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

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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-Gaussian 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