NNU · 南京师范大学
NANJING NORMAL UNIVERSITY

East-Asia AGN Workshop 2017, Dec. 4-6, 2017, Kagoshima, Japan

Spectral principal component analysis of mid-infrared spectra of a sample of PG QSOs

Wei-Hao Bian(卞维豪)[1], Zhi-Cheng He[1], Richard Frederick Green[2], Yong Shi[3], Xue Ge[1] and Wen-Shuai Liu[1]

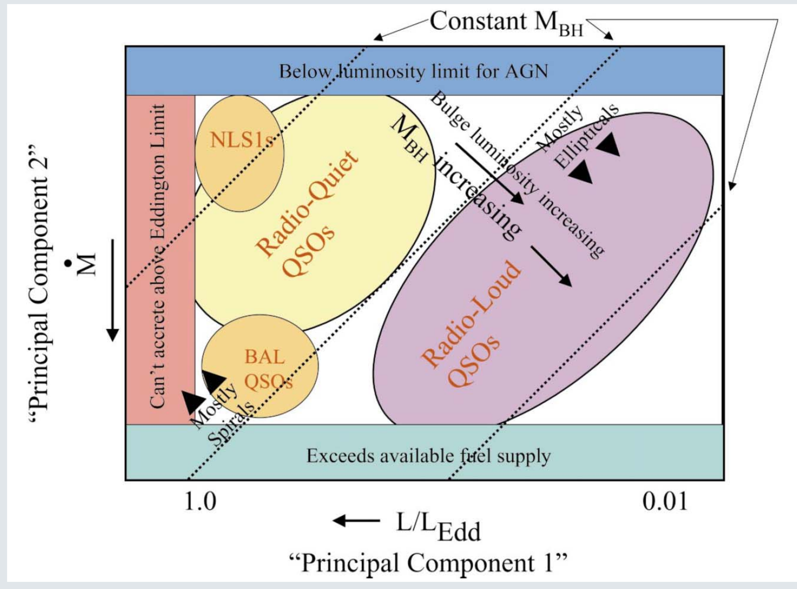
[1] Department of Physics and Institute of Theoretical Physics, Nanjing Normal University, Nanjing 210023, China

[2] Steward Observatory, University of Arizona, Tucson, AZ 85721, USA

[3] School of Astronomy and Space Science, Nanjing University, Nanjing 210093, China

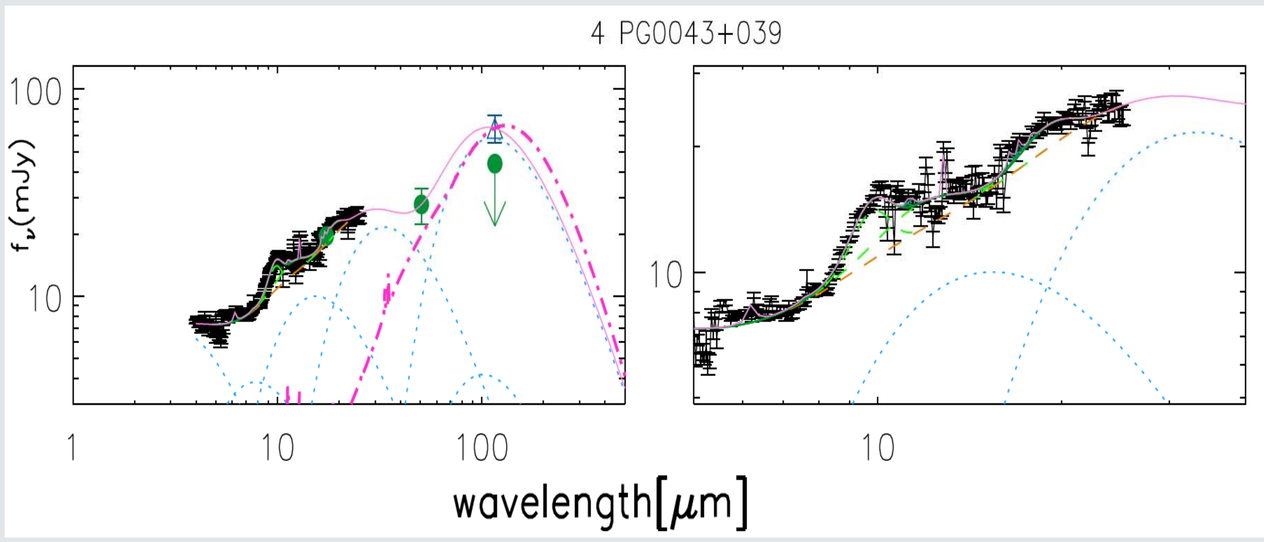
1. Introduction

- AGN/QSOs: standard paradigm, SMBH, BLRs/NLRs, torus, jet. Radiation + orientation => SED diversity.
- Torus+host: Si, PAH, molecular H, ion; SF, 11.3 μm PAH, MIPS 70 μm, MIPS/PACS 160 μm
- PCA: multivariate correlation analysis; find the fewest number of variables (PCs) to describe the variance. Drivers of PC1/PC2: PC1-> L/Ledd, PC2 -> L



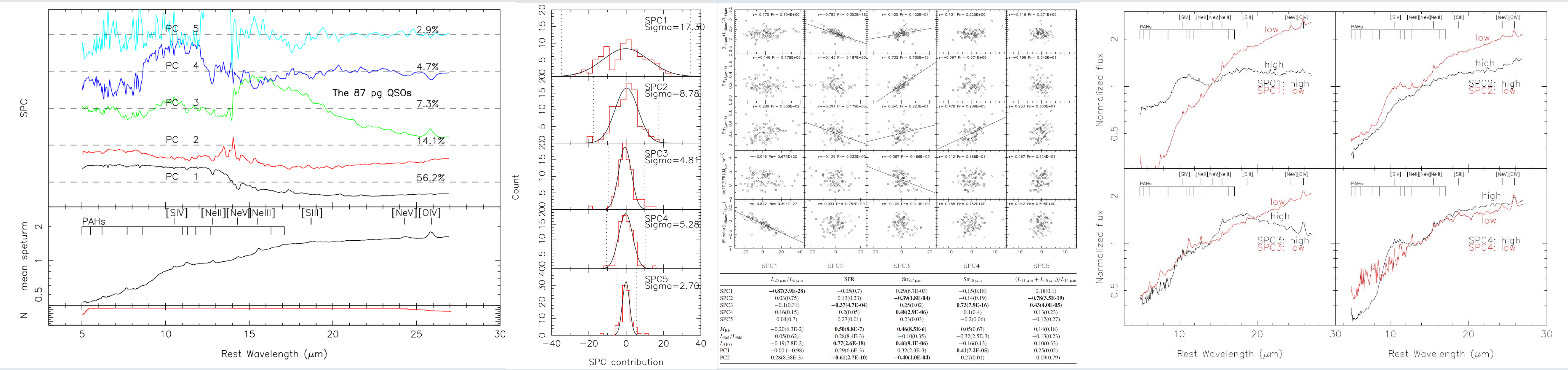
2. Sample

- 87 PG QSOs: z<0.5; mid-infrared, Spitzer IRS 5-40 μm, MIPS 24, 70, 160 μm, Herschel PACS 160 μm; SMBH mass, Eddington ratio
- Model IRS spectra+ MIPS/PACS: torus+SF, (multi-T BB, silicate, aromatic, emission lines, the SF template) , 26K-1000K (11 BB), two two-Gussian fit for Si 9.7, 18, Drude profiles for PAHs, one-Gussian fit for other emission lines.

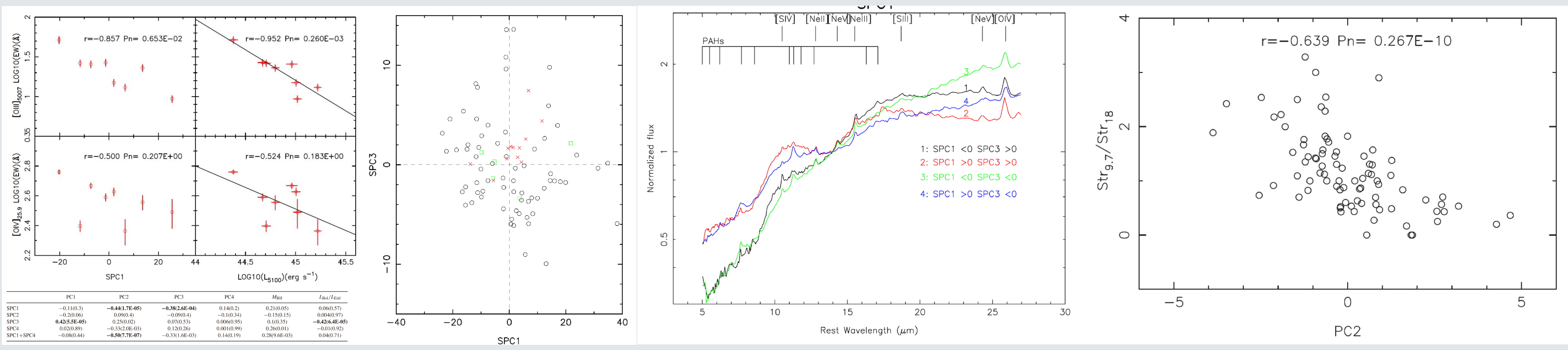


3. Results

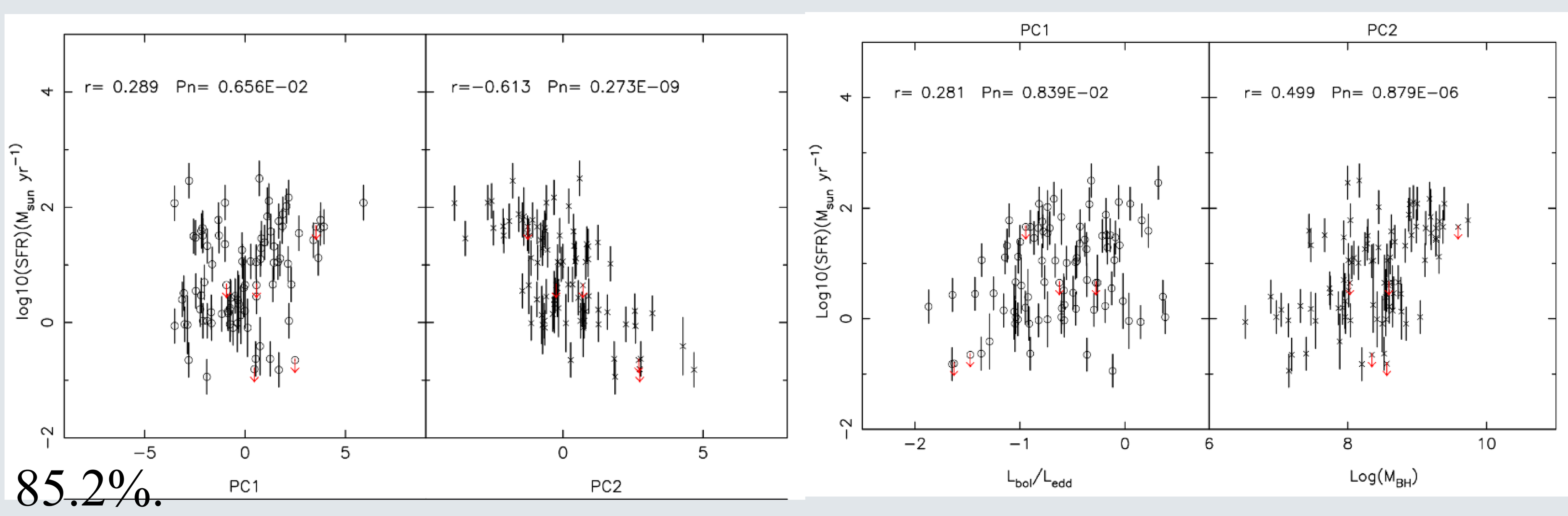
- The first five mid-IR eigenspectra:85.2%, relations (SPC1/2/3/4/5 versus IR-slope, SFR, Si); mean spectra for |SPC_ij|>1σ



- The relation with PCs by BG92: PC1/2/3/4 + M_BH + L/L_Edd, SPC1-SPC3



- The connection between SFR and PCs: more Luminosity -> larger SFR, feedback by MBH accretion.



4. Summary

- SPCA of mid-IR spectra of PG QSOs, first five eigenspectra, 85.2%.
- SPC1: mid-IR slope, forbidden IR lines EW, Baldwin effect, Larger AGN luminosity -> more dust, smaller opening angle -> suppressed EW
- SPC3: Si 18 μm, SFR(PAH 11.3 μm); SPC4: Si 9.7 μm
- SPCs-PCs: SPC1-PC2, SPC3-PC1; Strong correlation between Si9.7/Si18 and PC2 (L5100, MBH, accretion rate)
- SFR-PCs: correlation between SFR and PC2/MBH, possible feedback by SMBH accretion.

Reference

- Bian W. H., He Z.C., Green R. F., Shi Y., Ge X., Liu W. S., 2016, MNRAS, 456, 4081
- Boroson T. A., Green R. F., 1992, ApJS, 80, 109
- Shi Y., Rieke G. H., Ogle P. M., Su K. Y. L., Balog Z., 2014, ApJS, 214, 23