MID-INFRARED PROPERTIES OF LOCAL ACTIVE GALACTIC NUCLEI

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AGN in the mid-infrared

MIR atmosphere transmission at Paranal

Wavelength (μm)

Transmission

Type 2 AGN

Type 1 AGN

VISIR manual

N band

Q band

Thermal

Synchrotron

Jet?

NLR

LINER

Star-forming region

Glumpy torus

Thin accretion disk

BLR
The AGN MIR Atlas

• Goals:
  – Detect and characterize MIR emission in local AGN
  – Quantify non-AGN emission
  – Verify the nuclear MIR emission as bolometric indicator \((\text{Gandhi+09, Levenson+09})\)
  – Investigate the origin of the nuclear MIR emission
Importance of angular resolution in the MIR

**Spitzer/IRS** (~0.8m) **versus** **VLT/VISIR** (~8m)

Hernán-Caballero & Hatziminaoglou (2011) and Hönig et al. (2010)
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• **Sample:**
  - All Seyferts and LINERs with public ground-based high-angular resolution MIR imaging in N- and/or Q-band data
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• **Goals:**
  - Detect and characterize MIR emission in local AGN
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  - Verify the nuclear MIR emission as bolometric indicator (*Gandhi+09, Levenson+09*)
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• **Sample:**
  - All Seyferts and LINERs with public ground-based high-angular resolution MIR imaging in N- and/or Q-band data
  - 249 objects (z < 0.4)
  - >1/3 of the nearby AGN (z < 0.01; Veron-Cetty & Veron 2010)

• **Methods:**
  - Reduce all data in a uniform way (*as in Asmus et al. 2011*)
see also Hönig+10
Maximum star formation contamination

- 249 AGN with HR MIR imaging
- 200 objects detected
- >18% resolved
- Star formation weak in the nuclear 0.4” region

Scale star formation template to PAH 11.3 feature

Spitzer/IRS VISIR photometry maximum SF contribution

BAT:
Type 1
Type 2

Asmus et al. 2011

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The AGN MIR atlas in X-rays

**The BAT AGN surveys**
- “least-biased” all-sky sample of AGN
- selected at 14-195keV
- 9-month sample: 102 AGN (Tueller et al. 2008, Winter et al. 2009)
- We observed ~80% with HR MIR imaging

**Intrinsic 2-10keV properties**
- collected and combined from literature for all AGN

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Credit: Tueller et al. 2010
The MIR--X-ray luminosity correlation

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- 200 objects detected
- >18% resolved
- Star formation weak in the nuclear 0.4” region
- MIR—X-ray correlation valid for all AGN with slope \( \sim 1 \)

See also: Krabbe+01, Lutz+04, Horst+06, Horst+08, Gandhi+09, Levenson+09, Asmus+11, Matsuta+12, Mason+12, Ichikawa+12, ...

Asmus et al., in prep.

\[
\log L_{\text{MIR}} \sim (0.99 \pm 0.03) \log L_{\text{X}}
\]

- 155 detections plotted
- Obs. scatter \( \sim 0.42 \)
- Intrins. scatter \( \sim 0.28 \)
The MIR–X-ray correlation

- Hot corona
- Thin accr. disk
- Clumpy dusty structure

**Mid-infrared**

**X-ray**

**UV**
Dependency on optical type

Asmus et al., in prep.
Dependency on the nuclear obscuration ($N_H$)

$\log N_H / \text{cm}^2 \leq 22$

$\log N_H / \text{cm}^2 > 22$

Asmus et al., in prep.
Effect of the column density

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Asmus et al., in prep.
Dependency on the luminosity

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Effect of the accretion rate

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- No type or $N_H$ dependency obvious
- No luminosity dependency obvious
- Structure probably changes at low accretion rates

Asmus et al., in prep.
Thank you for your attention!

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The AGN MIR Atlas