

WISE Infrared Properties of Fermi AGNs

J. J. Qiu¹, J. S. Zhang^{1,*} & Q. Guo^{1,2}

¹*School of Physics and Electronic Engineering, Guangzhou University, Guangzhou 510006, China.*

²*Hunan University of Humanities, Science and Technology, Loudi 417000, China.*

**e-mail: jszhang@gzhu.edu.cn*

Abstract. The infrared properties of Fermi AGNs were investigated using the survey data of the Wide-field Infrared Survey Explorer (WISE). The results showed: (1) BL Lacs tend to be brighter than FSRQs at $3.4\ \mu\text{m}$. However, with increase of wavelength, FSRQs tend to be brighter than BL Lacs. (2) FSRQs colours are redder than BL Lacs; (3) A strong correlation exists between infrared and γ -ray luminosity.

Key words. AGN—infrared— γ ray.

1. Introduction

The clean sample of the second LAT AGN Catalog (2LAC; Ackermann *et al.* 2011) includes 886 AGNs, comprising 395 BL Lacertae objects (BL Lacs), 310 Flat-Spectrum Radio Quasars (FSRQs), 181 unknown. The Wide-field Infrared Survey Explorer (WISE; Wright *et al.* 2010) is a NASA medium class explorer mission that conducted a digital imaging survey of the entire sky. WISE is achieving 5σ point source sensitivities better than 0.08, 0.11, 1 and 6 mJy in unconfused regions on the ecliptic in 3.4, 4.6, 12 and $22\ \mu\text{m}$ mid-infrared bandpasses (hereafter W1, W2, W3, and W4). Its sensitivity is more than one hundred times better than IRAS in the $12\ \mu\text{m}$ band. We investigated and compared the infrared properties of FSRQs and BL Lacs, including their infrared apparent magnitude distribution, colour–colour properties and infrared luminosity vs. gamma ray luminosity. We use $\Omega_{\text{m}} = 0.27$ and $\Omega_{\Lambda} = 0.73$.

2. Analysis and results

Figure 1 shows that BL Lacs ($12.^m74 \pm 0.^m06$) are, on average brighter than FSRQs in the $3.4\ \mu\text{m}$ band ($13.^m52 \pm 0.^m07$). With the wavelengths increasing, however, FSRQs tend to be brighter than BL Lacs.

FSRQs colours are redder than BL Lacs, which may be explained by the dusty torus of FSRQs. Further discussions are needed (Fig. 2).

A strong correlation is obvious between both luminosities, and BL Lacs tend to lower luminosities compared to FSRQs. The correlation still exists, after eliminating

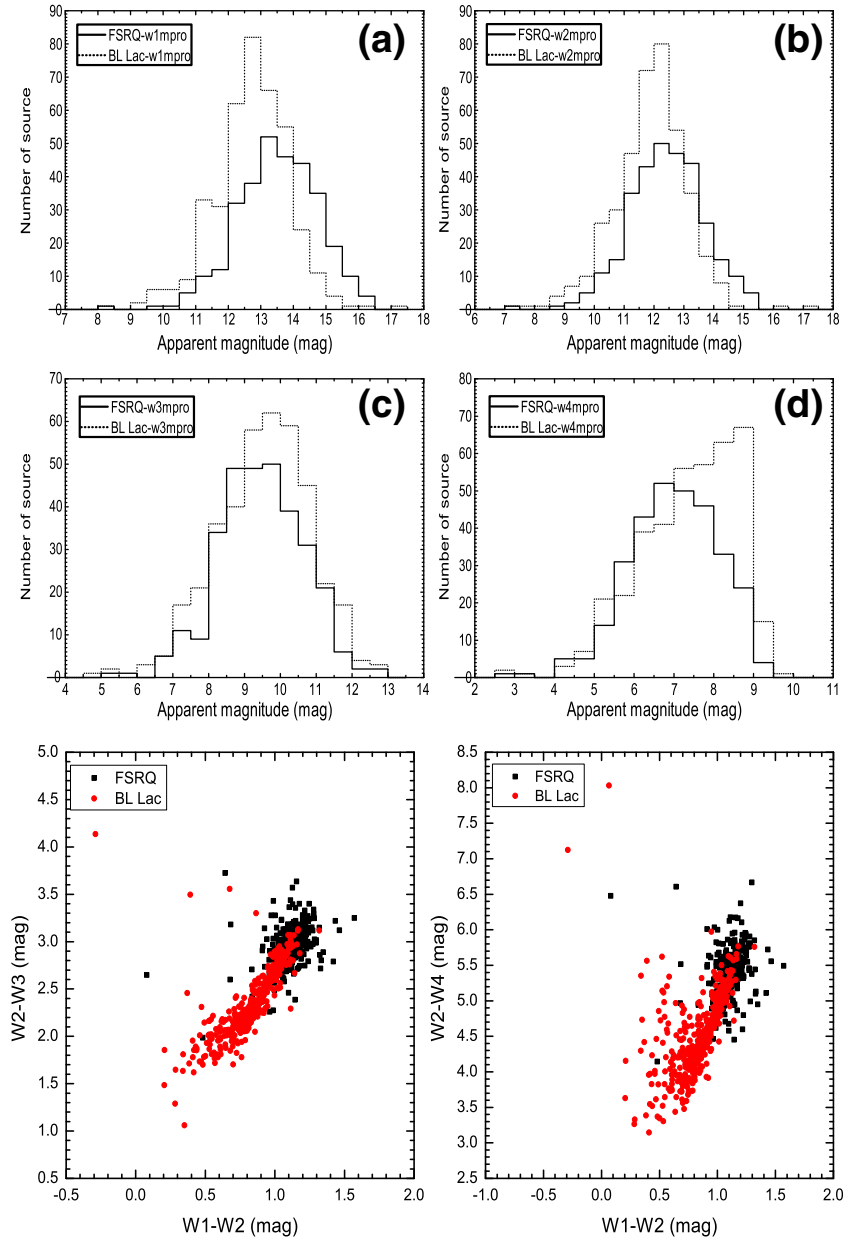


Figure 1. *Top: (a–d) W1 band infrared magnitude distributions for W1, W2, W3 and W4 (solid line: FSRQs; dotted line: BL Lacs); Bottom: Colour–colour diagrams.*

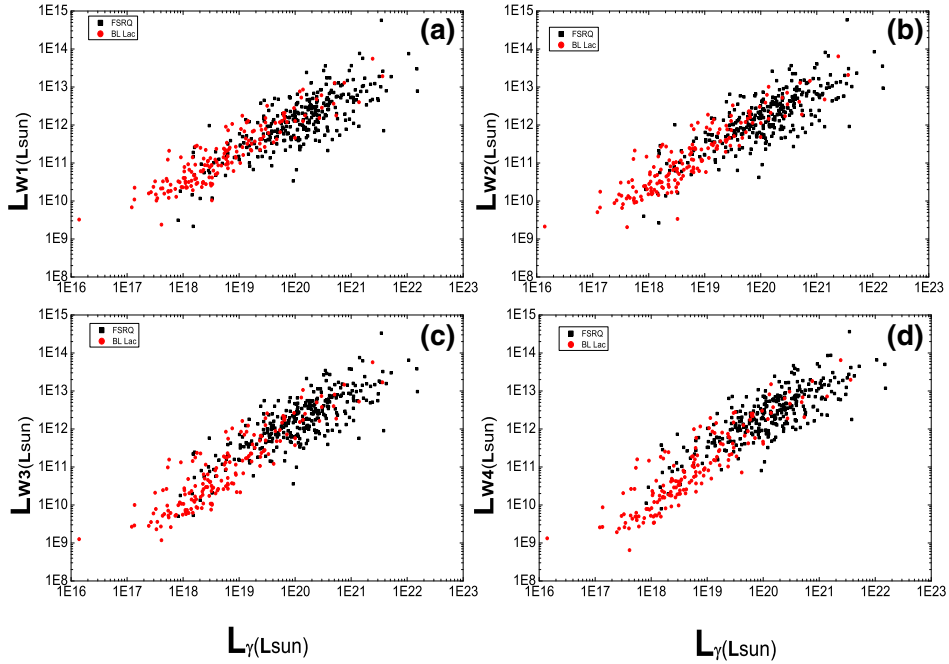


Figure 2 (a–d). W1–W4 infrared luminosity vs. γ -ray ($1 \sim 100$ GeV) luminosity for FSRQs (black) and BL Lacs (red).

the distance effect. And there is continuity between two blazar subclasses in that their properties overlap at intermediate values of both infrared and γ -ray ($1 \sim 100$ GeV) luminosity.

Acknowledgements

This work was supported by the China Ministry of Science and Technology under State Key Development Programme for Basic Research (2012CB821800) and the Natural Science Foundation of China (Nos 11043012, 11178009).

References

Ackermann, M. *et al.* 2011, *Astrophys. J.*, **743**, 271.
 Wright, E. L. *et al.* 2010, *Astron. J.*, **140**, 1868.