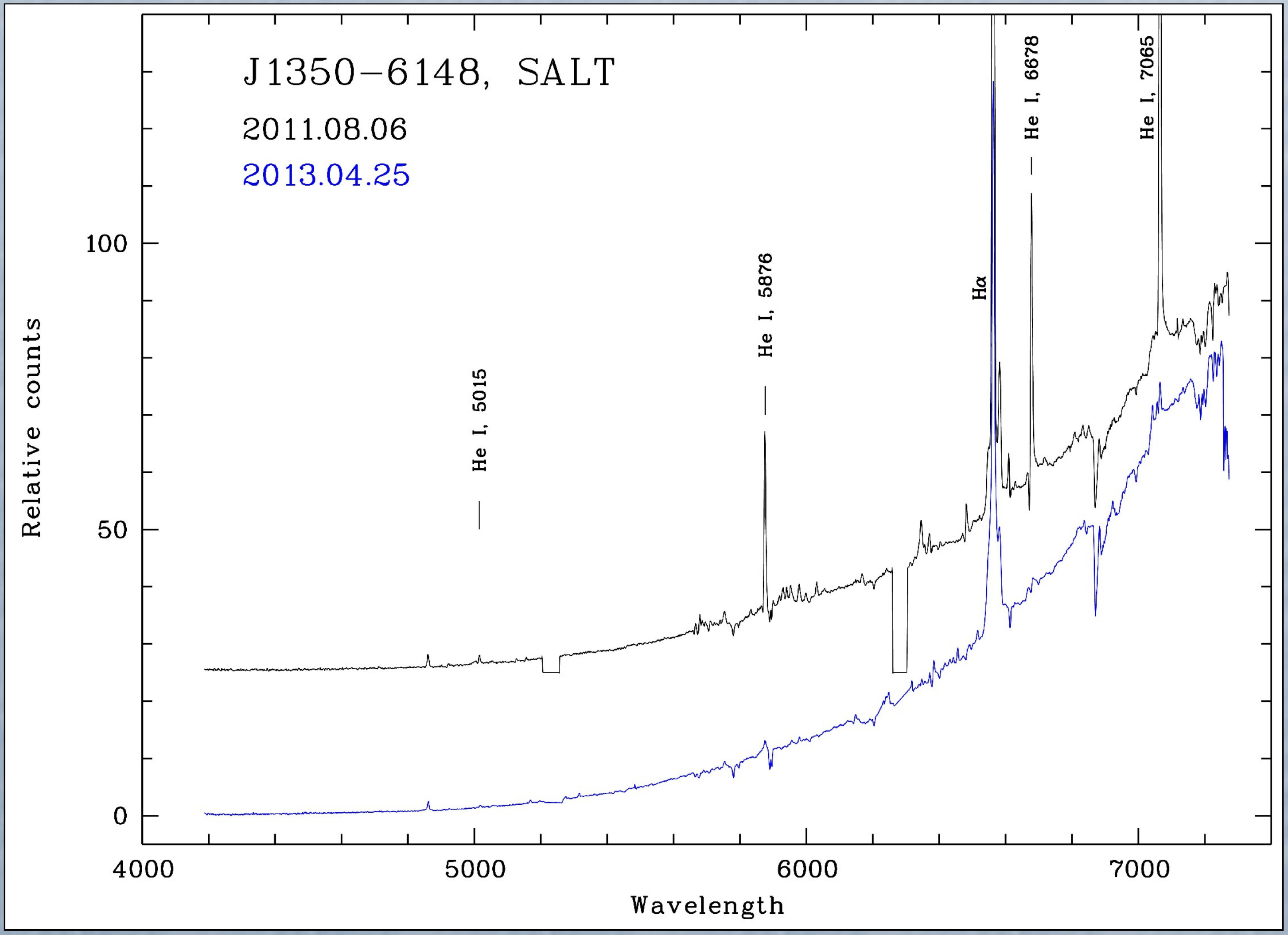


Discovery of two candidate LBV stars: WS1 and WS2



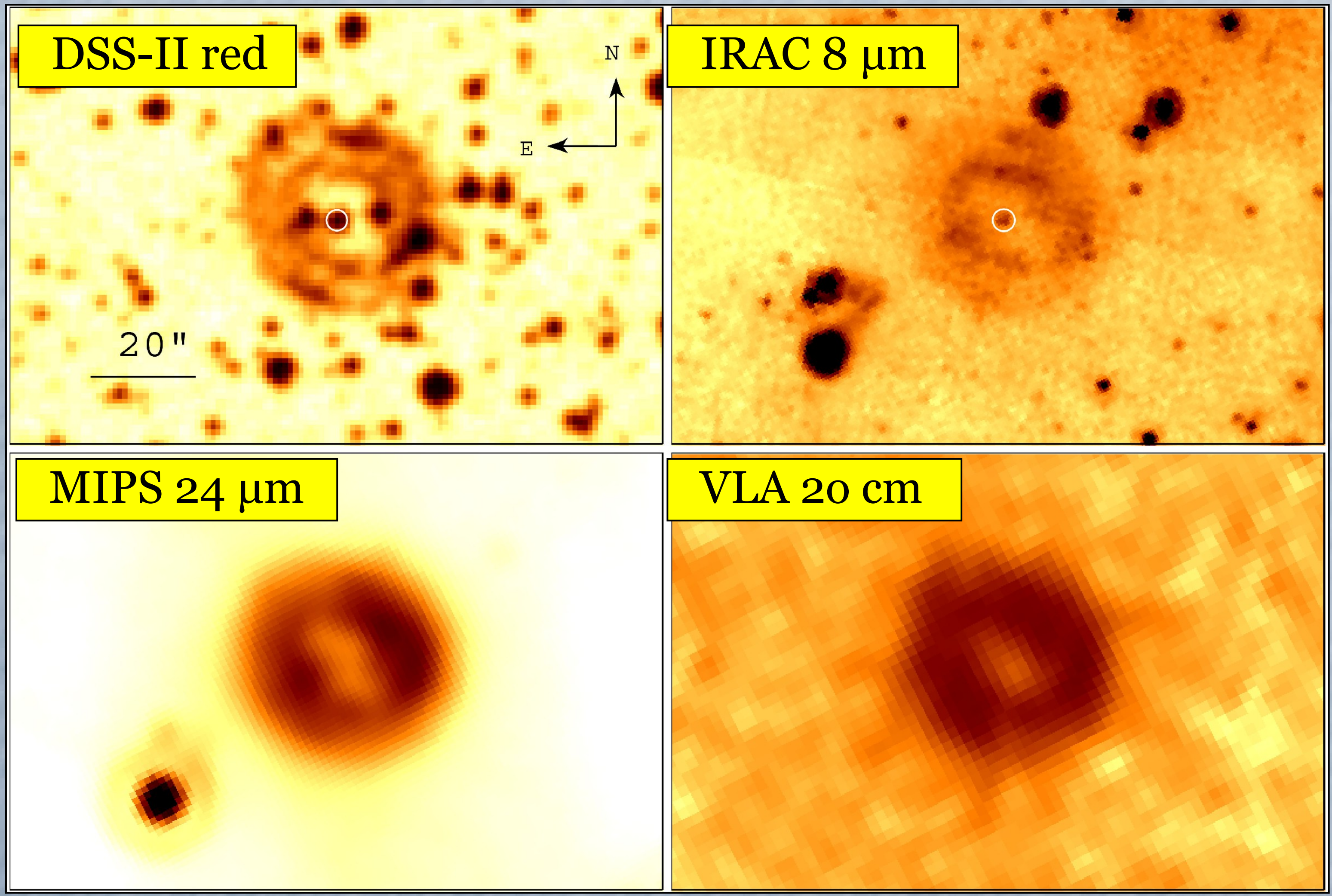
(Gvaramadze, Kniazev, et al., 2012, MNRAS, 421, 3325)

One more bona-fide LBV star – J1350-6148



Kniazev, et al., 2012, in preparation

Abell 48 – a rare WN-type central star of a planetary nebula (1)

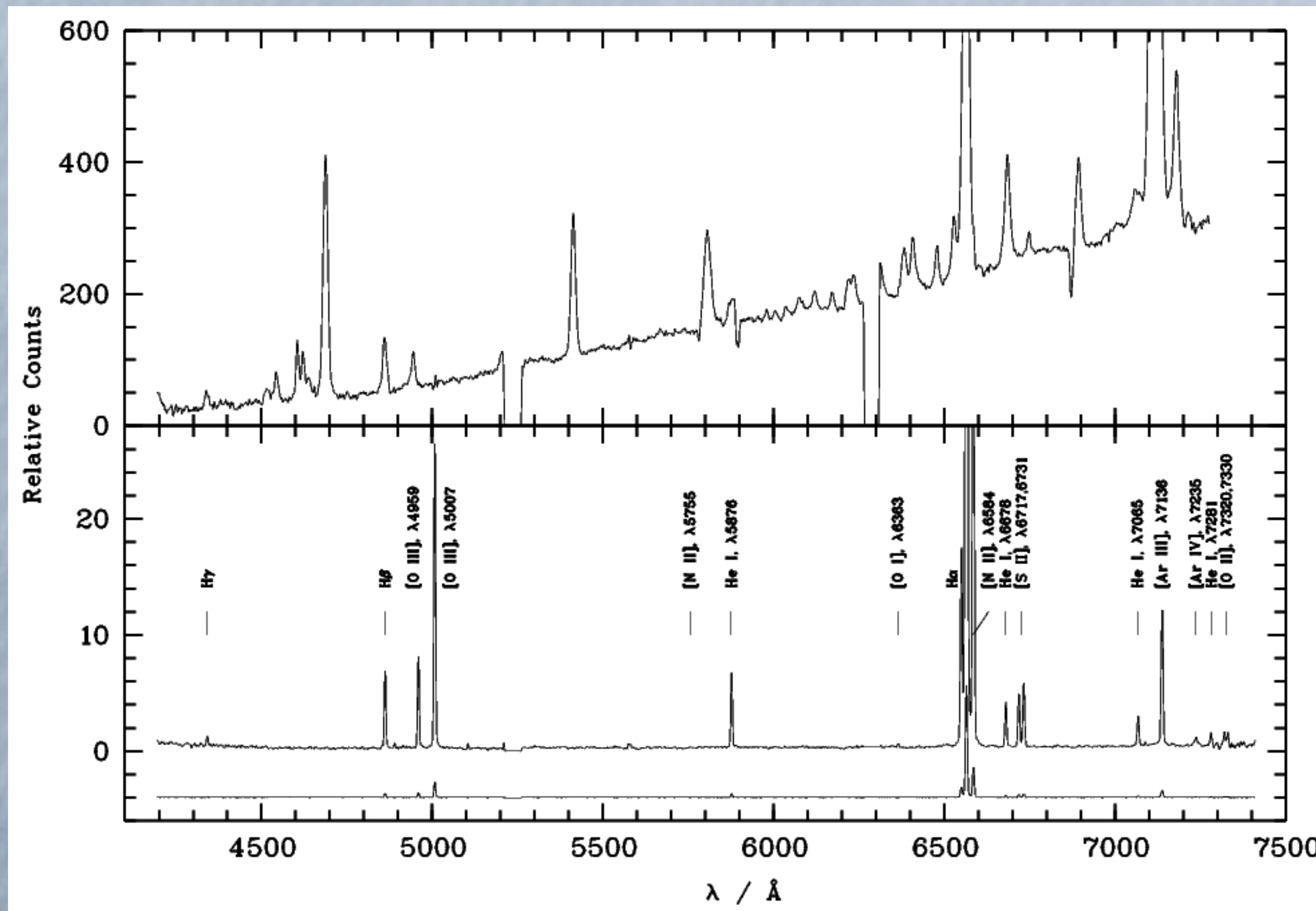


Abell 48 – a rare WN-type central star of a planetary nebula (2)

Todt , Kniazev, et al., 2013, MNRAS, 430, 2302 :
In this work we reported the spectroscopic identification of another rare [WN] star, the CS of Abell 48.

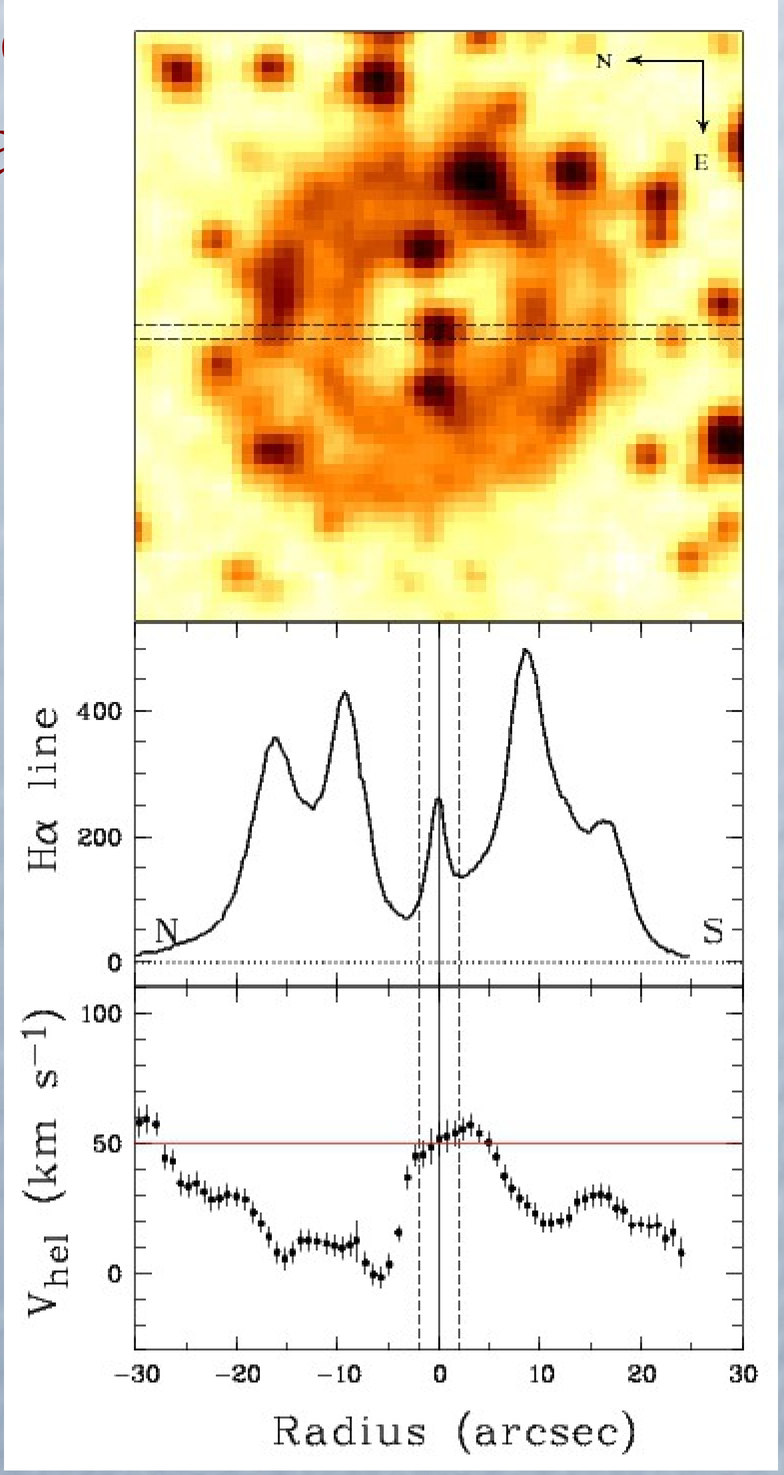
One-dimensional reduced spectra of the central star of Abell 48 (top) and nebula (bottom). The total exposure time is 3x900s.

Most of the detected strong emission lines of the nebula are marked.

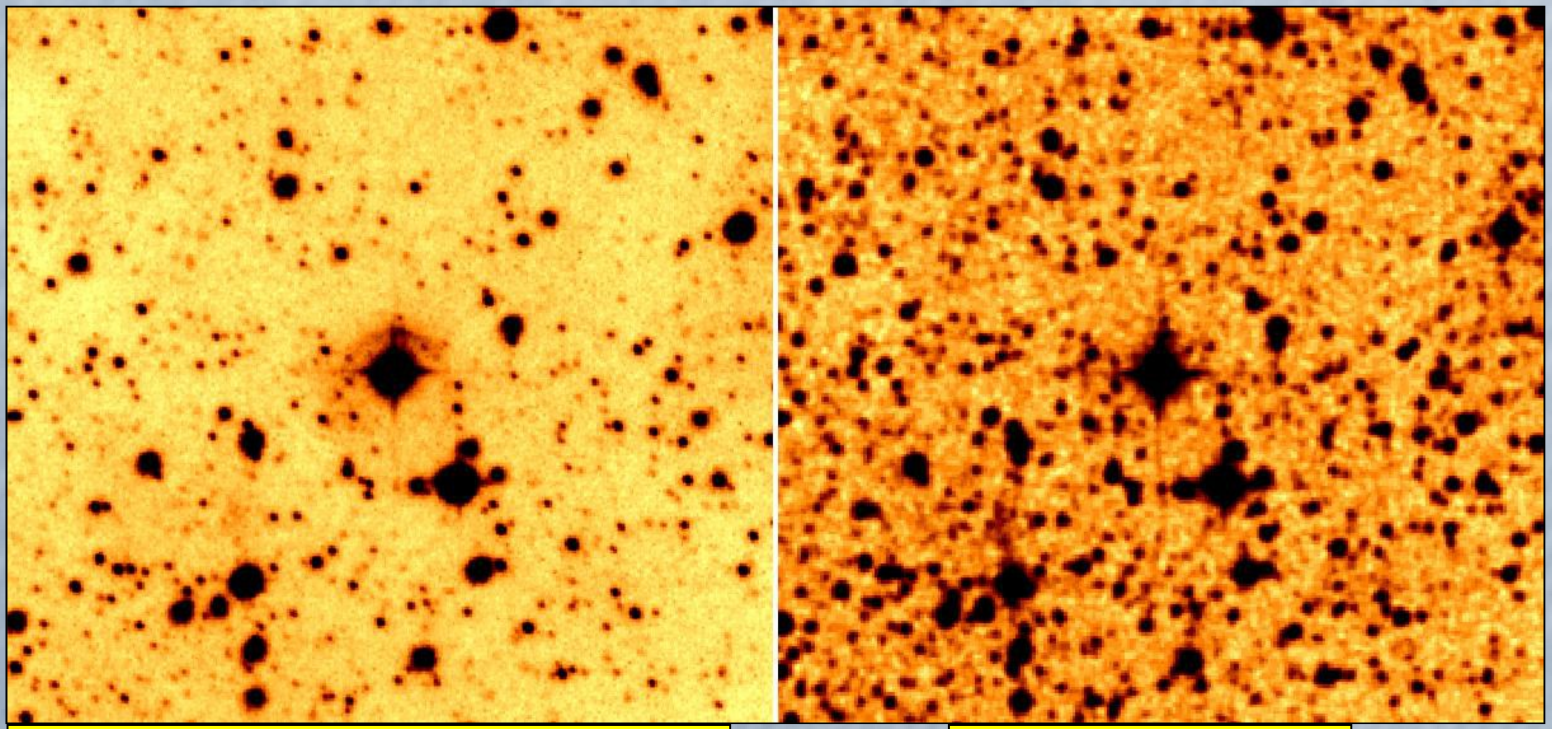


Abell 48 – a rare WN-type [...] planetary nebula

Ha intensity and radial velocity distribution along the slit.
Upper panel: DSS-II red band image of Abell 48 with the position of the 1.25 arcsec slit shown by dashed lines.
Middle panel: The relative flux of the Ha-line along the slit after continuum subtraction. N-S direction of the slit is shown. The vertical line at r=0 corresponds to the position of the CS. The region r+/-2 arcsec is shown with vertical, dashed lines to mark the area, where the average velocity V_hel = 50.4 +/- 4.2 km/s was calculated.
Bottom panel: The velocity profile of the Ha line, corrected by using the night-sky line [OI] 6363 Å. The horizontal line indicates the calculated Velocity 50.4 km/s, that has to be close to the heliocentric velocity of the CS.



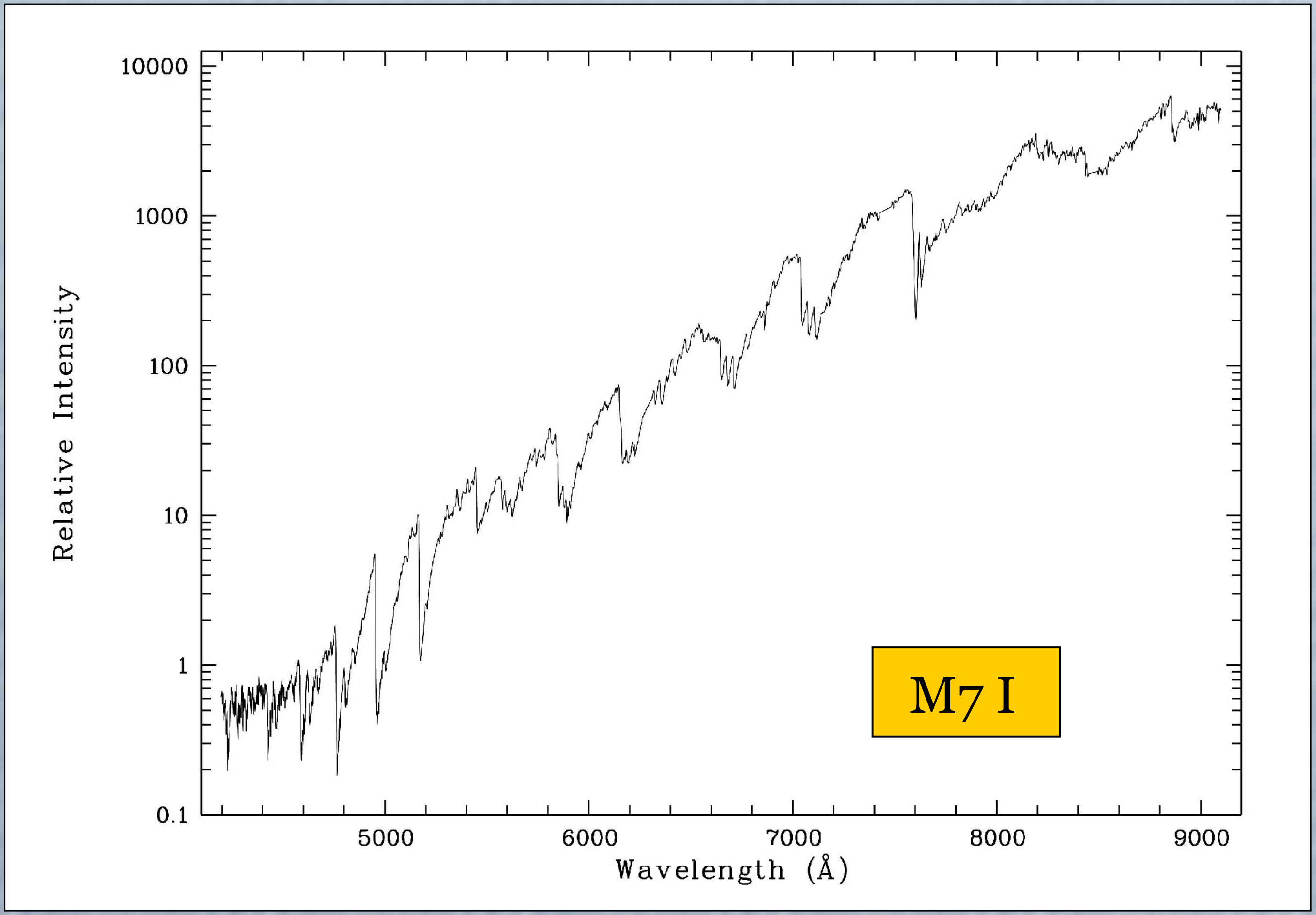
SALT spectroscopy of IRC-10414 and its arc-like nebula



SuperCOSMOS Hα+[NII]   DSS-II red

(Gvaramadze, Menten, Kniazev, et al., 2013, MNRAS, in press, astro-ph/1310.2245)

IRC-10414: a runaway M7 supergiant



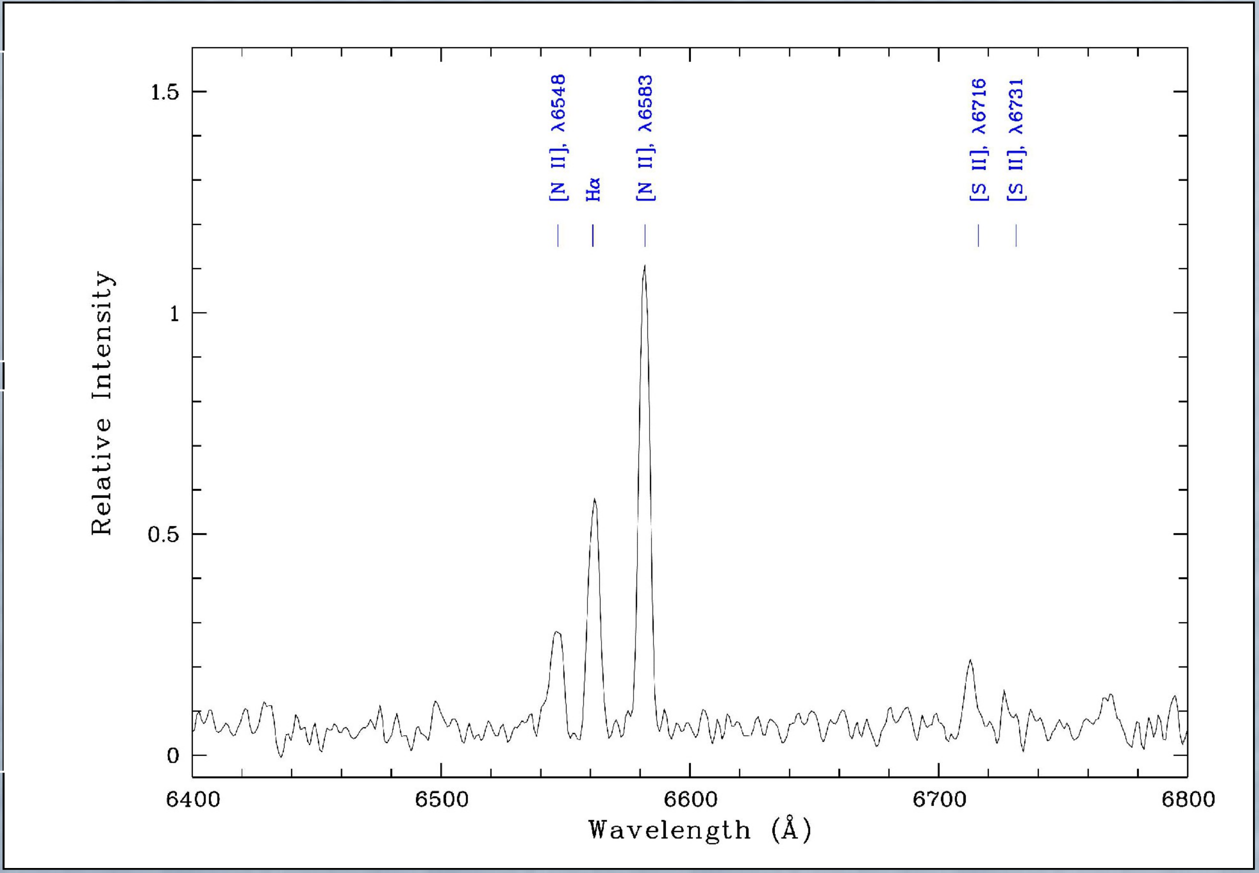
(Gvaramadze, Menten, Kniazev, et al., 2013, MNRAS, in press, astro-ph/1310.2245)

IRC-10414: Arc-like nebula is a bow shock

[SII]/Hα=0.4

=> shock-heated

A first-ever optically detected bow shock around a RSG!



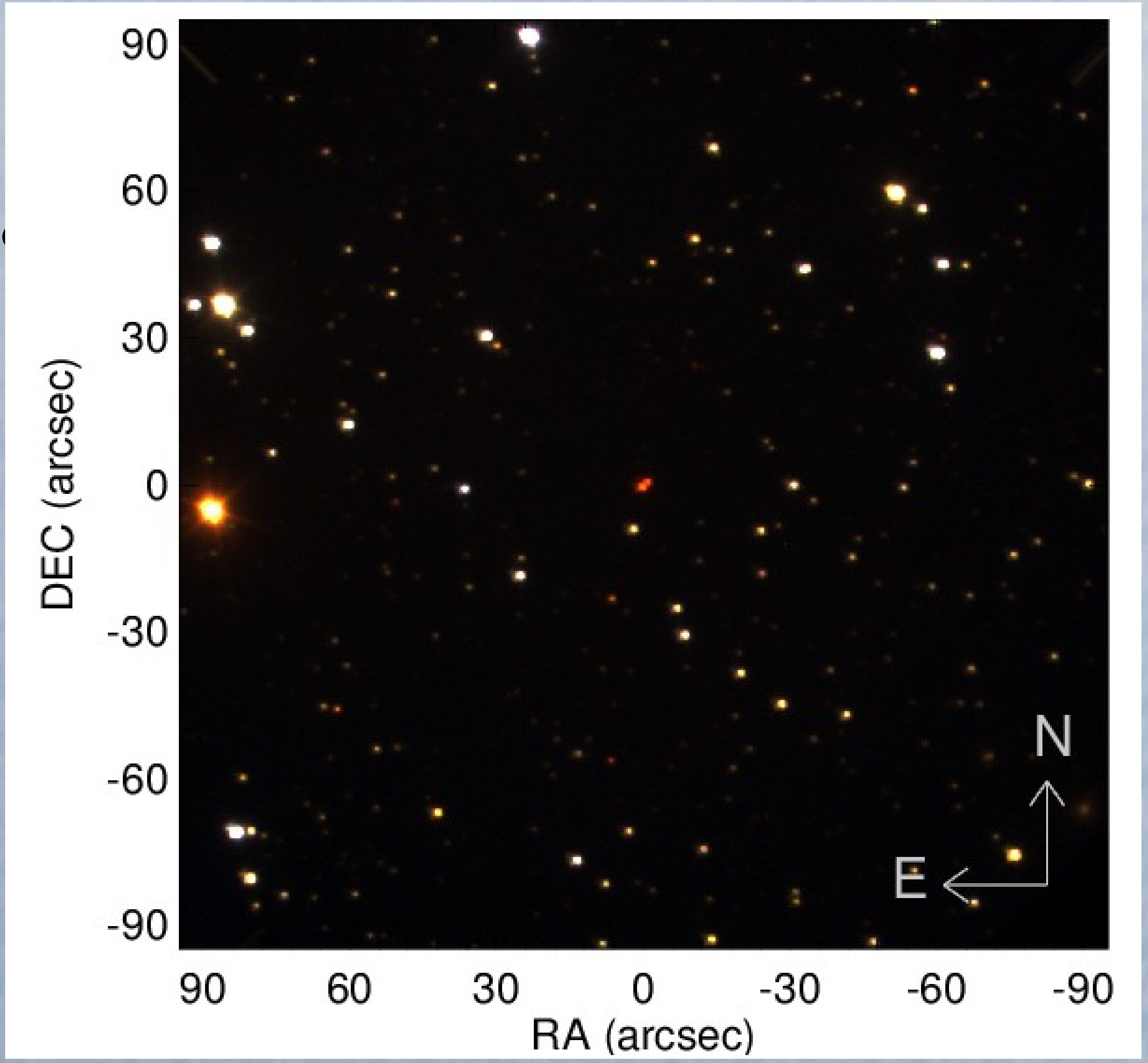
(Gvaramadze, Menten, Kniazev, et al., 2013, MNRAS, in press, astro-ph/1310.2245)

Characterization with SALT spectroscopy of the Nearby L/T Binary Brown Dwarf at 2 Parsecs from the Sun (1)

Luhman (2013) used multi-epoch WISE observations to search for objects with red colors and high-PM. He identified WISEJ104... (W10-53). His study placed W10-53 at a distance
~2pc, that makes it the third closest system to the Sun.

Long-slit spectra of W10-53 were obtained with RSS on March 12, 2013 and March 16th, 2013 to measure radial velocities and make spectral classification.

Three-color optical image of the W10-53 field highlighting the extremely red color of the binary. Three 90s exposures taken with the RSS at SALT

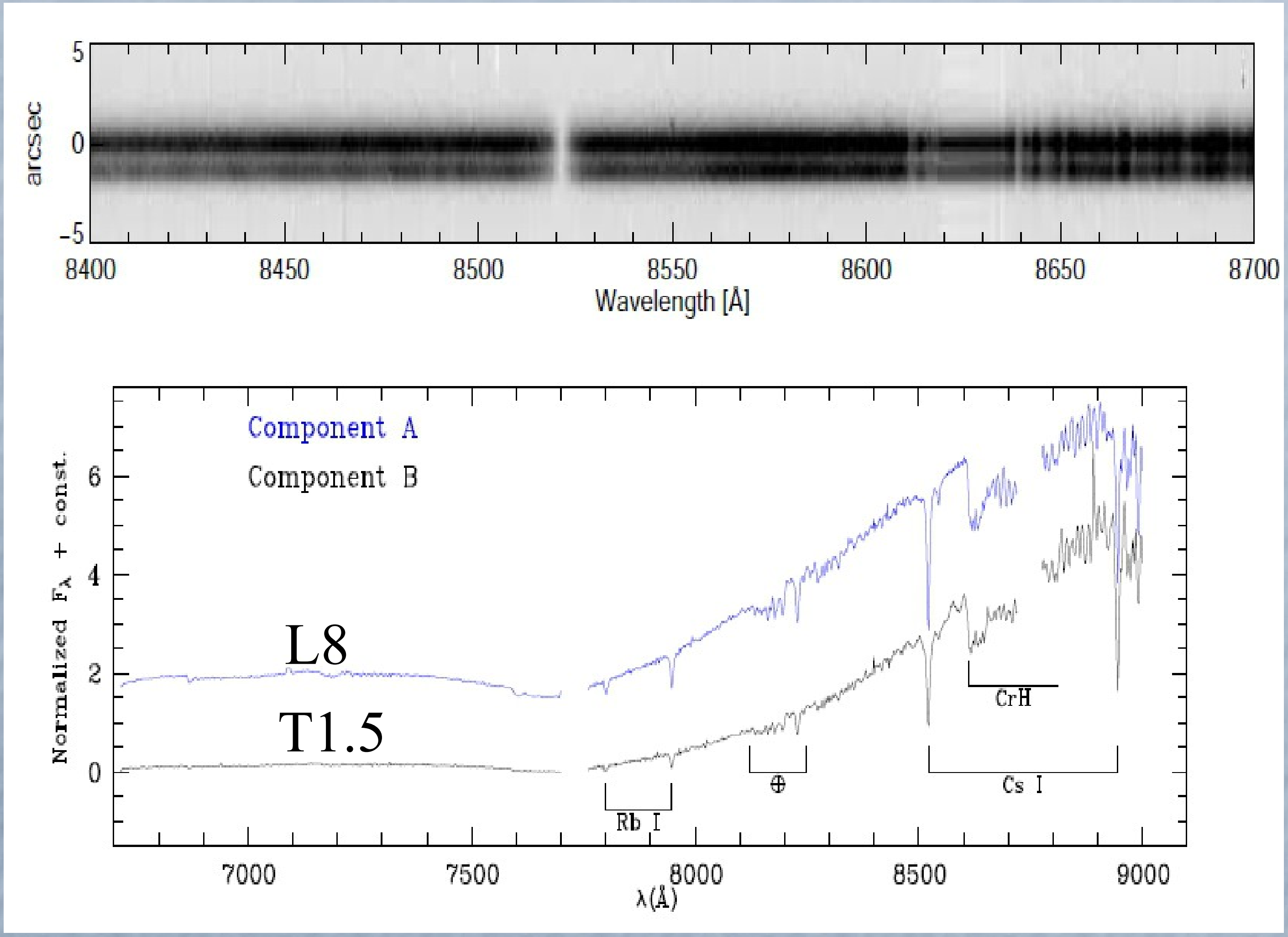


Characterization with SALT spectroscopy of the Nearby L/T Binary Brown Dwarf at 2 Parsecs from the Sun (2)

Kniazev, Vaisanen et al., 2013, ApJ, 770, 124 (7 citations up to now)

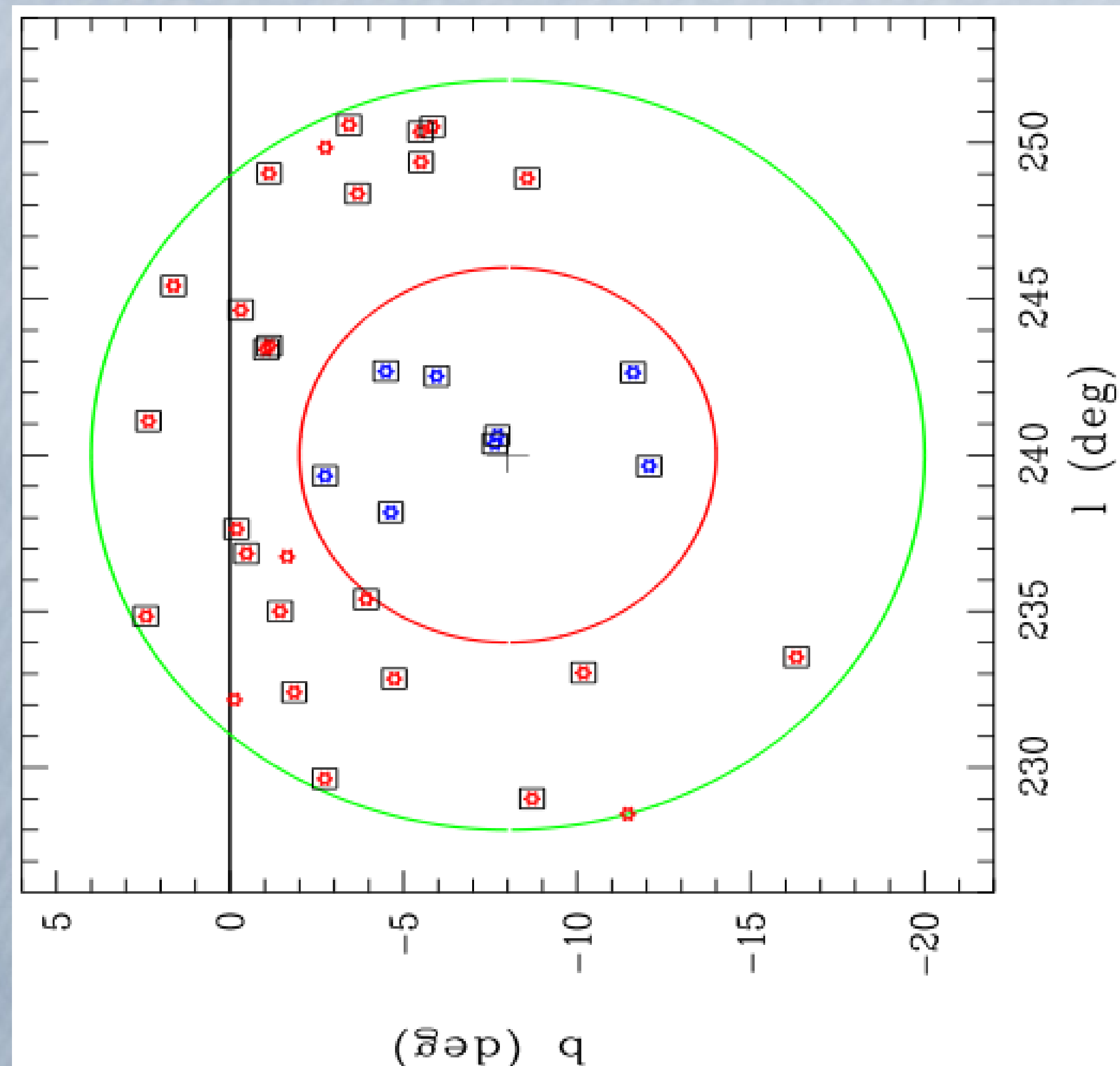
Part of the wavelength range of the reduced 2D spectrum of W10-53 taken with the PG1800 grating, showing the spatially resolved components of the binary. Component A, brighter in the optical, is at the top. The distance between components is 1.5 arcsec only.

Bottom: The extracted 1D spectra of both components obtained with the PG900 grating. The main spectral features are marked.



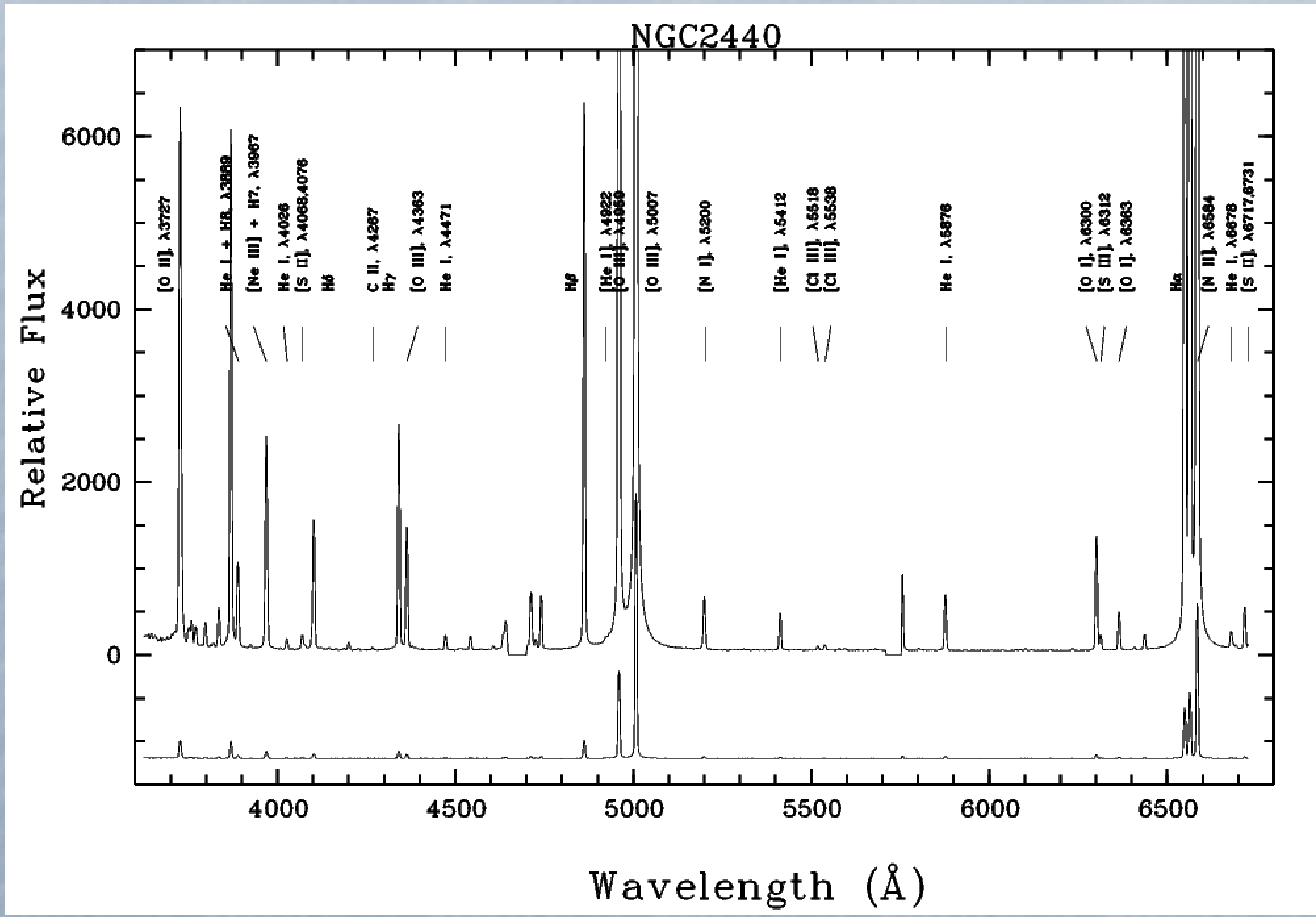
The PNe in the area of CMa dwarf galaxy (2)

Sky distribution of the sample of PNe and PN candidates from the region of CMa in the Galactic coordinate system. The center of the region with coordinates (l, b) =(240◦,−8◦) is indicated by the cross at the center. The first- and second-priority objects are indicated by the blue and red symbols, respectively.



From the total sample of 35 PNe and PNe candidates with size <100”, 31 were observed up to now using SALT.

The PNe in the area of CMa dwarf galaxy (3)

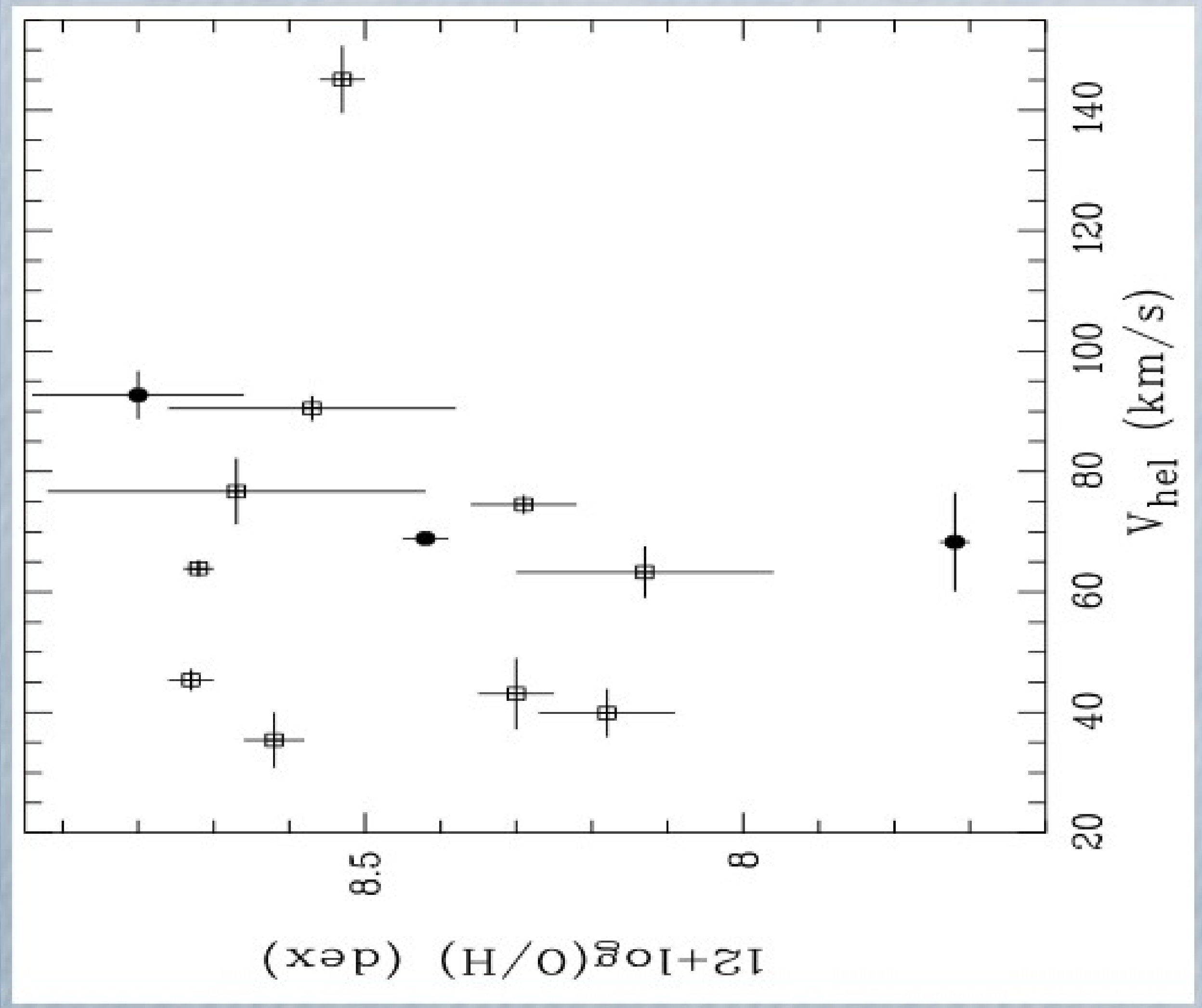


From the total sample of 35 PNe and PNe candidates, 31 were observed up to now using SALT.

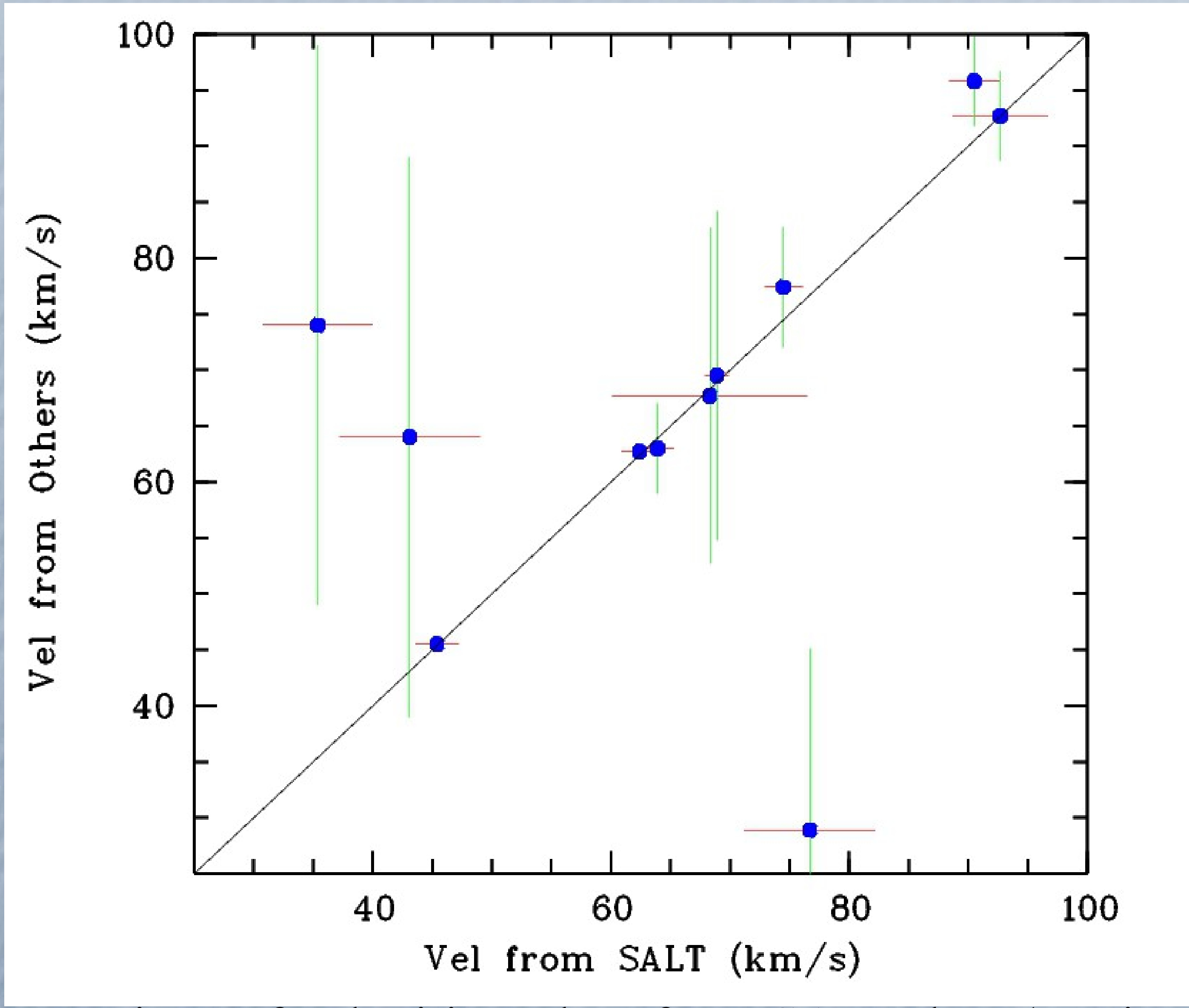
The PNe in the area of CMa dwarf galaxy (4)

Pilot results on SALT observations of first 7 PNe were published in Kniazev (2012, Astronomy Letters, 38, 707)

Distribution of measured velocities for all of the nebulae studied relative to their calculated oxygen abundances. The filled circles and open squares indicate the first- and second-priority objects, respectively.



The PNe in the area of CMa dwarf galaxy (5)

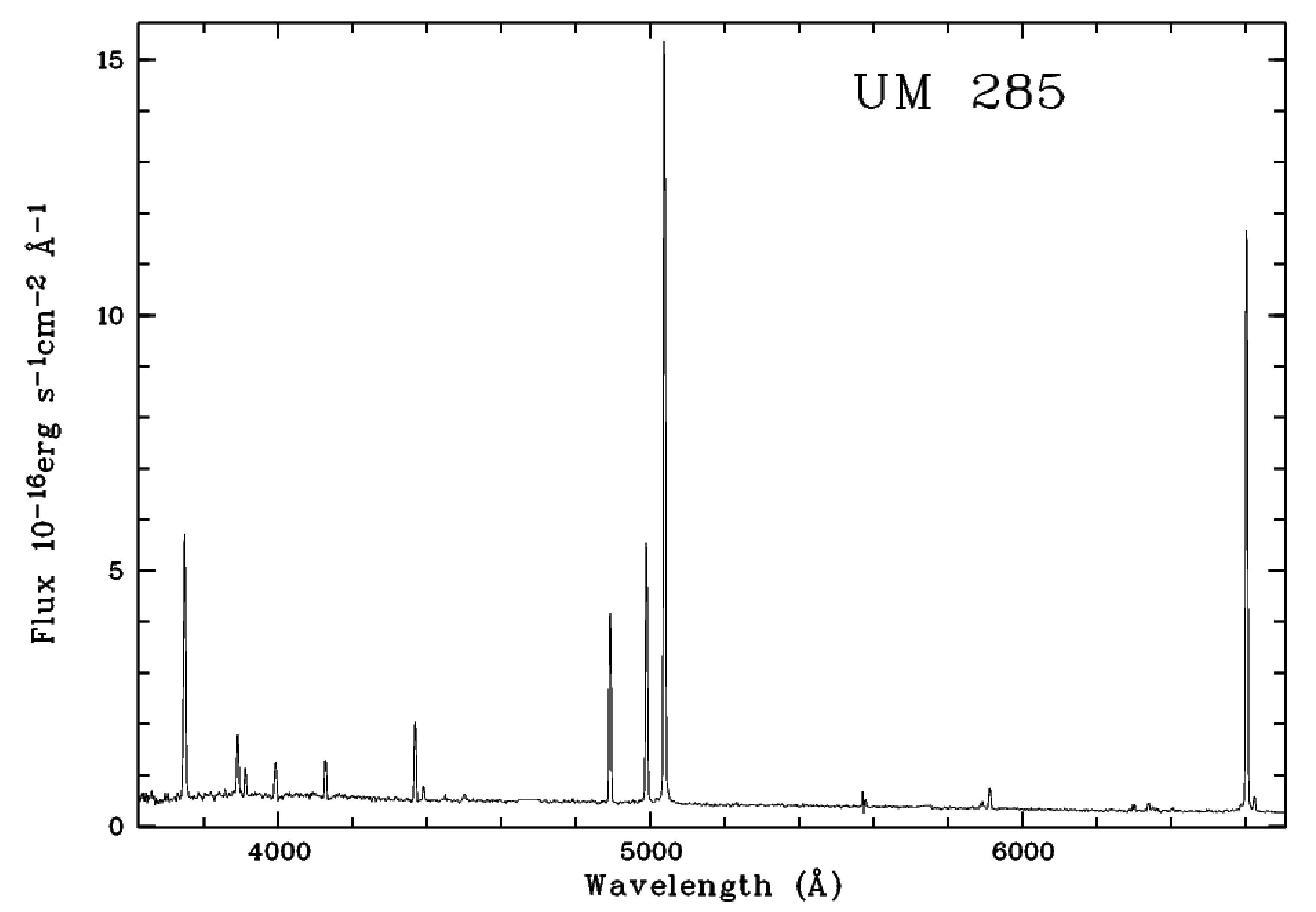


The comparison of velocities taken from SALT data (grating GR900) and from other sources. SALT data show very nice accuracy.

Galaxy evolution versus global environment

- Role of denser galaxy density is relatively clear, but for very low density regions (voids) the effect of environment is poorly known.
- Voids are delineated by luminous ($L > L^*$) massive objects, are populated by dwarfs and devoid of luminous objects. Void properties can vary.
- Not only galaxy interactions occur in voids much less frequently, but also DM halo and galaxy formation from density perturbations can be somewhat retarded due to the lower void mean gravitational potential.

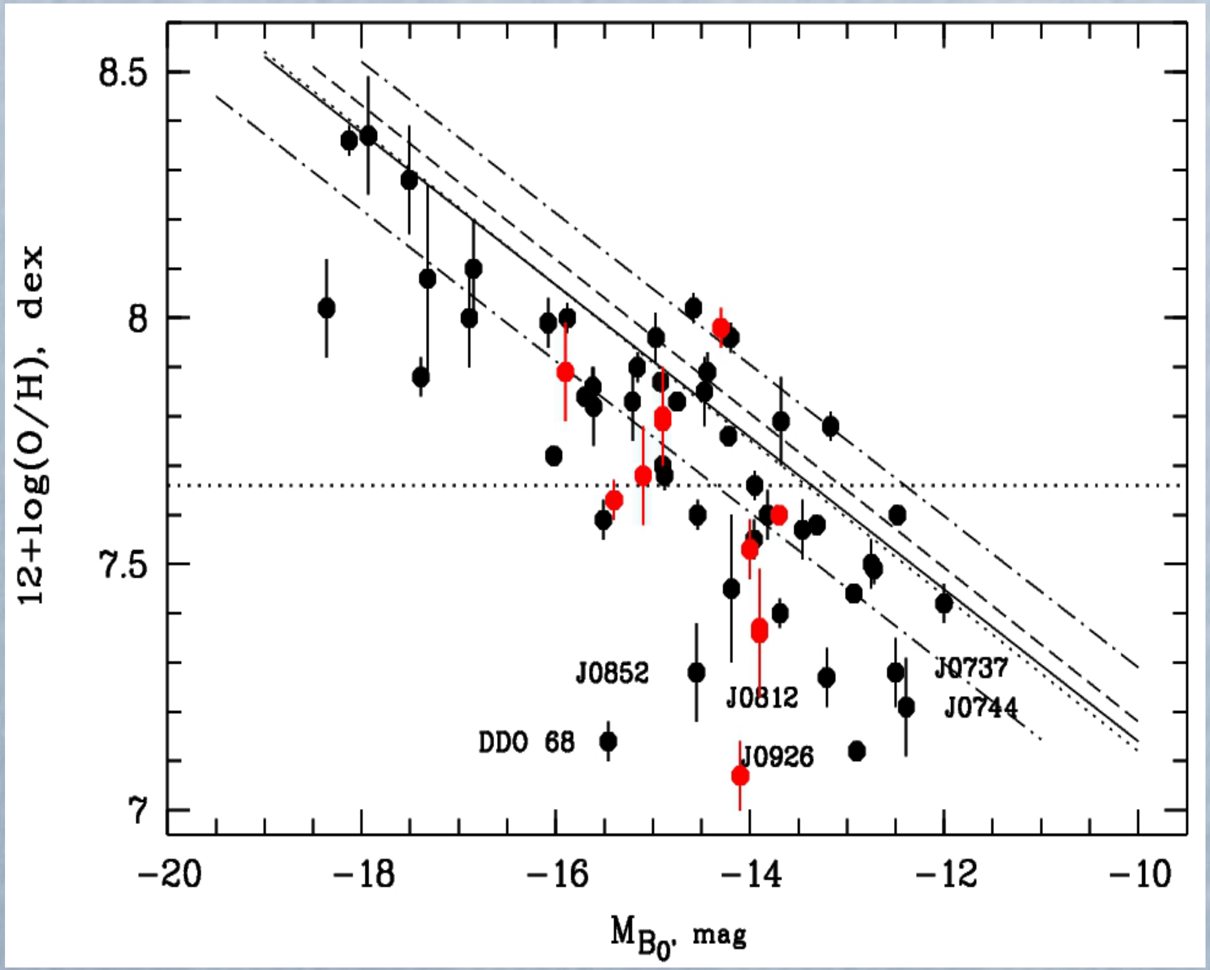
The Eridanus void galaxies: census and evolutionary status (2)



Ten galaxies in the Eridanus void out of 21 observed in 2012-1, 2012-2 and 2013-1 show [O III] 4363 line.

The Eridanus void galaxies: census and evolutionary status (3)

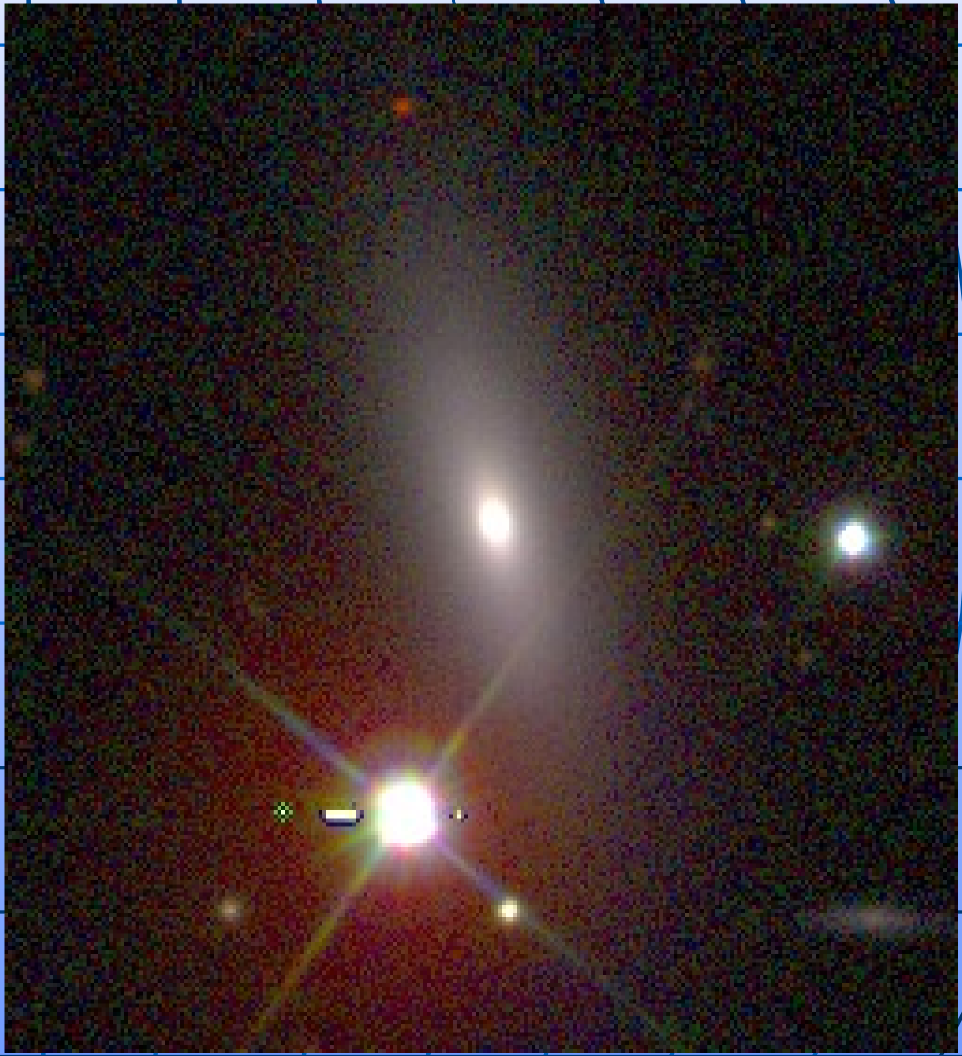
- The basic relation "O/H vs M_B" as derived on the Local Volume groups and field dwarfs (van Zee & Haynes 2006, the upper dashed line) and O/H, observed in void dwarfs
- The line shifted by 1 mag (or ~0.15 dex on O/H) better accounts for possible systematic lower O/H in the void
- Black points are our data from Pustilnik, Teplyakova & Kniazev (2011) for galaxies from Lynx-Cancer void. Red points are our data from SALT and SDSS for the Eridanus void galaxies



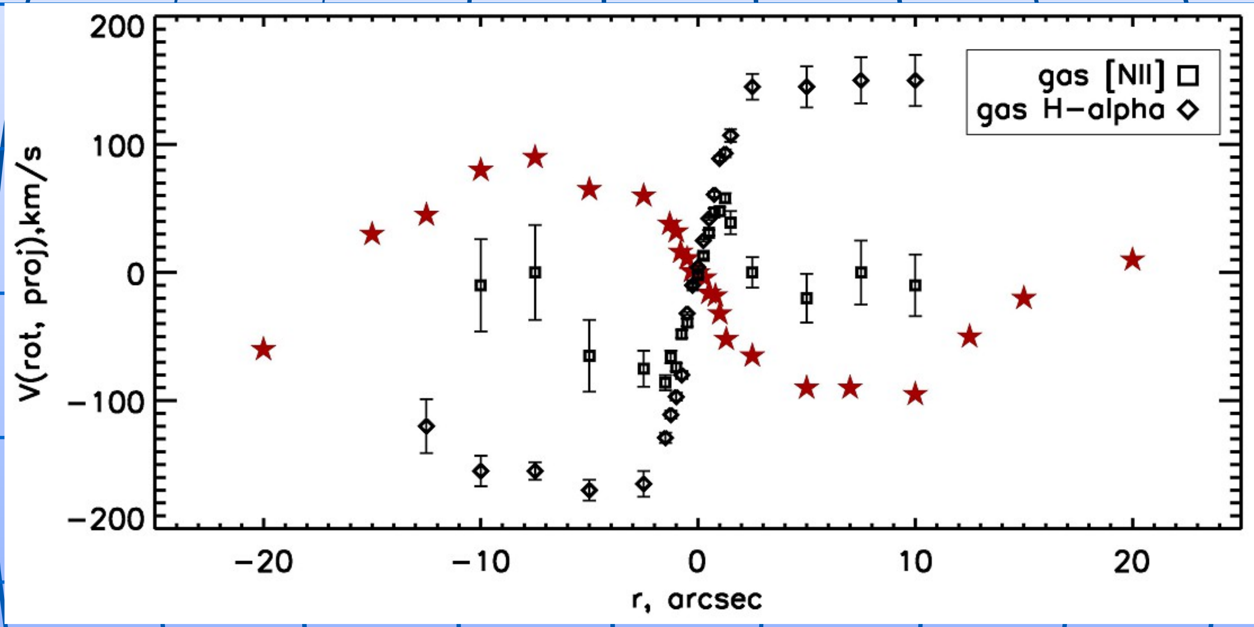
Long-slit study of lenticular galaxies: stellar/gas kinematics and Lick indices

An example of S0 galaxies under consideration: IC 560

Smooth reddish appearance – no bar, no dust, BUT there is some gas…

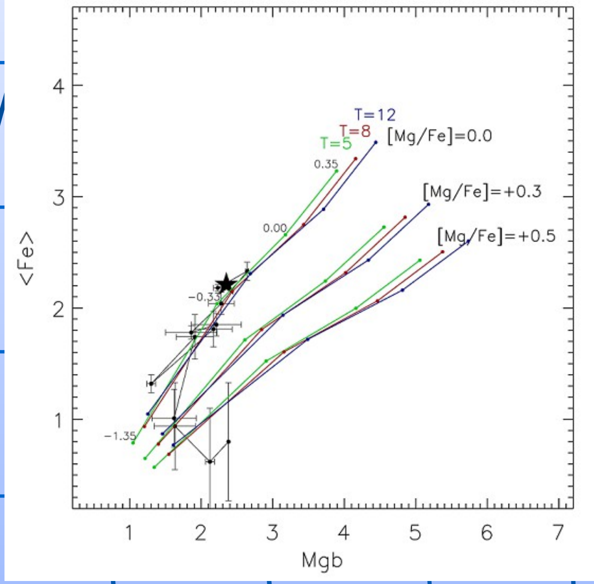


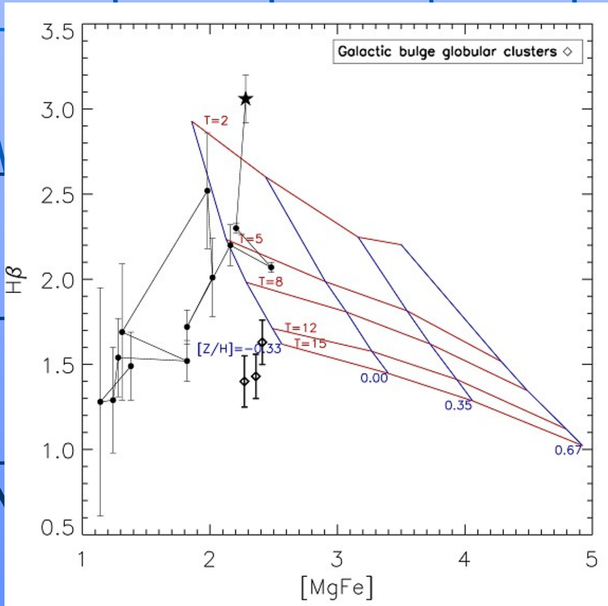
An example of decoupled gas/star kinematics: IC 560



- Visible counterrotation of the stars and ionized gas in the center;
- BUT gaseous kinematics is also complex – forbidden [NII] and Balmer H-alpha show different behaviour; a starforming disk vs shock fronts?
- And the stellar disk is obviously warped: in the outer part the rotation sense is reversed.

IC 560: stellar populations of different components





- In the center (R<5”) star formation was continuous: the Mg/Fe ratio is solar; but the large-scale disk is magnesium-overabundant and VERY metal-poor, [Z/H]~-1.
- Correspondingly, the age gradient is positive: the nuclear stellar population is about 2 Gyr old, the bulge is 5 Gyr old, and the outer disk is as old as Galactic globular clusters.

Models from Thomas et al. 2003