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MIR AND HARD X-RAY LUMINOSITIES, SILICATE FEATURES, AND SFR IN AGN

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We investigate the obscuration and star formation activity in local AGN by exploiting a large compilation of Spitzer-IRS spectra. In order to avoid biases due to the obscuration itself and to measure the intrinsic luminosity in a homogeneous manner in both, obscured and unobscured objects, we have selected a sample of local AGN observed with Spitzer-IRS having hard X-ray spectra. The analysis of a large sample allows us to investigate the relationship between obscuration, dust covering factor, star formation rate (SFR) and intrinsic luminosity of the AGN.

We gathered a sample of 192 AGN exhibiting a wide range of AGN types. This sample is drawn from several authors (see references). We used IRS observations in the standard staring mode, covering the interval between 5 and 38 μm with $R \sim 60$–120. Figure 1 depicts the IRS spectra with the best fit.

We studied the correlation between the reprocessed mid-IR (MIR) and absorption corrected hard X-ray luminosities. A high correlation is found between the rest frame 6.7 μm ($L_{\rm MIR}$) and 2–10 keV (L_X) luminosities, following the non-linear relation $\lambda L_\lambda(6.7\mu m) \propto L_X^{0.83}$, supporting the previous finding where the dust covering factor decreases with luminosity (Maiolino et al. 2007). However, the dust covering factor, which is proportional to the ratio between the MIR dust thermal continuum and the L_X, decreases with luminosity in Type 1 (unobscured) AGN, while Type 2 (obscured) AGN do not show such a trend. The 7.7 μm PAH emission feature, expected from starburst activity, was used to estimate the SFR. We found that the SFR correlates with the AGN intrinsic luminosity, in agreement with the expectation of models of galaxy-BH coevolution. We found the dust covering factor correlates with the SFR, suggesting that SFR enhances the amount of gas and dust in the nuclear region. However, the gas and dust columns along the line of sight (inferred from the X-rays and from the 9.7 μm absorption feature) do not correlate with SFR. This apparently contradictory result may provide clues on the geometry and distribution of the gas and dust in the circumnuclear region, and on its connection to the star formation activity.

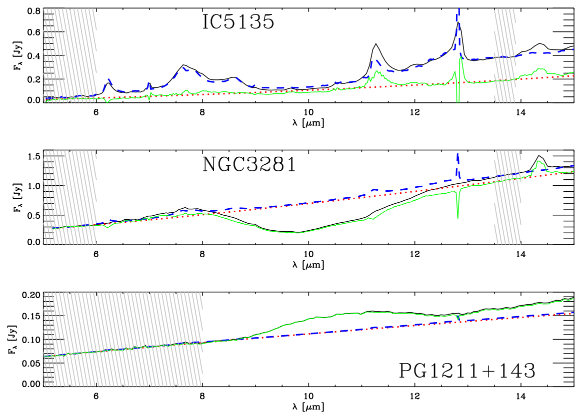

Fig. 1. Spitzer-IRS spectra (black). The red line is the fitted continuum, the blue line is the scaled M82 template, and the green line is the residual, subtracting the scaled M82 template from the spectrum of the object. Upper panel: PAH-dominated spectrum. Middle panel: absorption-dominated spectrum. Lower panel: continuum-dominated spectrum. The hatched areas mark regions that were used to fit the continuum.

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