Stellar populations of the local infrared-selected galaxies

Xiaoyan Chen[1,2] (chenxy@bao.ac.cn), Yanchun Liang[1], Francois Hammer[3], Yongheng Zhao[1], Guohu Zhong[1,2,4]

1) National Astronomical Observatories, Chinese Academy of Sciences, A20 Datun Road, 100012 Beijing, PR China (NAOC);
2) Graduate School of the Chinese Academy of Sciences, 100049 Beijing, PR China;
3) GEPI, Observatoire de Paris-Meudon, 92195 Meudon, France;
4) Department of Physics, Hebei Normal University, 050016 Shijiazhuang, PR China

1. Abstract

The stellar populations of 849 local infrared-selected galaxies, which contain 419 star-forming galaxies, 326 composite galaxies, 35 Seyfert 2s, and 69 LINERs, are studied by using STARLIGHT. Among the 4 spectral classes, the importance of young populations decreases from star-forming, composite, Seyfert 2 to LINER, and Seyfert 2 and LINER are more metal-rich. While the dominant contributors to mass are all old populations.

2. Sample selection and classification

2.1 Selection:

- **Cross-correlated between SDSS DR4 main galaxy sample and IRAS PSCz using 5 arcsecs matching radius.**
- **Cut by emission-line S/N>5σ (Hα ,Hβ, [NII]6583), and S/N>3σ([OIII]5007).**
- **The fibers locate at the center.**

2.2 Classification:

1) By emission-line ratios (Baldwin et al. 1981, BPT):

419 star-forming galaxies, 326 composite galaxies, 35 Seyfert 2s, 69 LINERs (Fig. 1).

2) By infrared luminosity (Elbaz et al. 2002):

299 ULIGs & LIGs ($L_{IR}/L_\odot > 10^{11}$), 451 starbursts ($10^{11} > L_{IR}/L_\odot > 10^{10}$), 99 normal galaxies ($L_{IR}/L_\odot < 10^{10}$).

3) The spectra in each of the classes are combined to improve well their S/N.

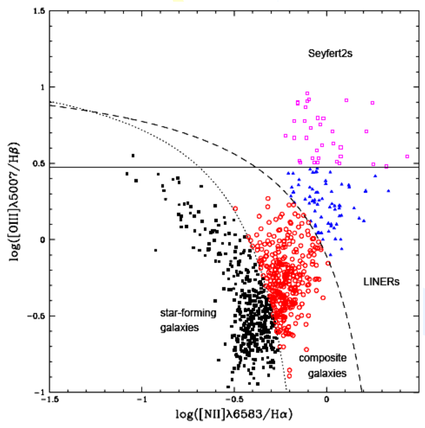

Fig.1 Emission-line diagnostic diagram, dotted line: Kauffmann et al. 2003; dashed line: Kewley et al. 2001; solid line: Shuder et al. 1981.

3. Spectral synthesis results

3.1 Method:

- **code: STARLIGHT** (Asari et al. 2007; Cid fernandes et al. 2005).
- **reddening law: CAL** (Calzetti et al. 1994).
- **bases: 45 SSPs from Bruzual & Charlot 2003** (15 ages: 1Myr~13Gyr, 3 metallicities: 0.2, 1, 2.5 $Z_\odot$).

3.2 Results:

1) different spectral classes:

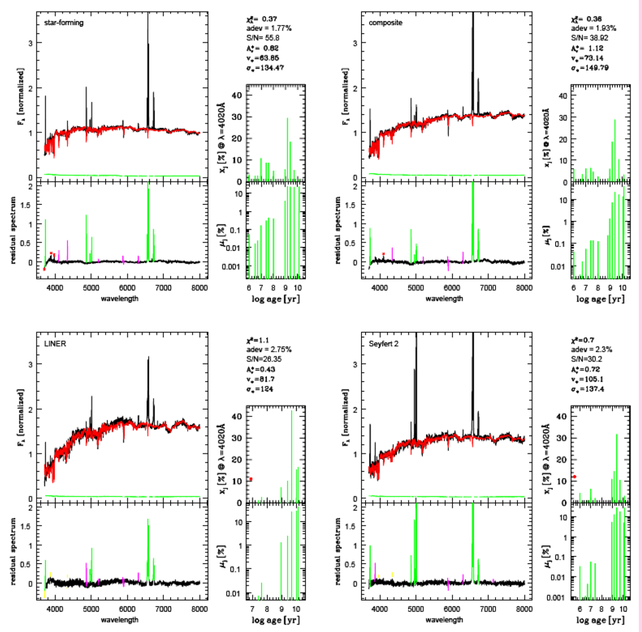

Fig. 2 Stellar population analysis on 4 classes: star-forming (top-left), composite (top-right), LINER (bottom-left), Seyfert 2 (bottom-right).

Each of the 4 panels: top-left: comparison of synthesis spectra (red line) with observed spectra (black line); bottom-left: residual spectra (black line) and mask regions (color lines); top-right: fraction of light associated to each age of SSPs; bottom-right: fraction of mass as function of each age of SSPs (log-scale).

2) different bins of infrared luminosity:

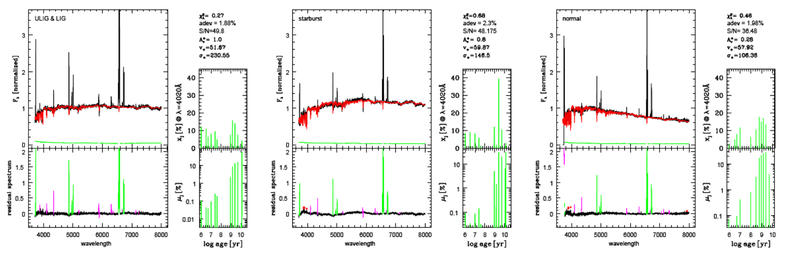

Fig. 3 Stellar population analysis on star-forming galaxies in 3 L_{IR} bins: ULIGs & LIGs (left), starbursts (middle), normal galaxies (right). Same symbols as above.

SSP		emission-line diagram				star-forming in L_{IR} bins		
		star-forming	composite	LINER	Seyfert 2	ULIG&LIG	starburst	normal
age	young	41.4	30.2	3.4	15.1	51.3	32.6	40.4
	intermediate	57.5	65.2	56.4	68.5	44.4	63.4	59.6
	old	1.1	4.6	29.9	4.3	4.3	4.0	0.0
	power law			10.3	12.1			
$Z/Z_\odot$	0.2	78.5	84.8	40.4	44.	71.9	76.9	42.7
	1.0	14.4	10.5	40.4	7.4	19.0	15.1	14.4
	2.5	7.1	4.7	8.9	36.5	9.1	8.0	42.9
	power law			10.3	12.1			

Table 1 Fraction of light in each subsample. The importance of young populations decreases from star-forming, composite, Seyfert 2 to LINER. Seyfert 2 and LINER are more metal-rich.

ULIGs & LIGs present the most significant fraction of young populations. Normal galaxies are more metal-rich (young: <0.5Gyr, old: >10Gyr,intermediate: between them).

4. Conclusions:

- **LINERs present the oldest populations among 4 spectral classes, and the importance of young populations decreases from star-forming, composite, Seyfert 2 to LINER. LINER and Seyfert 2 are more metal-rich.**
- **ULIGs & LIGs present the youngest populations among 3 infrared luminosity bins. Normal galaxies are more metal-rich.**
- **The dominant contributors to mass are old populations in all cases.**

5. References

Asari et al. 2007, MN, 381, 263; Baldwin et al. 1981, PASP, 93, 5; Bruzual &Charlot 2003, MN, 344, 1000; Calzetti et al. 1994, ApJ, 429, 582; Cid Fernandes et al. 2005, MN, 358, 363; Elbaz et al. 2002, A&A, 384, 848; Kauffmann et al. 2003, MN, 346, 1055; Kewley et al. 2001, ApJ, 556, 121; Shuder et al. 1981, ApJ, 250, 55.