

# SMC planetary nebulae in S-PLUS

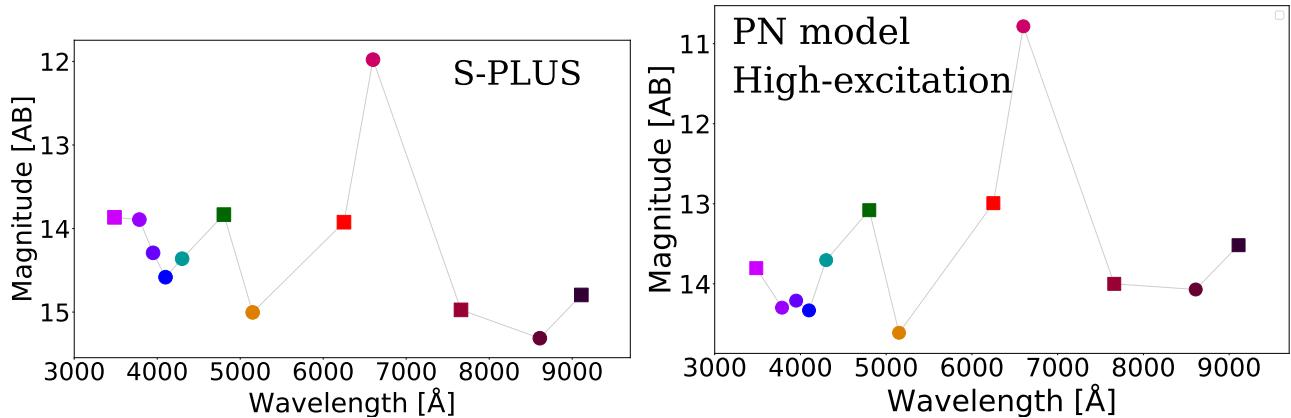
## 1 Science verification

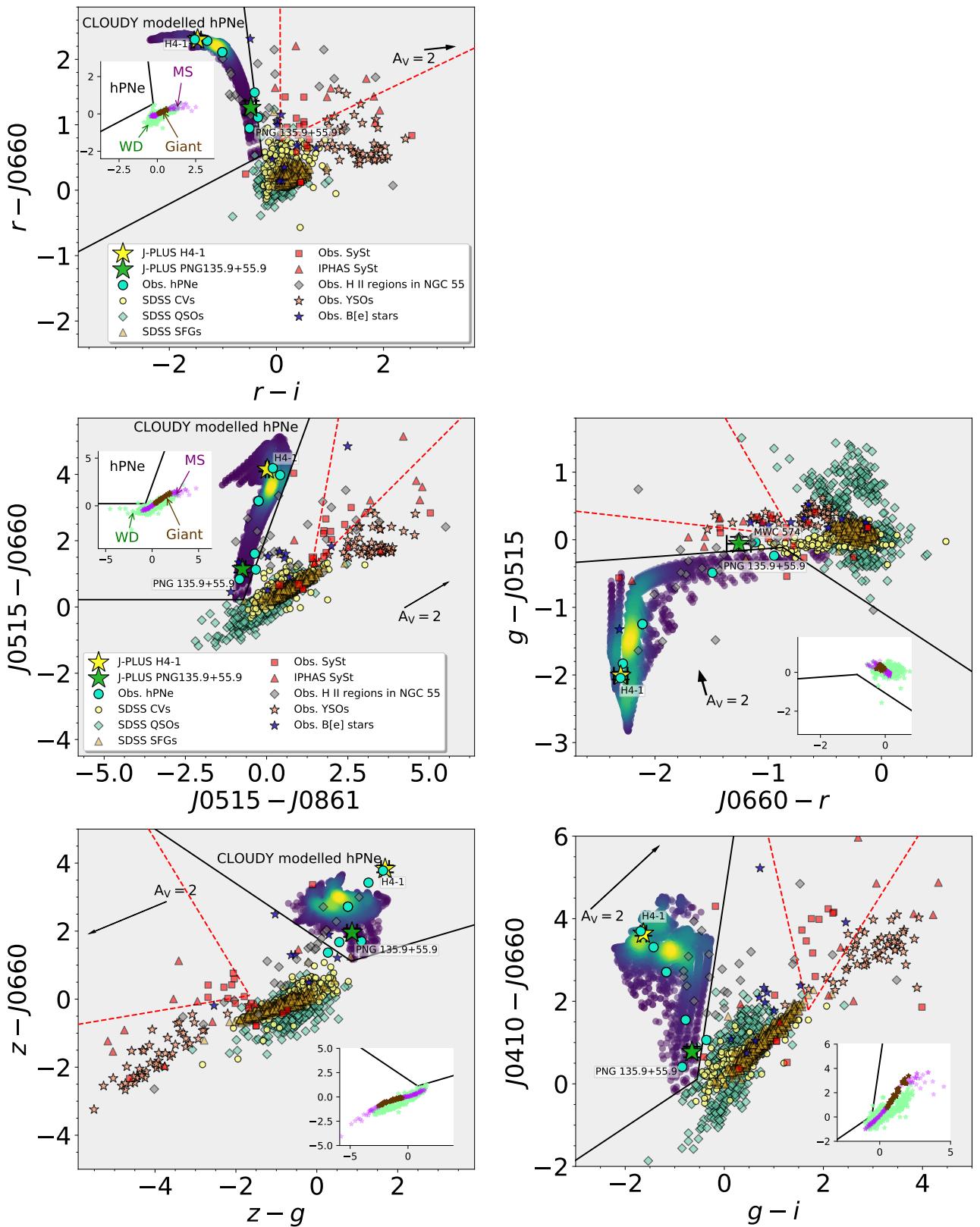
The Small Magellanic Cloud (SMC) is a gas-rich late-type dwarf galaxy (Bolatto et al. 2007) with a gas-to-dust ratio 30 times higher than the Milky Way (Stanimirovic et al. 2000). It is a member of the Local Group and is classified as an irregular galaxy (ImIV–V) (Sandage et al. 1994). The SMC is at a distance of  $60.6 \pm 3.8$  kpc (Hilditch et al. 2005) from the Galaxy which makes the spatial scale  $\sim 0.3$  pc/arcsec.

I found this sample of SMC PNe: vizier -> J/A+A/472/101/table7. Chemical evolution of SMC planetary nebulae (Idiart+, 2007, 2007A&A...472..101I) This catalog has  $\sim 40$  PNe.

I made cross matching between this catalog and SPLUS catalog. I found 21 matches using a 1 arcsec of radii.

I putted the final matches in my S-PLUS colour diagrams diagram (see Fig. 2),





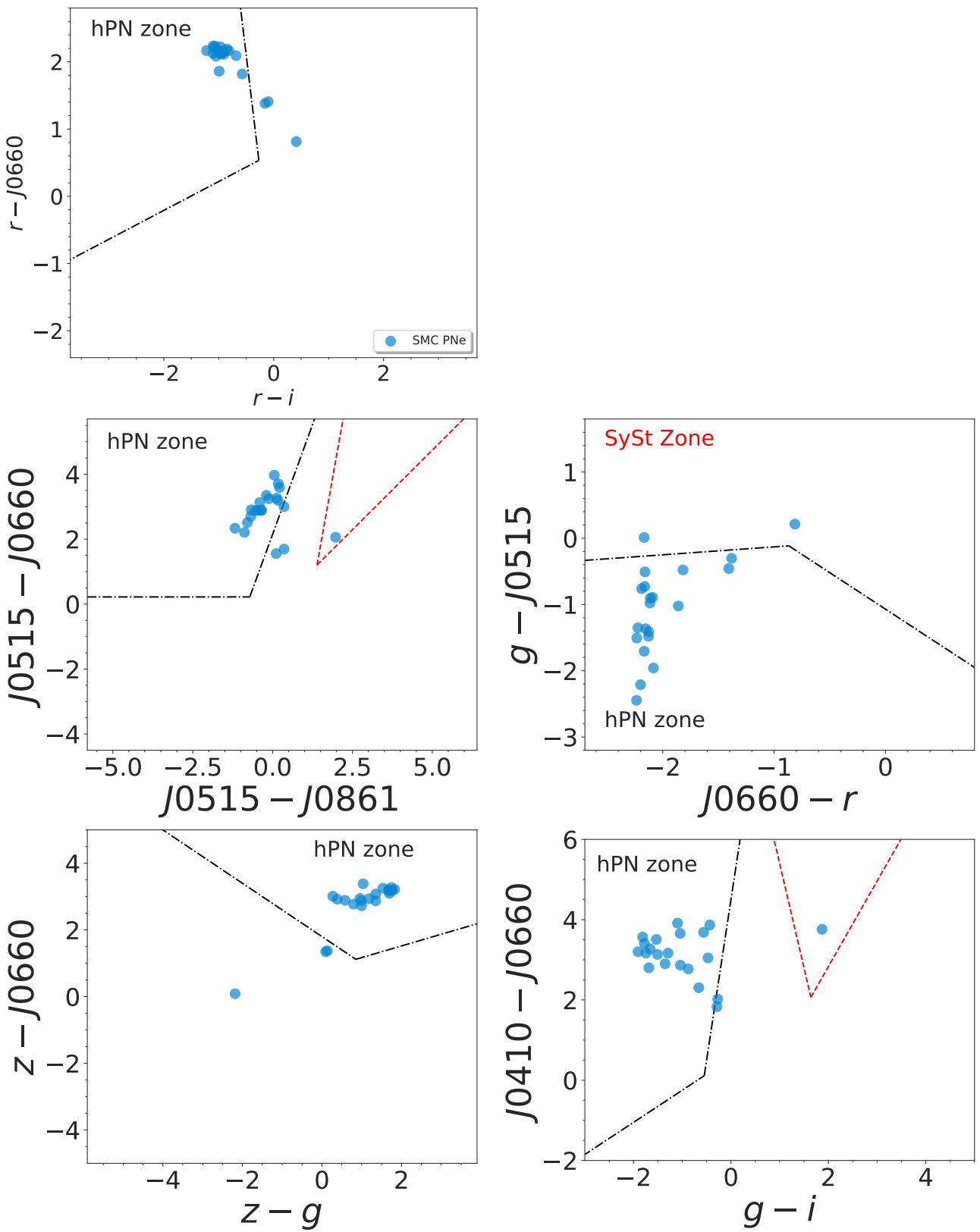
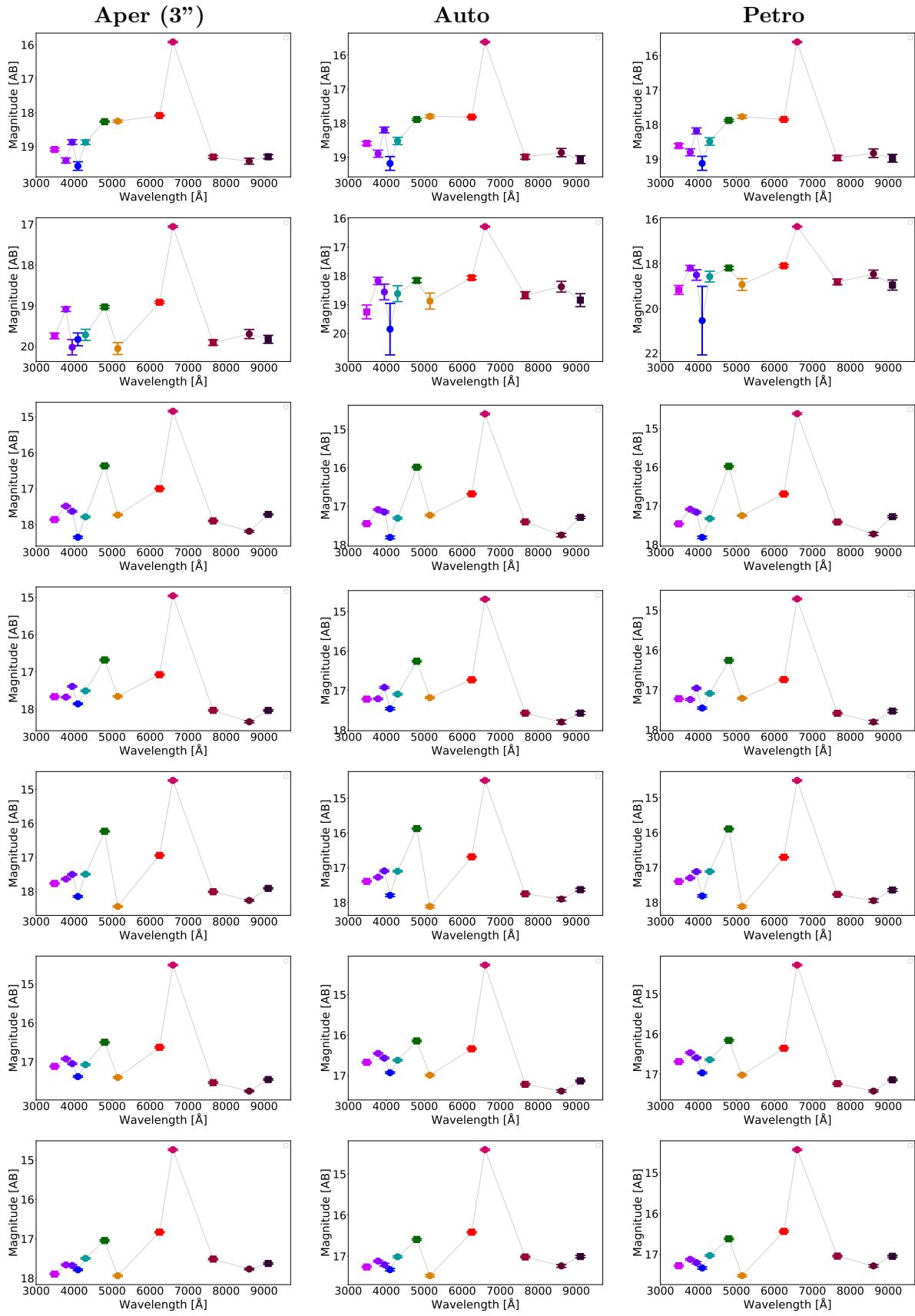
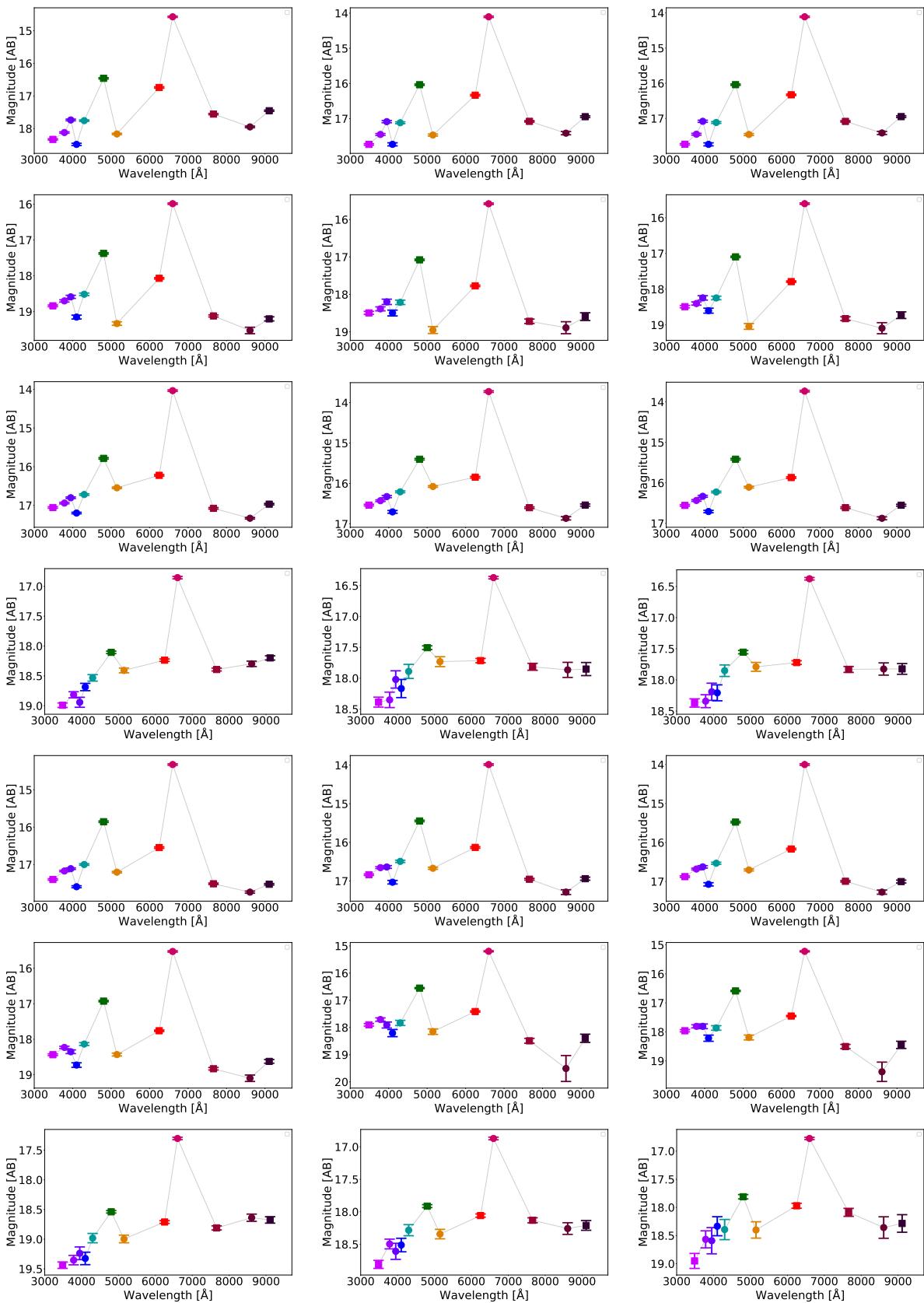
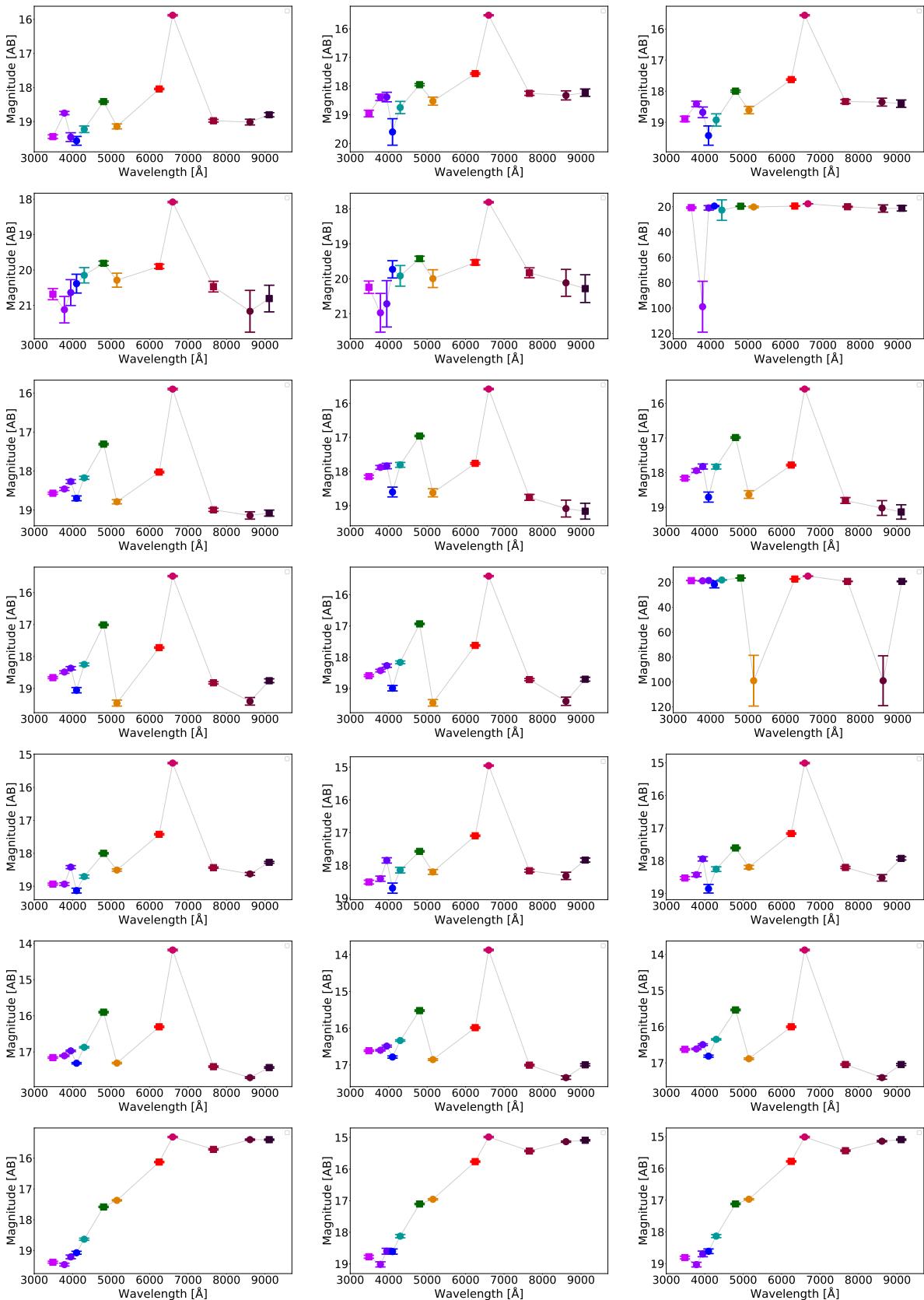
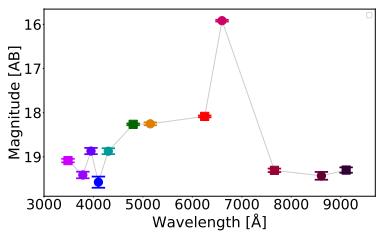
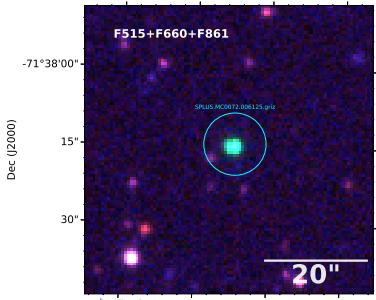
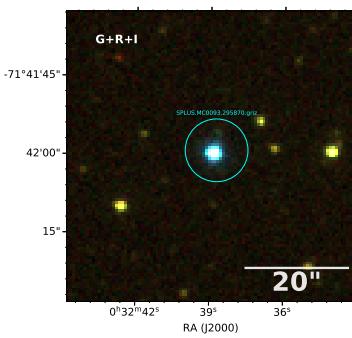
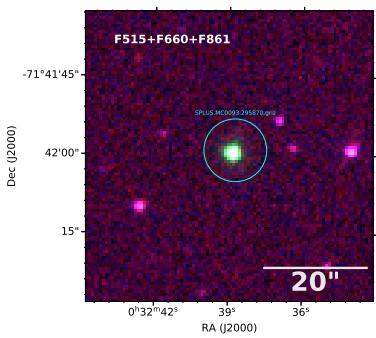
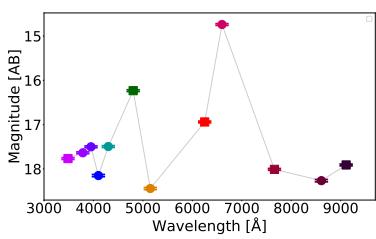
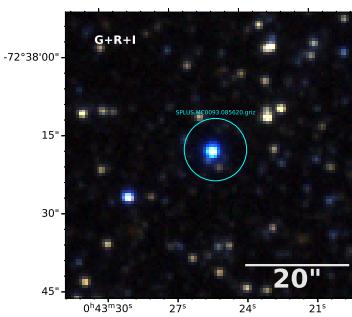
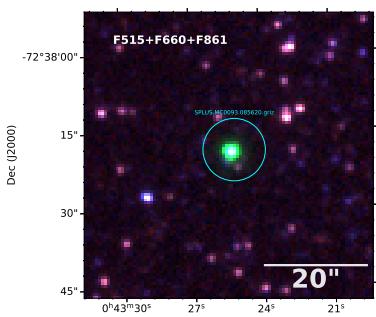
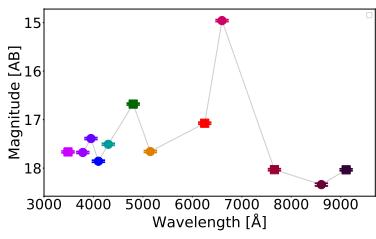
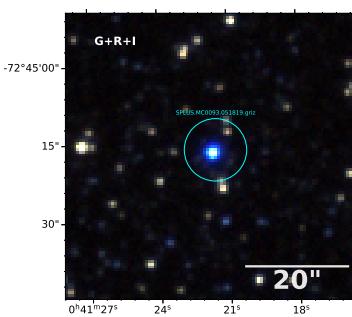
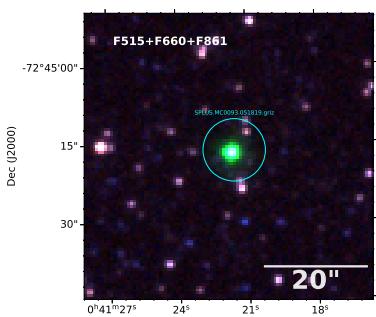
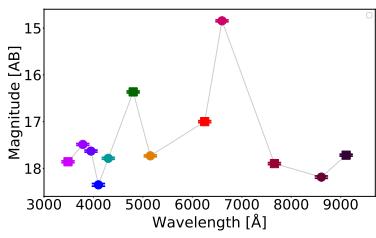
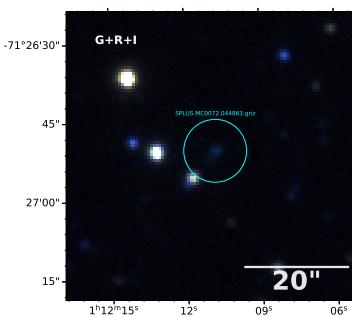
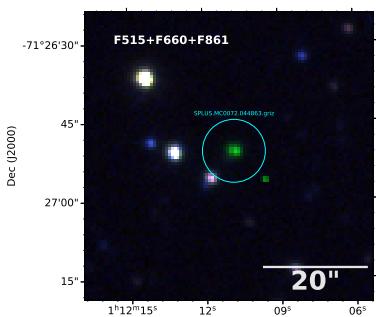
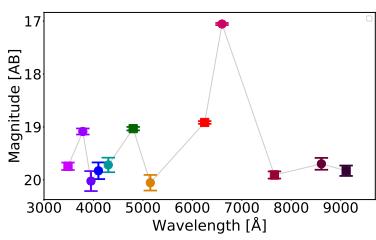
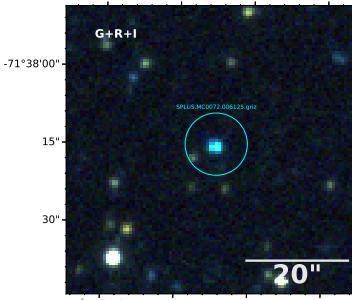


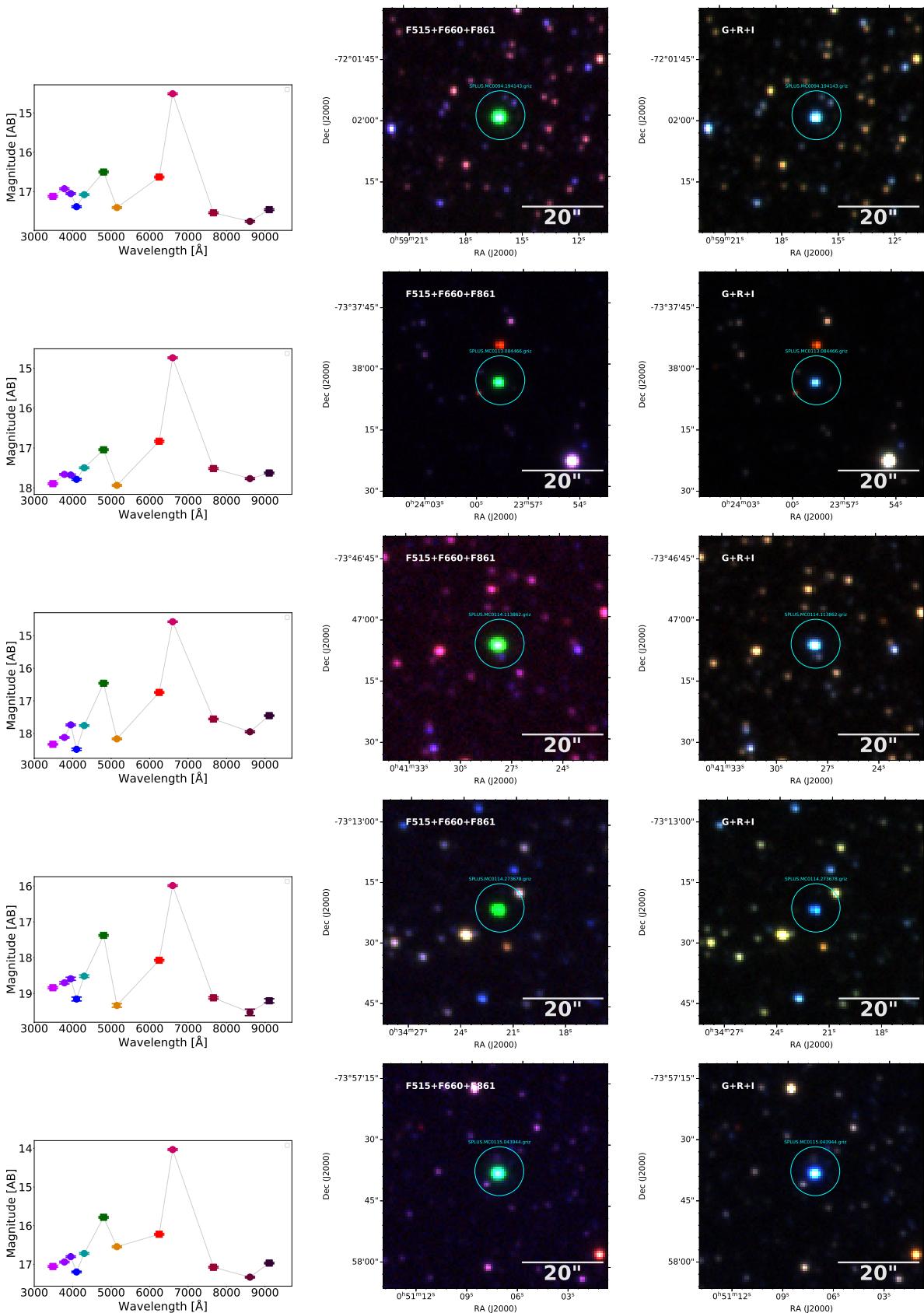
Figure 1:

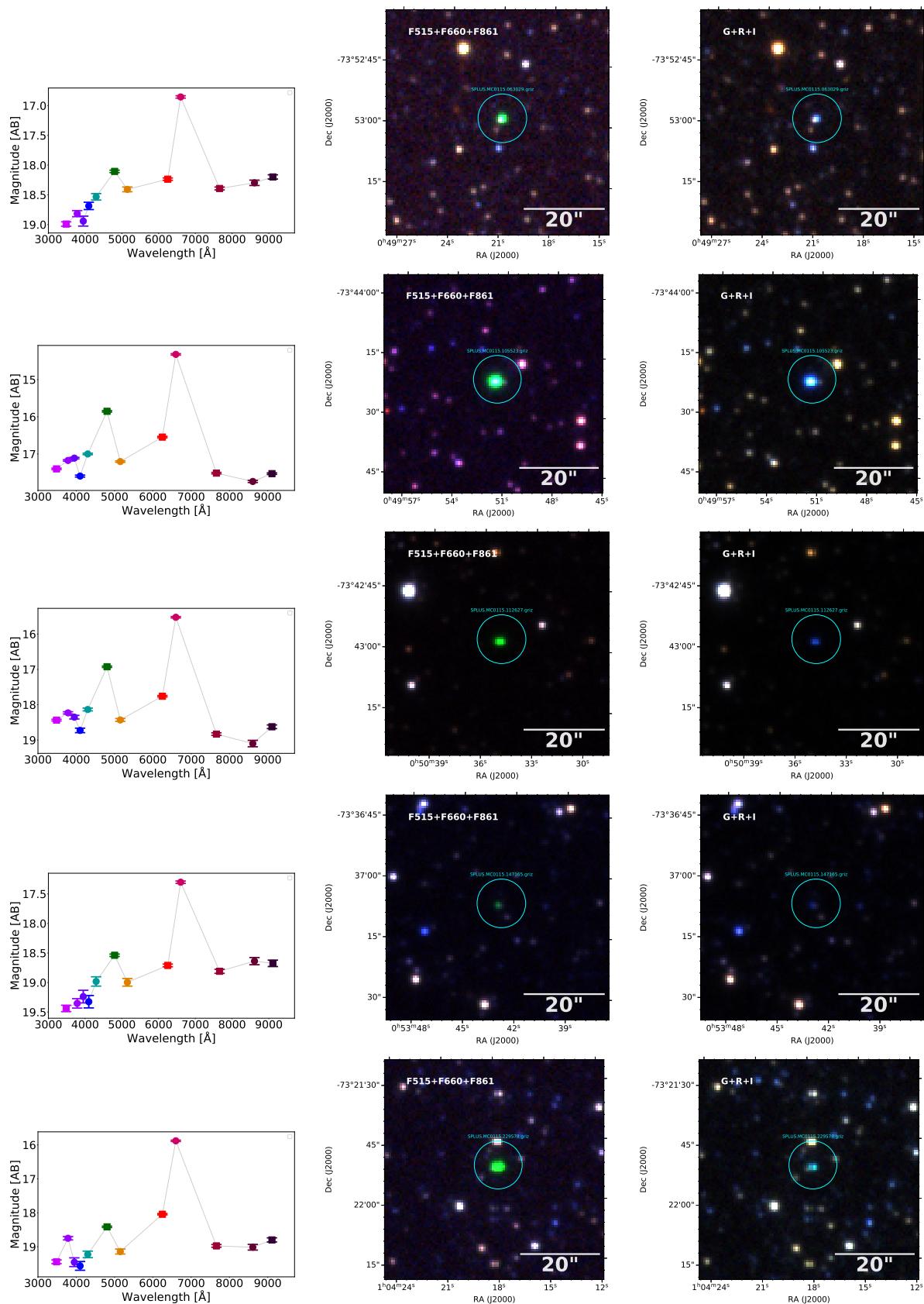


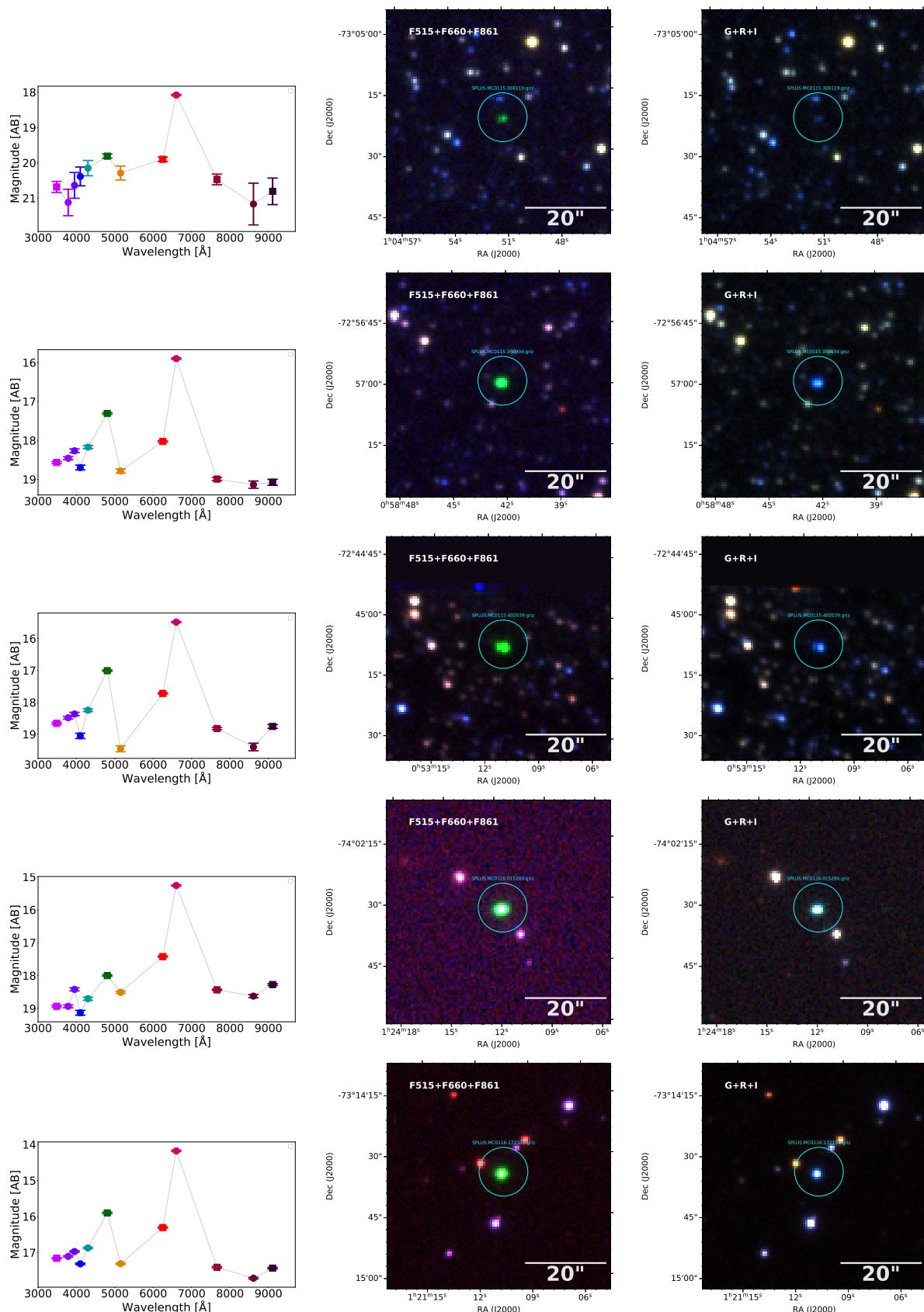


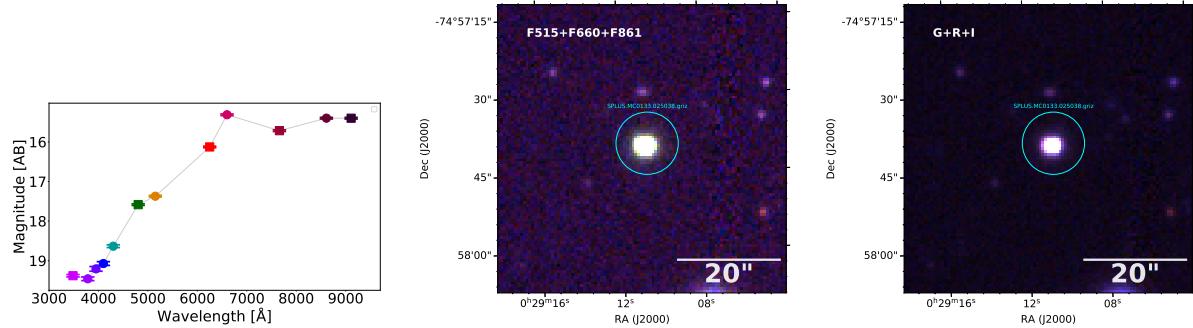


**Aper(3'')****F515+F660+F861****G+R+I**









## 1.1 What about compact H II regions

I found a catalog of 12 compact H II regions (2012SerAJ.185...53W) in the SMC SPLUS catalog. In Simbad appear reported like emission line stars.

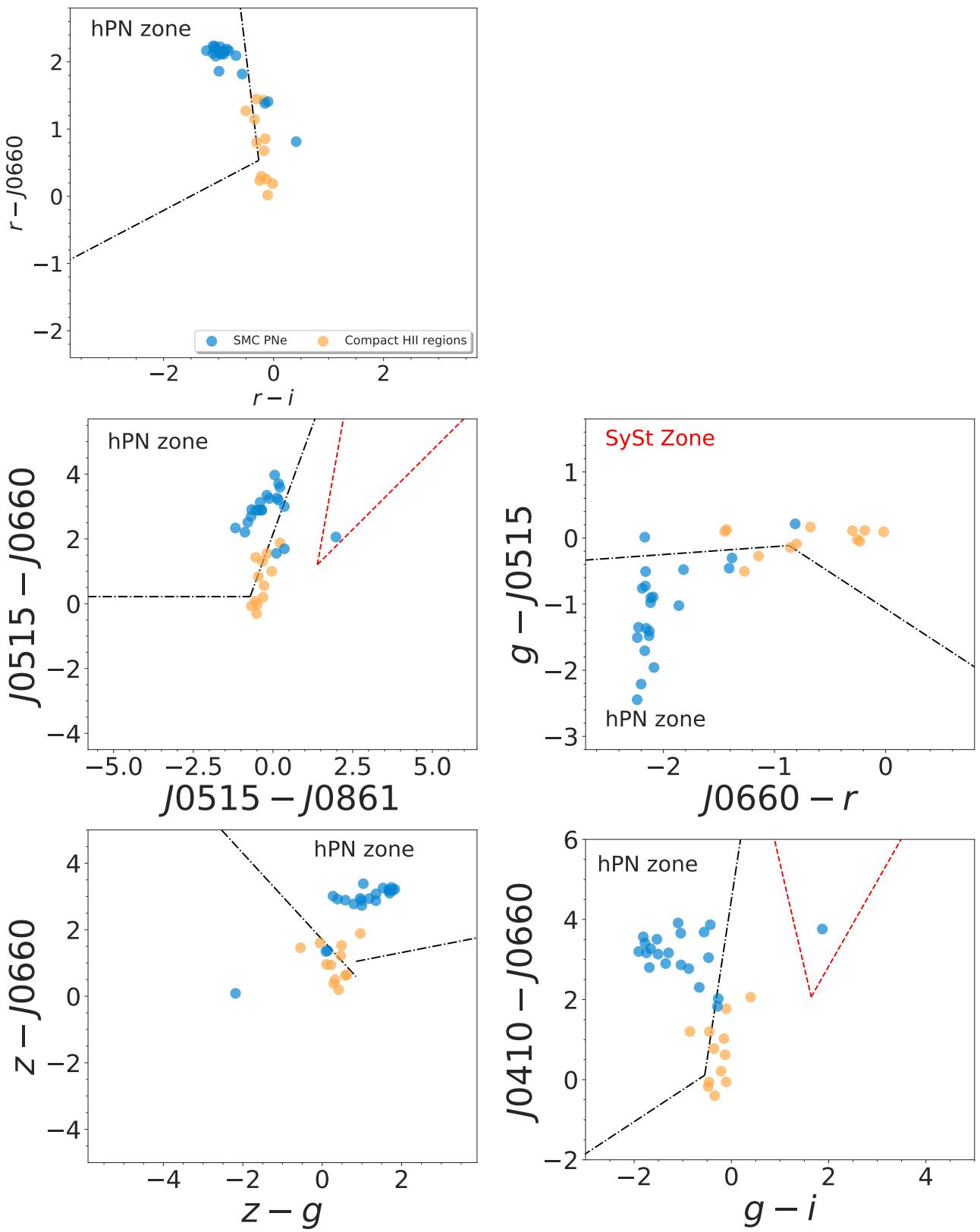
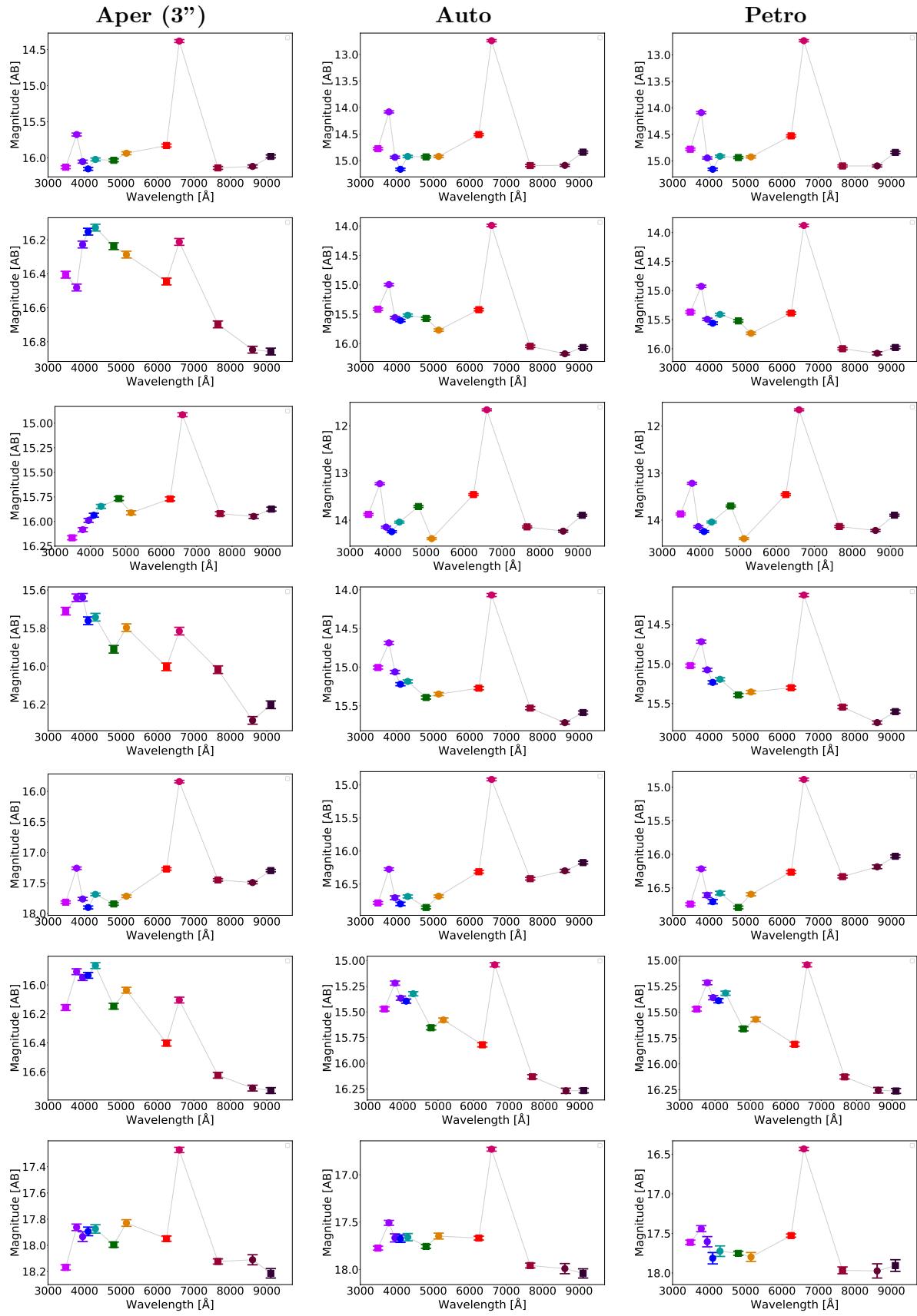
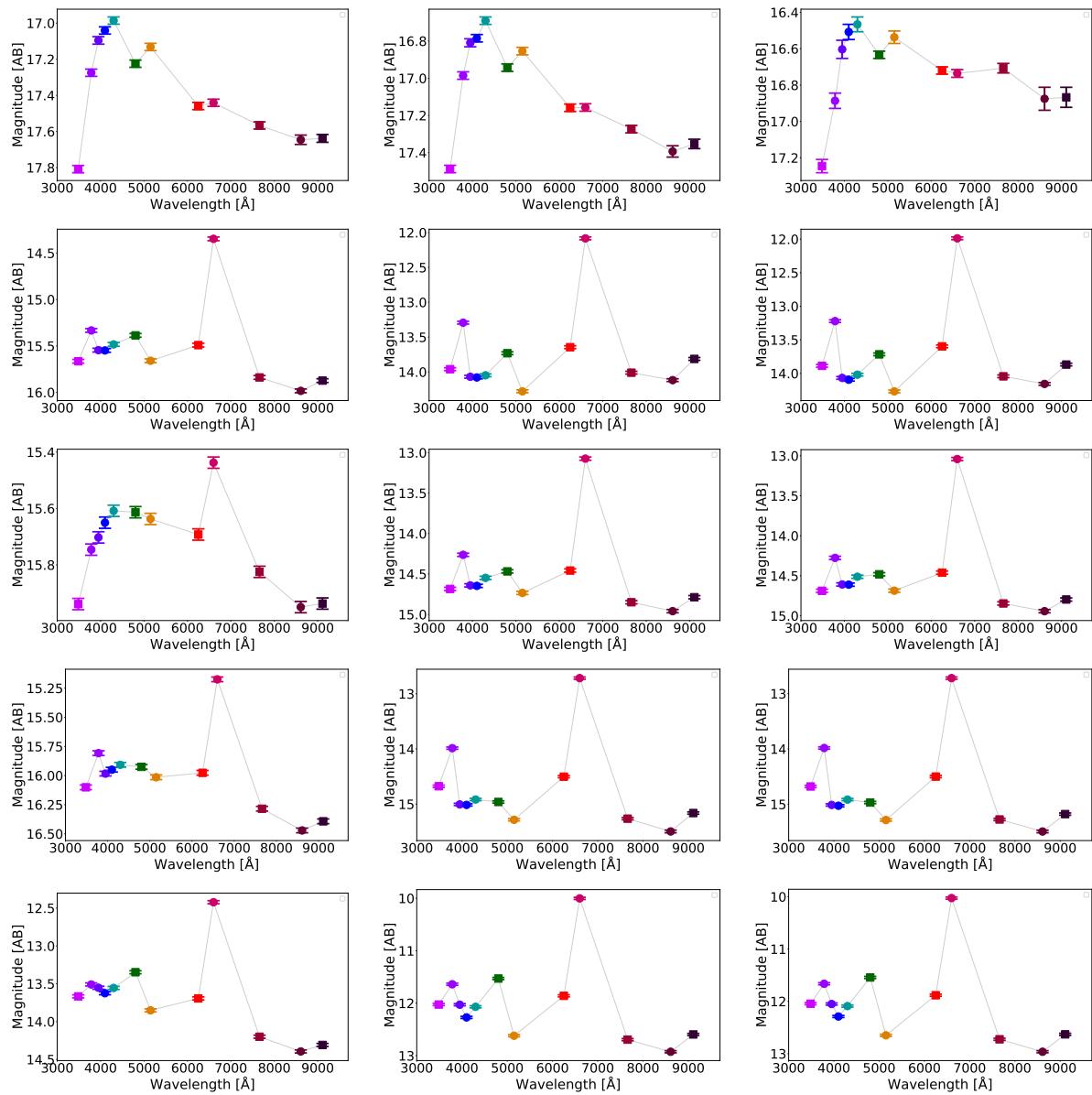


Figure 2:





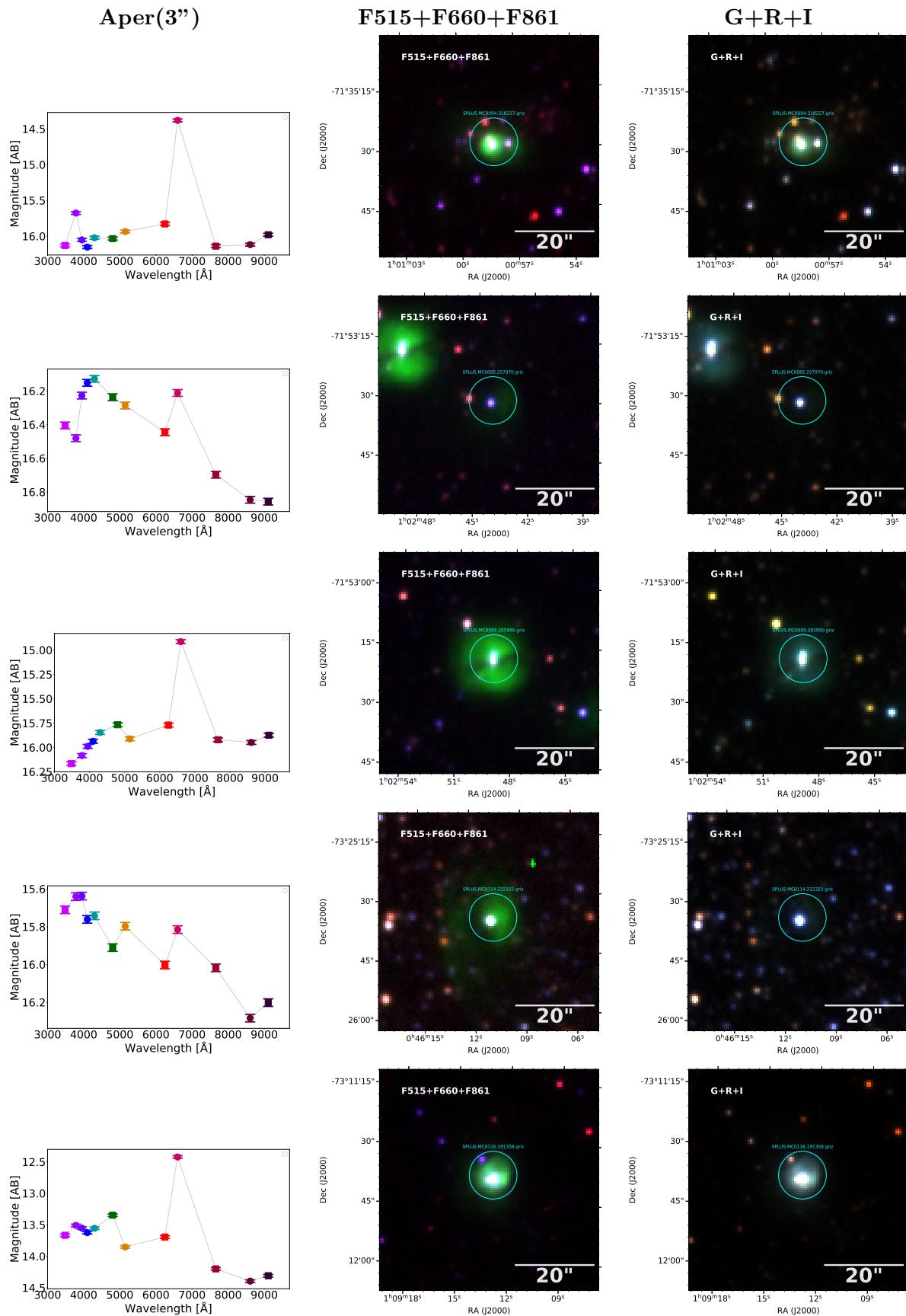


Figure 3:

### **1.1.1 Comparing SPLUS images with HST**

The professor Denise found HST information for four of these objects. She sent me the information that follows (I added the SPLUS images).

A import detail about the paper cited in below document. "The nebular diameters, given in column (5), were measured with respect to the 10% intensity contour of the outermost structure and are useful for conducting follow-on observations of the PNe." And the paper (2003ApJ...596..997S) used the same method to measured the size. "the nebular dimensions, measured from the 10% brightness contour".

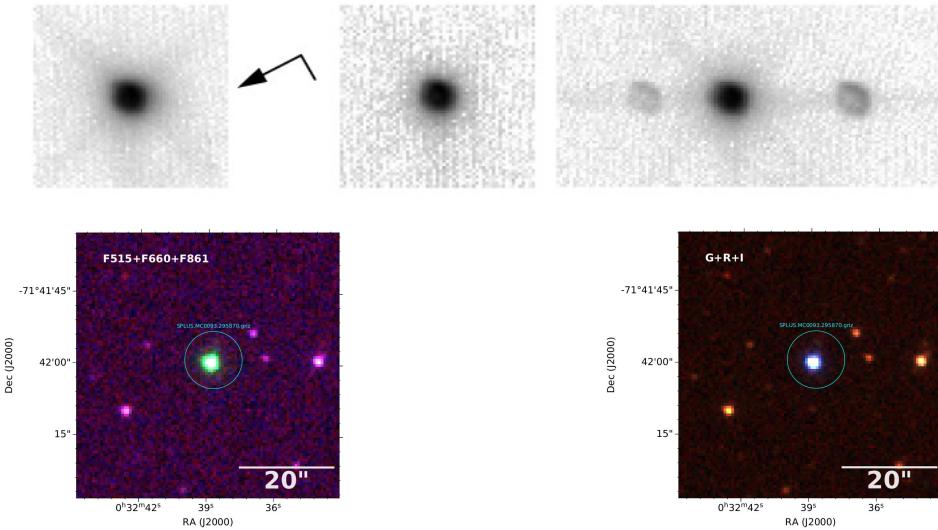
SimbadName	RA	DEC	RAx	DECx	Dimension (HST)	Morpho
SMP_SMC_2	8.16179	-71.69986	00:32:38.83	-71:41:59.5	0.54"	R
SMP_SMC_3	8.59137	-73.22264	00:34:21.93	-73:13:21.5	0.59" x 0.48"	E(bc)
SMP_SMC_15	12.78071	-73.96047	00:51:07.37	-73:57:37.7	0.32"	R
SMP_SMC_28	21.04921	-74.04239	01:24:11.81	-74:02:32.6	0.31"	R

REF: Shaw, Stanghellini, Villaver & Mutchler, 2006 ([2006ApJS..167..201S](#))

All figures are: HST image; [OIII], [NII], Ha and [NII] STIS spectra. Box sizes: 3x3arcsec<sup>2</sup>. The orientation for each image is indicated on the figure, with north lying in the direction of the arrow and east to the left.

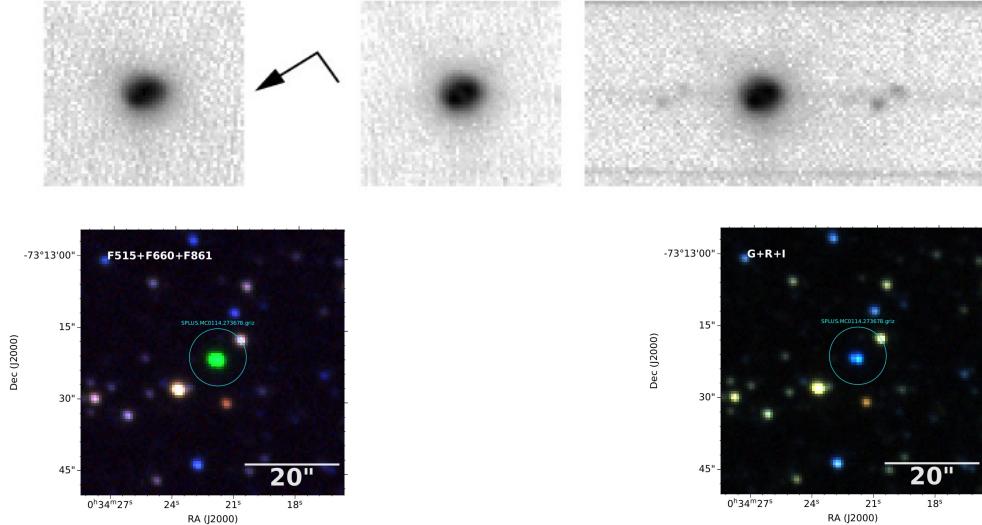
SMC-SMP 2. This **round nebula has an asymmetric bright-ness profile** in broadband light and in the high-ionization lines of H and [Oiii], with higher emission on the south side. The low-ionization lines such as [Nii] show emission in an elliptical ring, again with somewhat brighter emission on the south edge. No CS is evident in the broadband image. (See Fig. 18.)

SMC-SMP 2



SMC-SMP 3. This elliptical nebula has a very distinct **bi-polar core**. Interestingly, only the lobes can be seen in the [Nii] emission. The CS is very apparent in the broadband image. (See Fig. 18.)

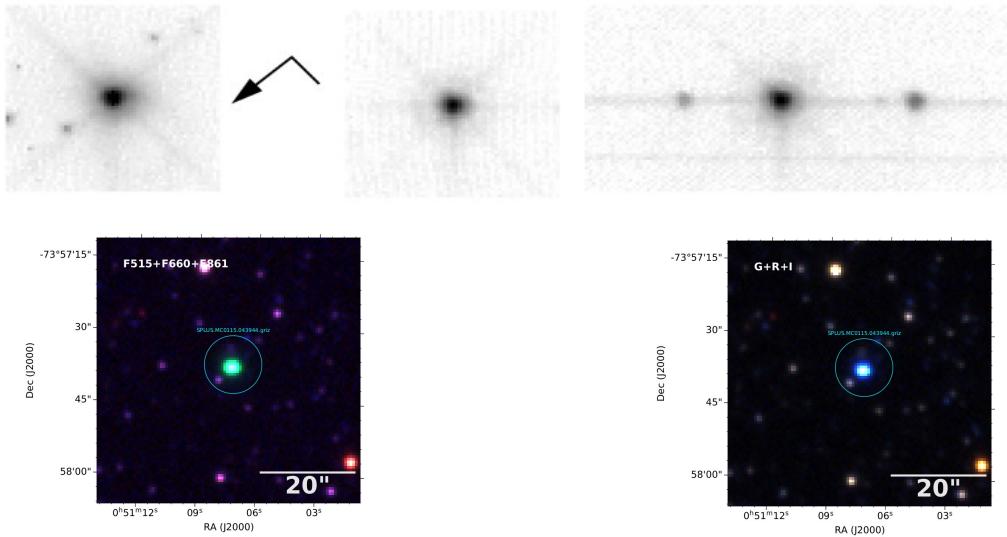
SMC-SMP 3



Please pay attention to the orientation of the bi-polar lobes in the [NII] spectra.

**SMC-SMP 15.** The emission from this nebula is **strongly peaked in both the broadband image, as well as the high-ionization lines of H and [Oiii].** The emission in [Nii] is not as strongly peaked, and from the 6583 line it is possible to make an improved estimate of the nebular size, which is slightly broader than a pointsource. The CS might have been detected had it not saturated in the broadband image. (See Fig. 18.)

**SMC-SMP 15**



**SMC-SMP 28.** This bright, compact nebula is **round but appears to have a faint, diffuse tail of emission extending about 0.9'' to the northwest from the central star.** No G750M spectrum is available. (See Fig. 18.)

**SMC-SMP 28**

