



Developing Tools to Search for PNe in the J-PAS Survey



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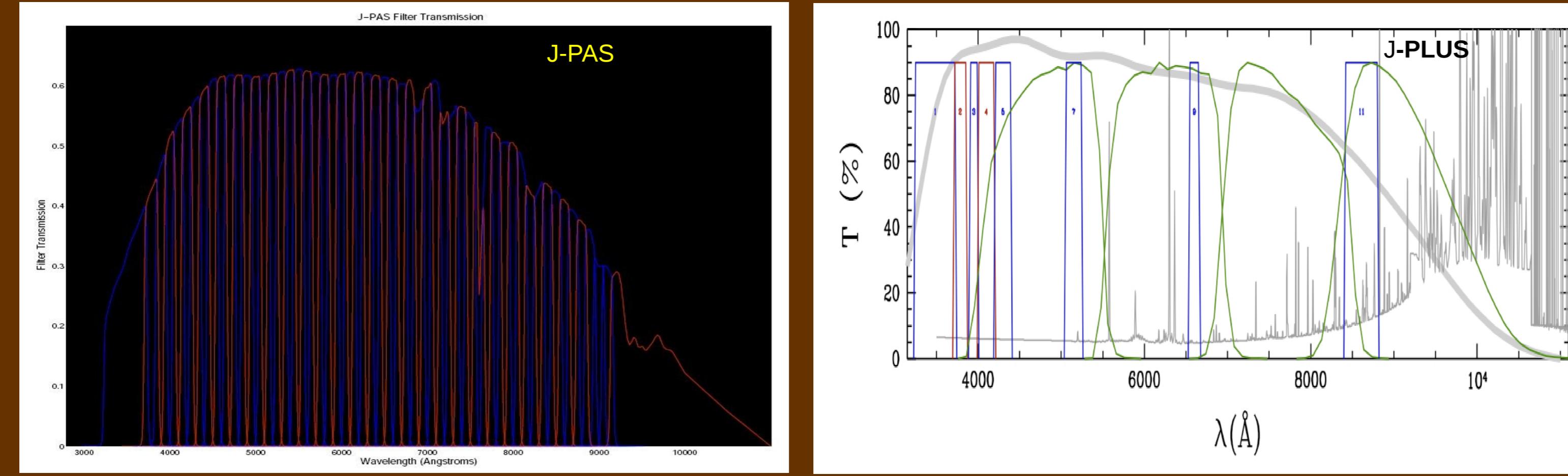
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J-PAS Survey Description

The Javalambre Physics of the Accelerating Universe Astrophysical Survey (J-PAS) is a new astronomical facility dedicated to mapping the observable Universe in 58 colors, and will produce high-quality images and an unique spectral resolution over the 8000 deg². It will consist of two telescopes. One of 2.5-m (J-PAS) and another of 0.8-m (J-PLUS, mainly for calibrations). The former will have a dedicated 1.2-G pixel survey camera (containing an array of 14 CCDs) with a FoV of 5 deg². It is planned to take 4–5 years and is expected to map the above area to a 5 σ magnitude depth for point sources equivalent to i~23.3 over an aperture of 2 arcsec².

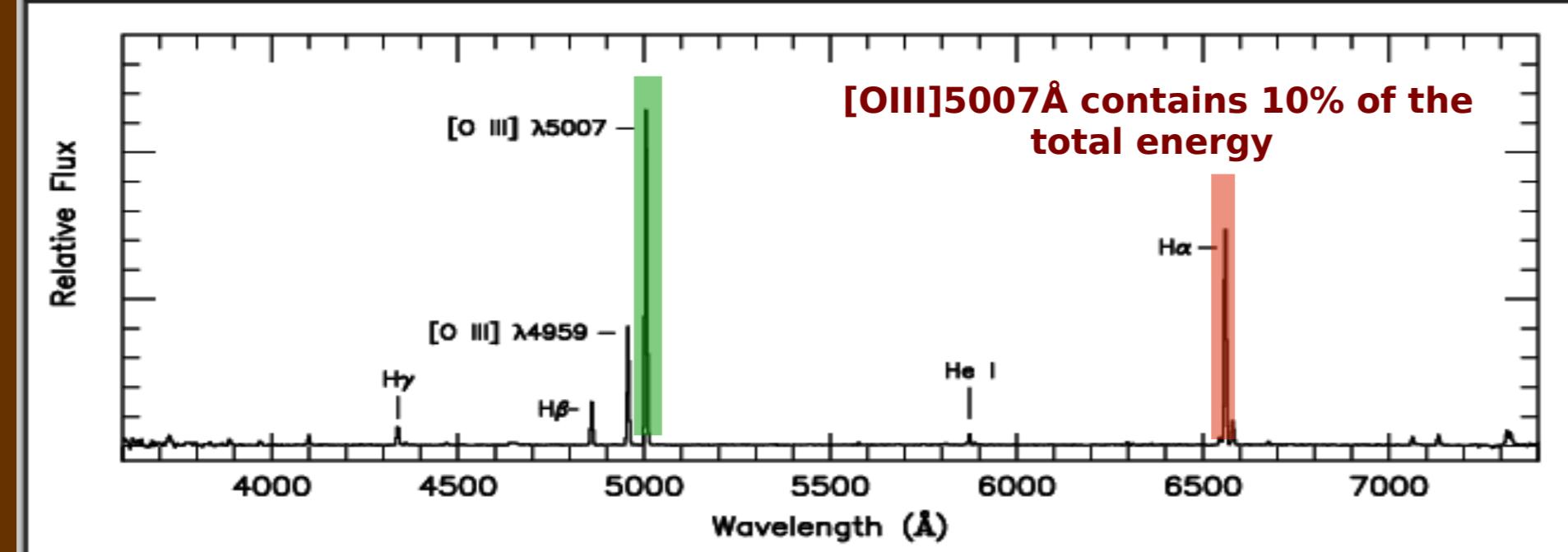
The J-PAS filter system consists of 54 contiguous narrow band filters of 100-Å FWHM, from 3,500 to 10,000Å. To those filters 2 broad-band ones will be at the extremes, UV and IR, plus 3 SDSS g, r, and i filters. J-PLUS, on the other hand, comprise 12 filters, including g, r, i and z SDSS ones.



Why do we care about PNe in the Galactic halo?

Since:

- They are present in the disc as well as in the halo;
- Their chemistry provides information about the distant past of the Galaxy (old to intermediate age stellar population);
- Our knowledge of the Galactic halo is worse than of the disc;
- Their emission lines are very bright;



- They give constraints for stellar yields and Galactic chemical evolution

FROM THE POINT OF VIEW OF THE HALO J-PAS SURVEY

By determining halo-PNe abundances and masses we will shed light on:

- the Galactic chemical evolution
- the stellar evolution in environments other than the Galactic disk

Alves et al. 2000, AJ, 120, 2044
Henry et al. 1998, ApJ, 680, 1162
Howard et al. 1997, MNRAS, 284, 465
Otsuka et al. 2010, ApJ, 723, 658
Pereira & Miranda 2007, A&A 467, 1249
Viironen et al., 2009, A&A, 502, 113

How do halo-PNe look like?

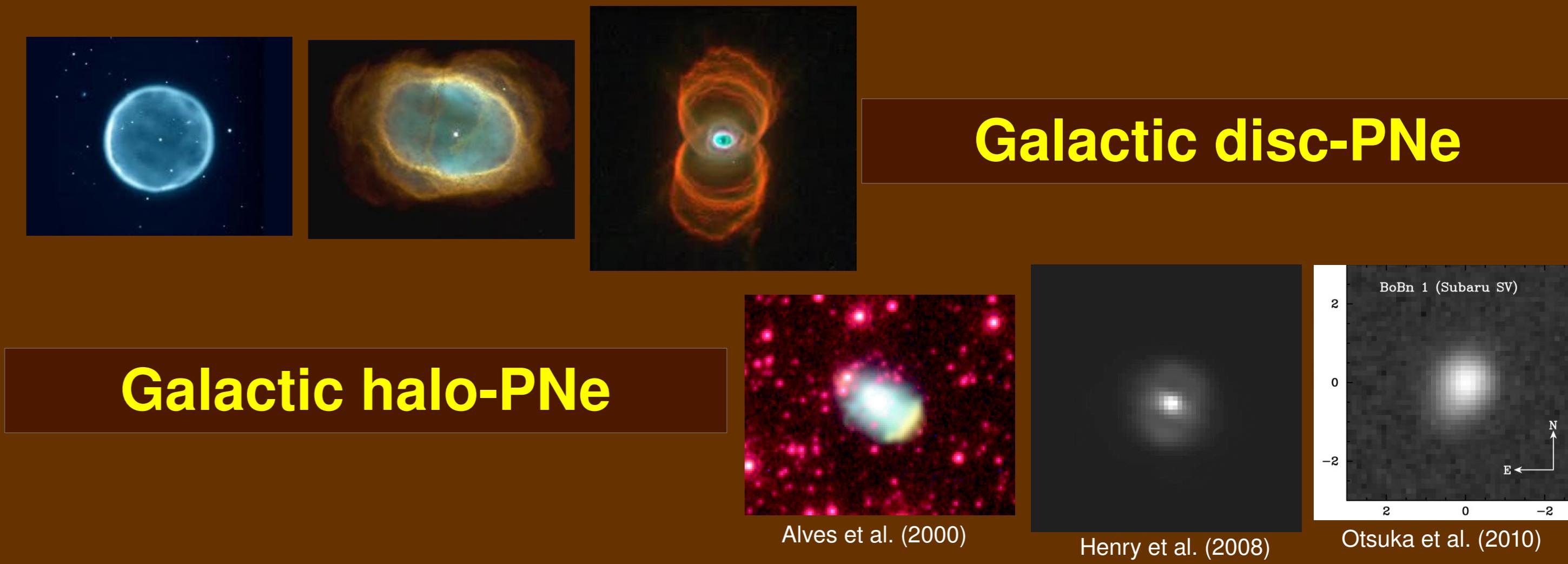


Table 1: observed properties of halo-PNe

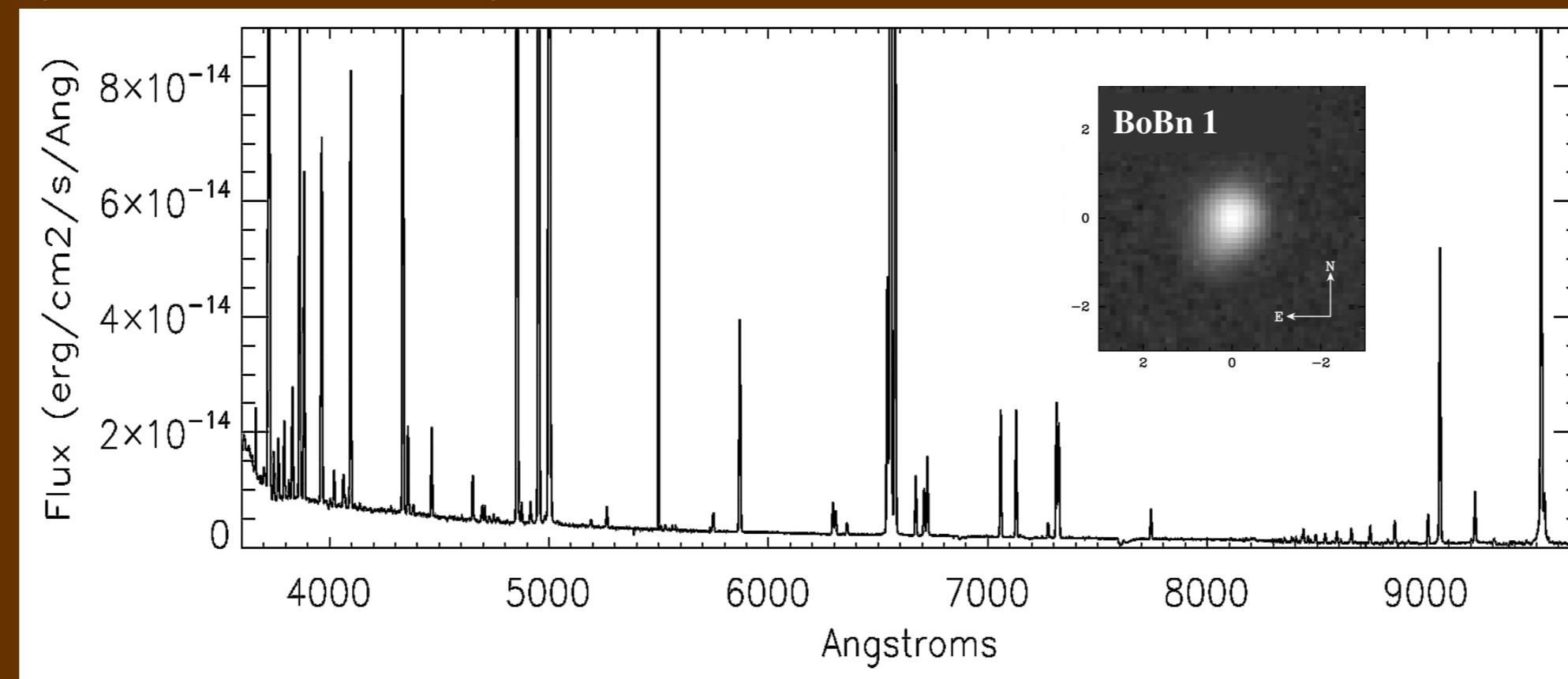
Object	R (")	V(km/s)	D(kpc)	m _v	c(H β)
K648	1.0	-141	10	14.9	0.08
DdDm-1	0.5	-304	17	15.6	0.0
PN006-41.9	8.4	--	7	17.0	0.15
NGC2242	22	30	6	15.0	0.16
NGC4361	81	30	1.2	13.2	0.10
M2-29	3.6	-103	4	17.7	0.97
BoBn-1	3.0	196	10.8	--	0.23
H4-1	2.7	-14.1	--	19.5	--
PN243.8-37.1	23	--	5.0	15.6	0.09
GJJC-1	4	-15.3	3.1	14.3	0.53

(Howard et al. 2007)

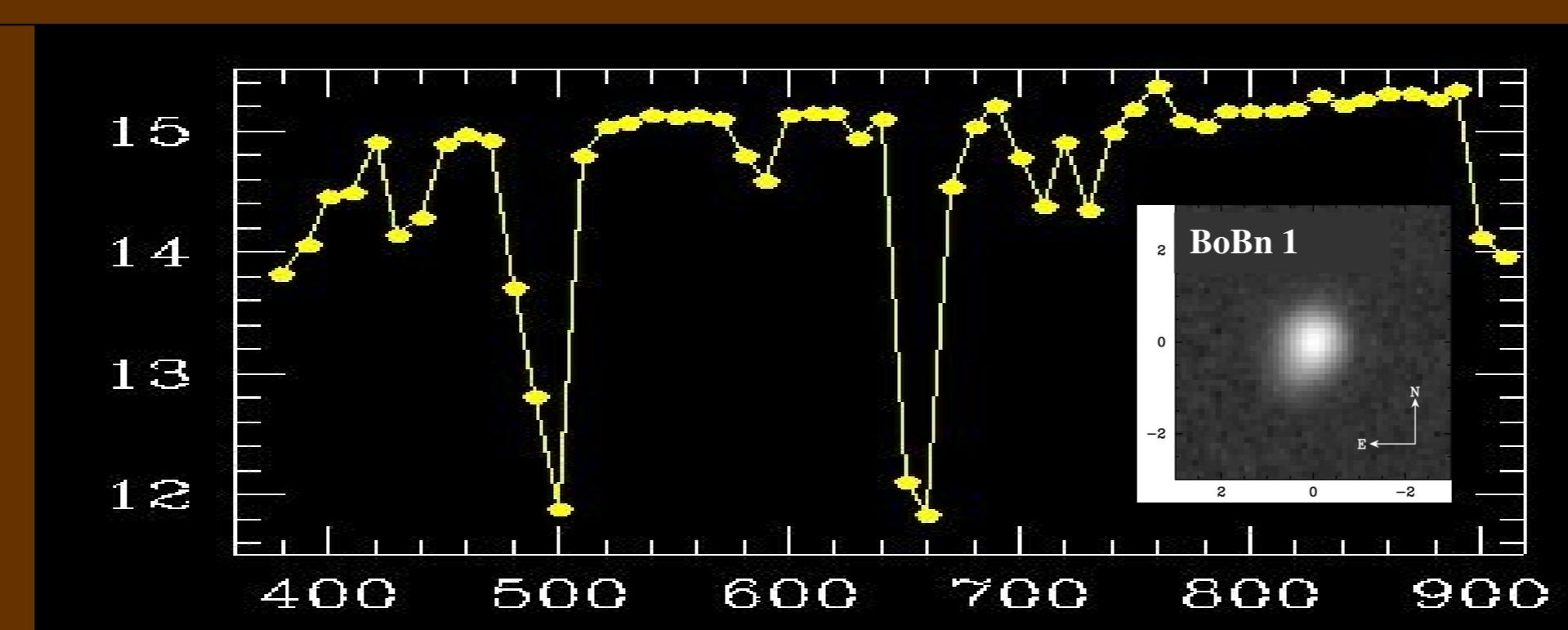
Detecting PNe with J-PAS/J-PLUS

Observed spectrum of a halo PN: DdDm 1

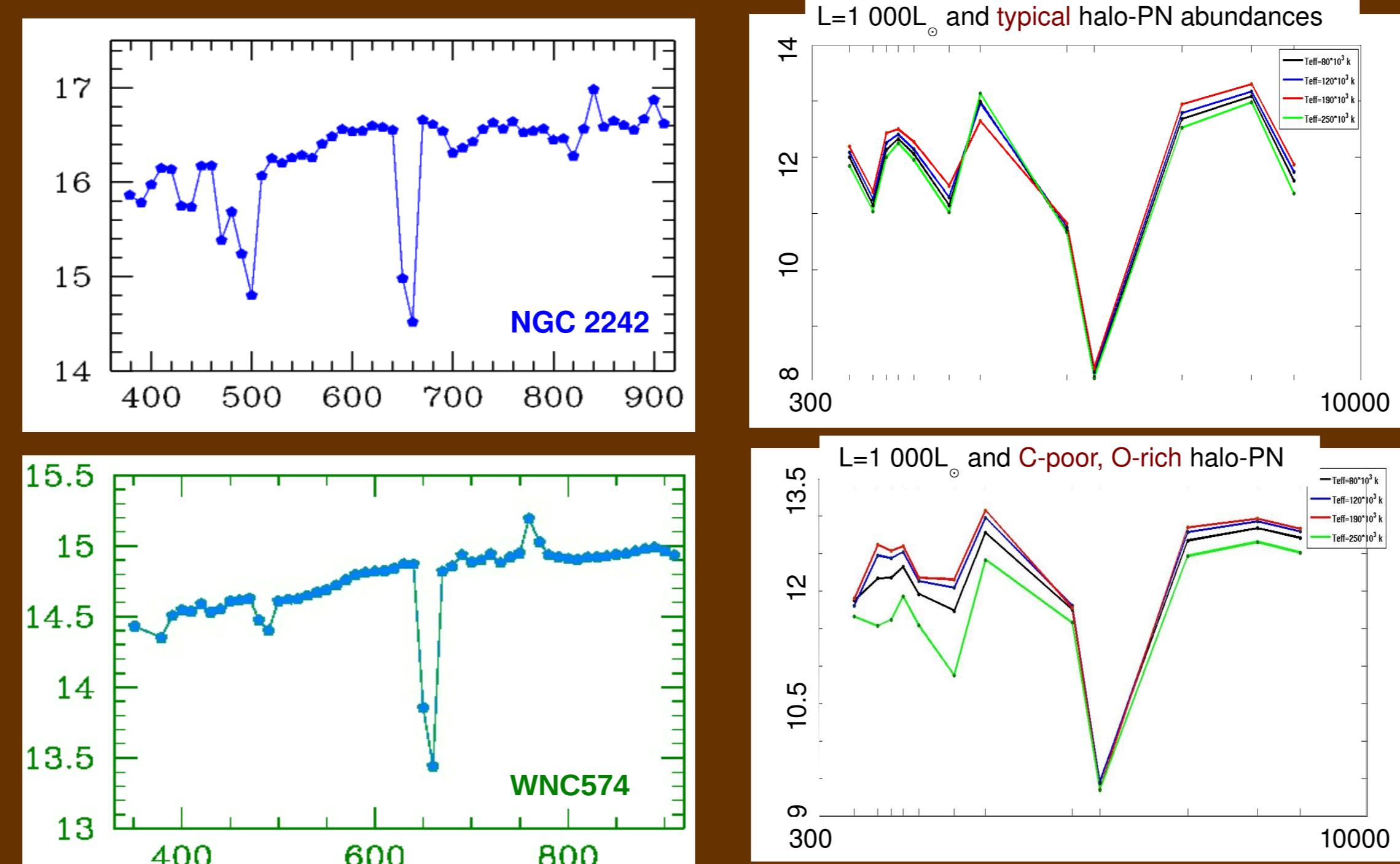
(Pereira & Miranda 2007)



Convolved to simulate the J-PAS “spectrum” (mag x nm)



J-PAS/J-PLUS “spectra” (mag x nm)



The blue continuum versus its strong emission line is not as well characterized as with J-PAS filters, but the H α emission is easily detected!

J-PLUS can also be used to search for PNe!

Tools to Search for PNe with J-PAS/J-PLUS

Stellar/Nebular Parameters

50 \leq T_{eff} \leq 250 (x10³) K

X/H: Typical + other 2

4 L: 500 - 10 000 L_{sun}

Ne: 3 000/6 000 cm⁻³

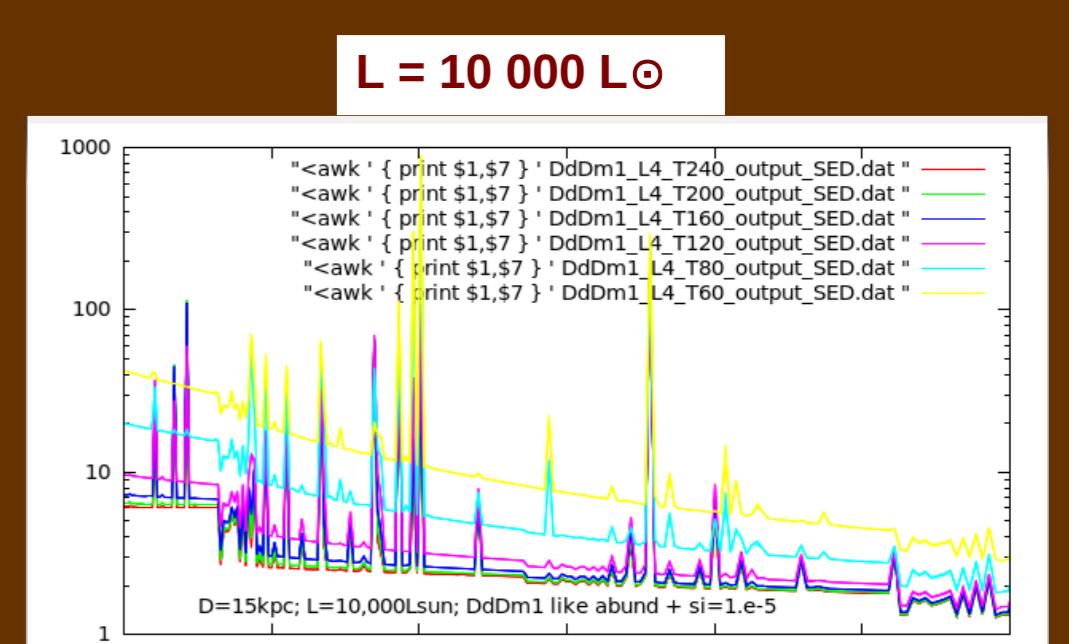
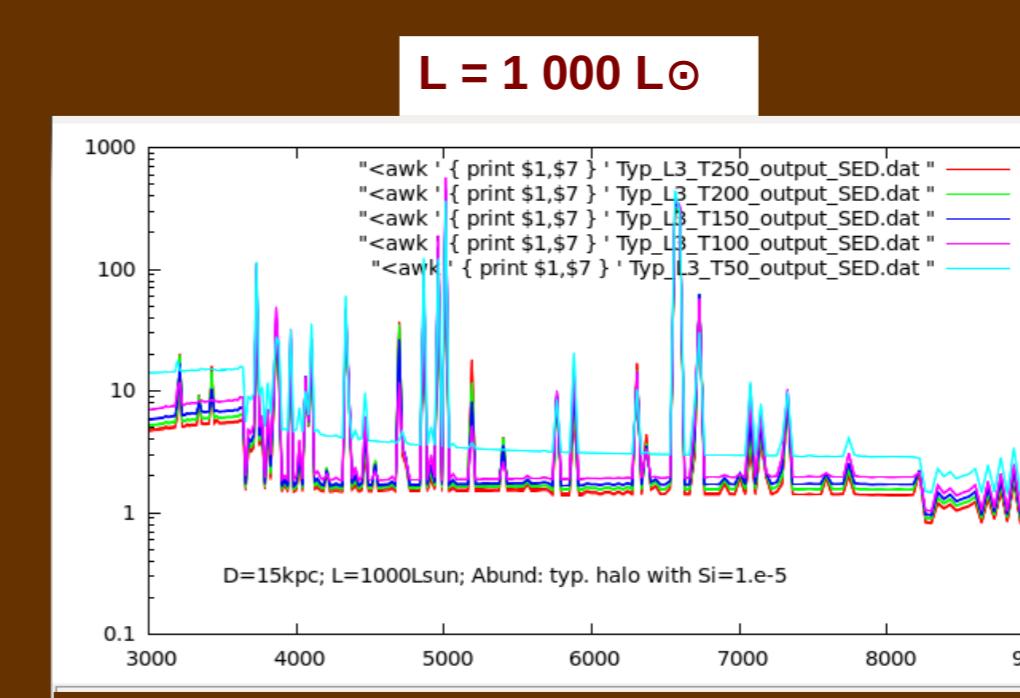
Cont. Shape: blackbody

Size: 2.7 arcsec

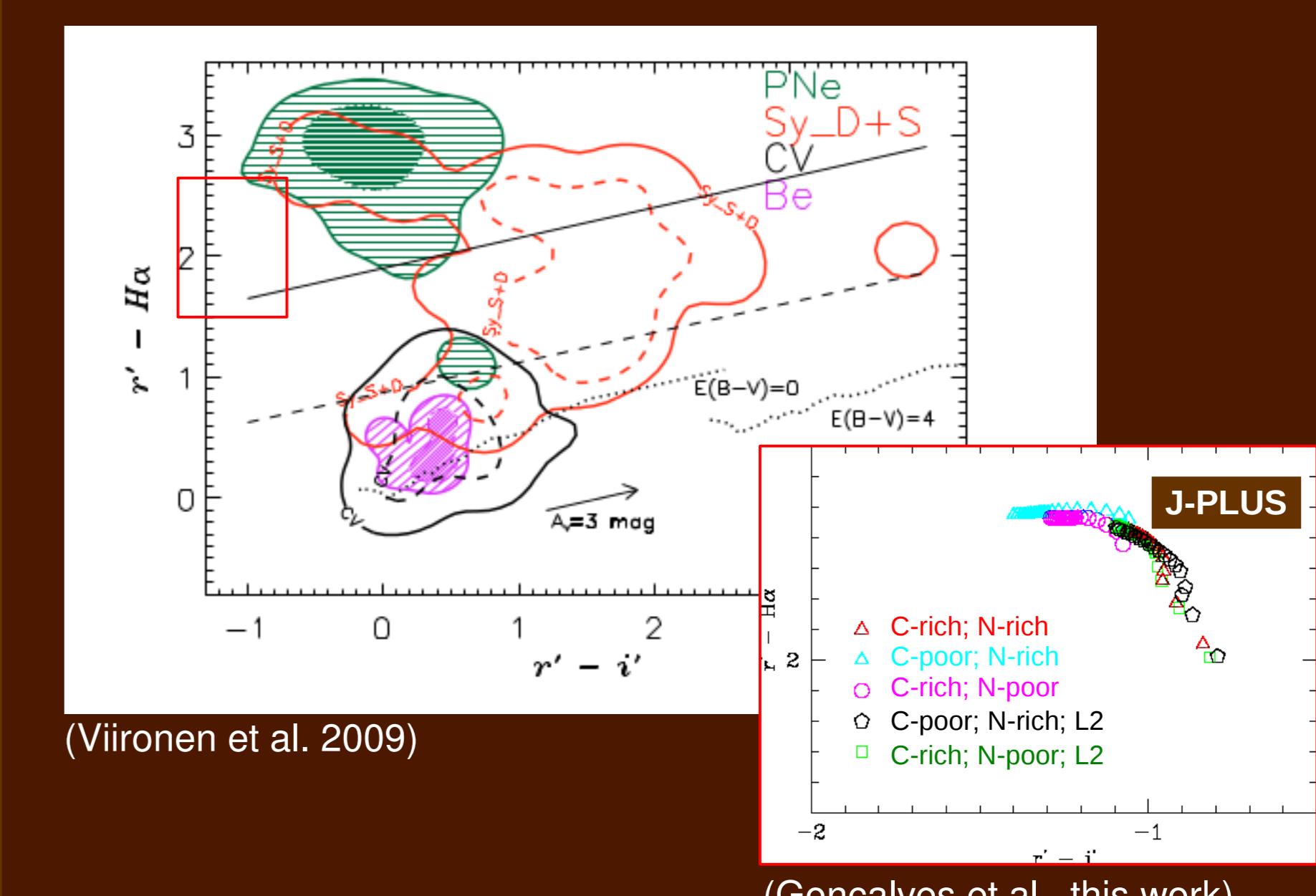
Distance: 10 kpc

Geometry: spherical

- We are using CLOUDY to build a grid of halo PNe spectra
- Using the typical parameters of the ~20 known halo-PNe (Table 1)
- Sets of abundances: C- and N-rich (typical); C-rich and N-poor; and C-poor and N-rich.



Tools to Search for PNe: the IPHAS r' – H α versus r' – i' with the halo-PNe J-PLUS colors



(Viironen et al. 2009)

(Gonçalves et al., this work)