Unveiling the nature of Seyfert nuclei with 1 – 100 μm spectral energy distributions

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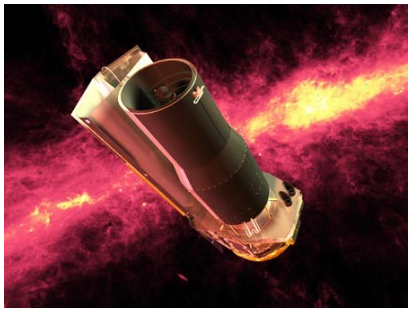
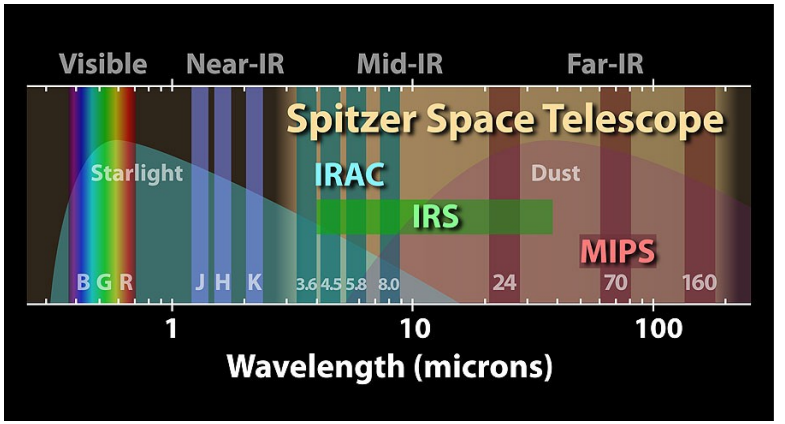
IR emission as a probe of Seyfert nuclei

- Circumnuclear dust
  - Absorbs and reradiates higher energy photons
- Spitzer Space Telescope
- Dust heated by SF and AGN
  - SED decomposition can separate the contributions to dust heating
  - Modelling can infer the input spectrum and dust properties

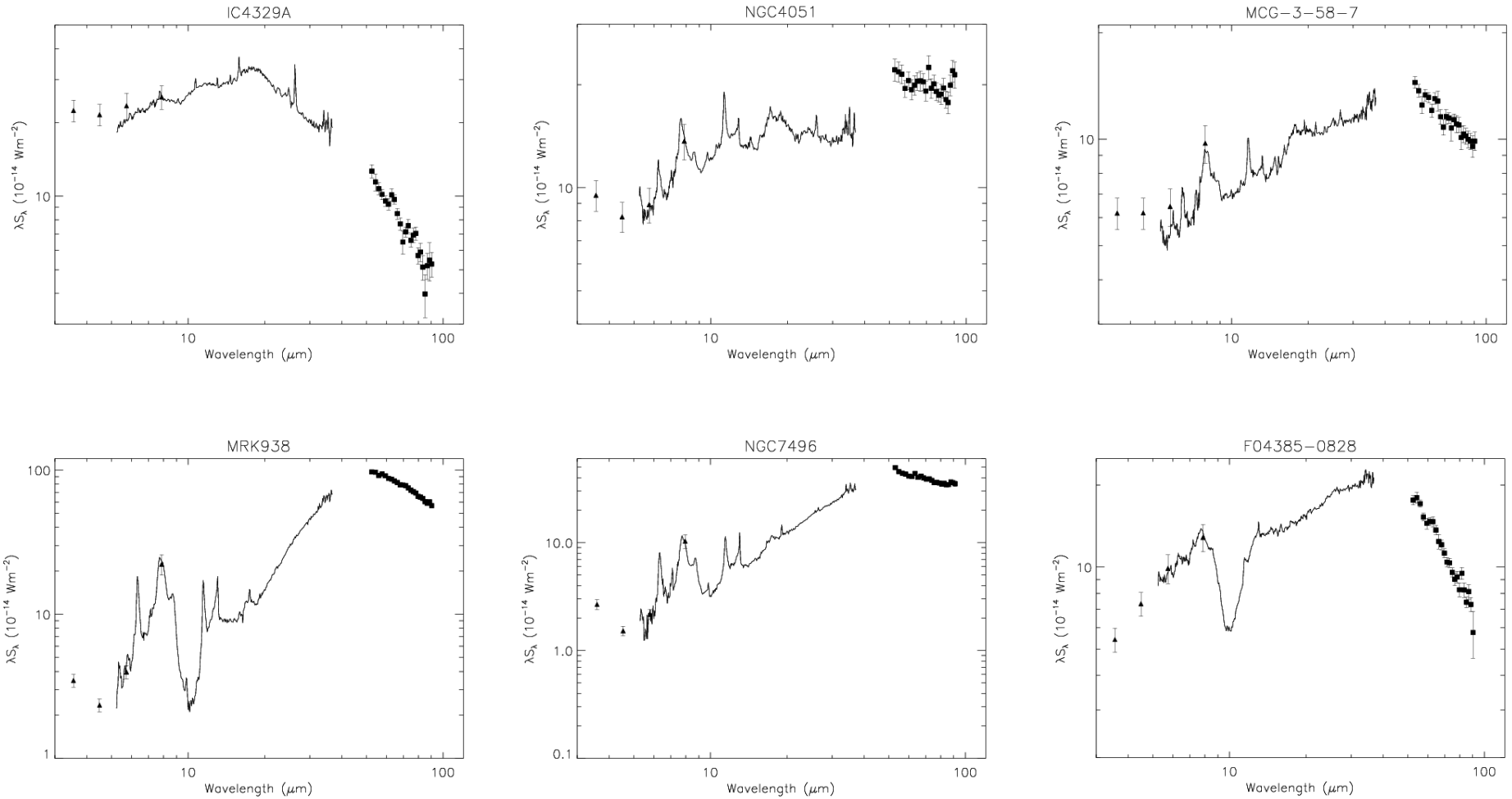




Spitzer Seyfert study

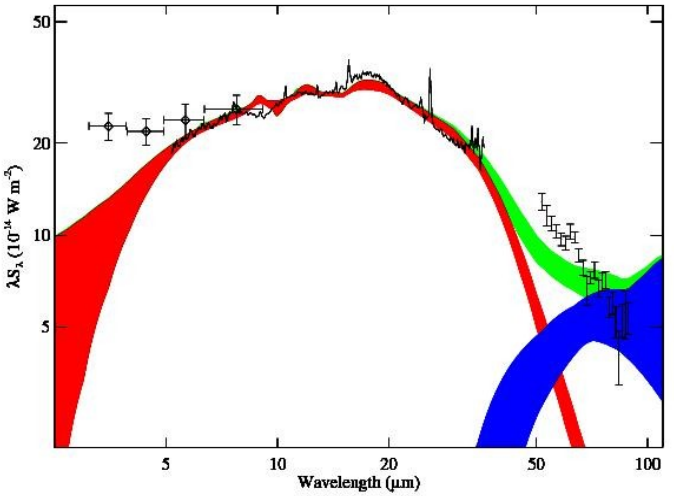
- Sample of 87 nearby (*cz* < 10000 km/s) Seyfert galaxies (Rush et al. 1993)
  - Probing the central few kiloparsecs
  - IR-selected to minimise orientation-dependent selection effects
  - Large enough to do statistical analysis
- *Spitzer Space Telescope* dataset
  - 3.6 - 100 μm (spectra/photometry from all three Spitzer instruments)
  - Matched 20” apertures at all wavelengths
  - Additional ground-based data (optical and NIR)
- Analysis
  - Model-fitting to SED – CLUMPY & SK07
  - Line and continuum diagnostics – PAHFIT

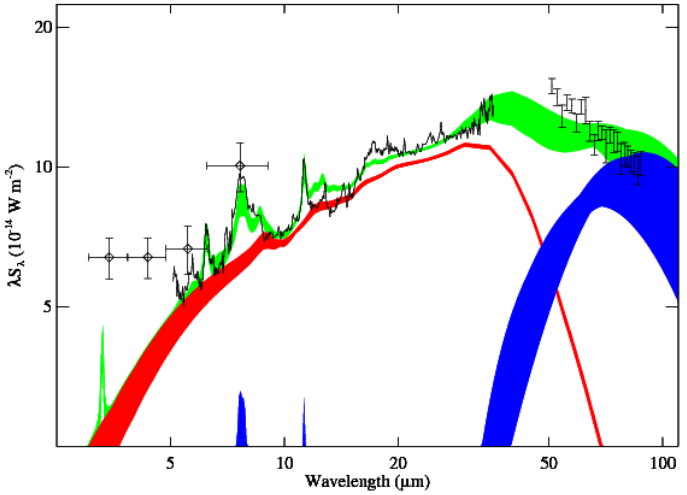
IR SEDs of Seyfert Galaxies

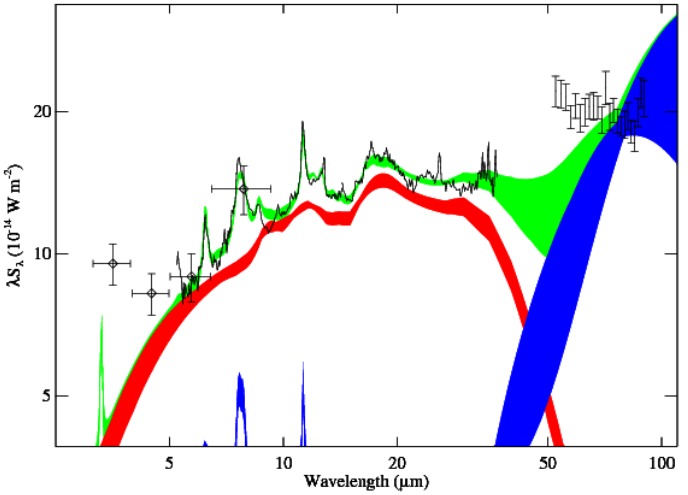


Seyfert 1s

- Weak silicate in emission
- AGN-dominated
- IR spectra similar for HBLR Sy 2s







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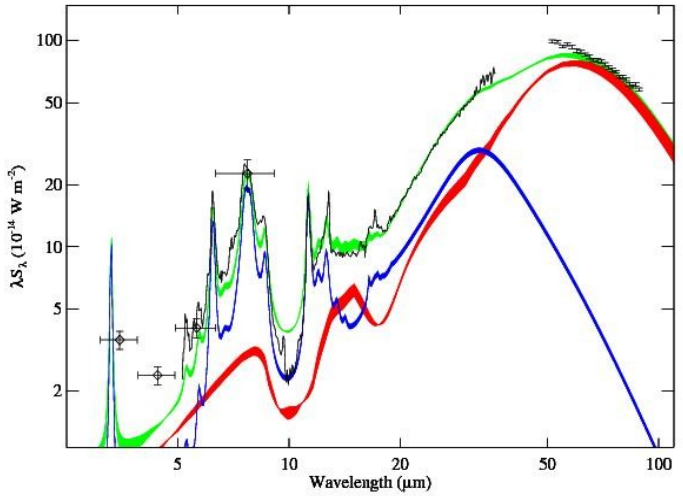
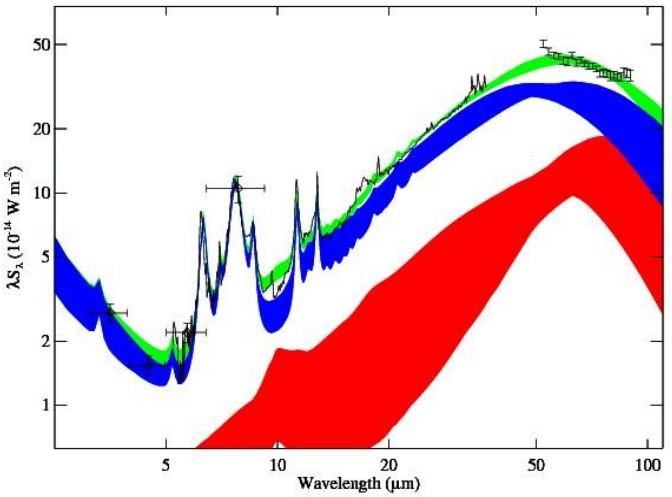
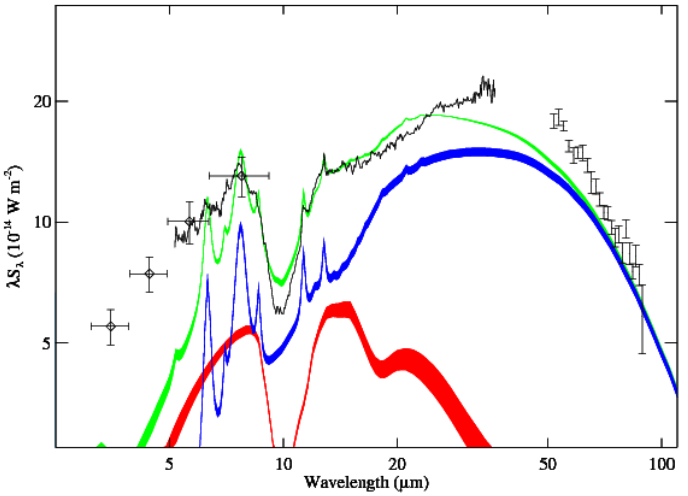
Seyfert 2s



- SB-dominated (selection effect)
- Silicate in absorption
- Strong silicate features in edge-on galaxies





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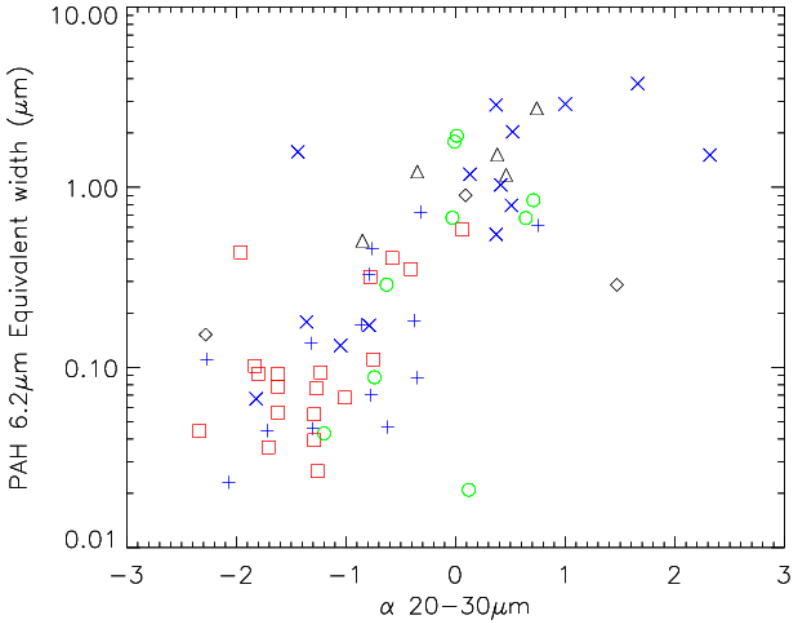
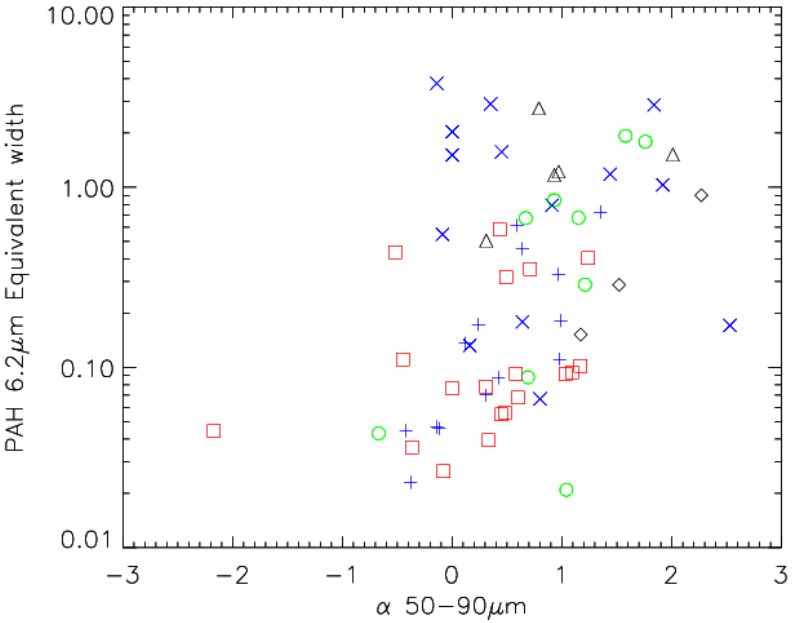
Star formation contributions

- PAH larger in sources which are redder in mid and far IR
  - Cool dust is primarily heated by SF
- Seyfert 2s with HBLR show weaker SF than those without
  - BLR harder to detect in presence of SF





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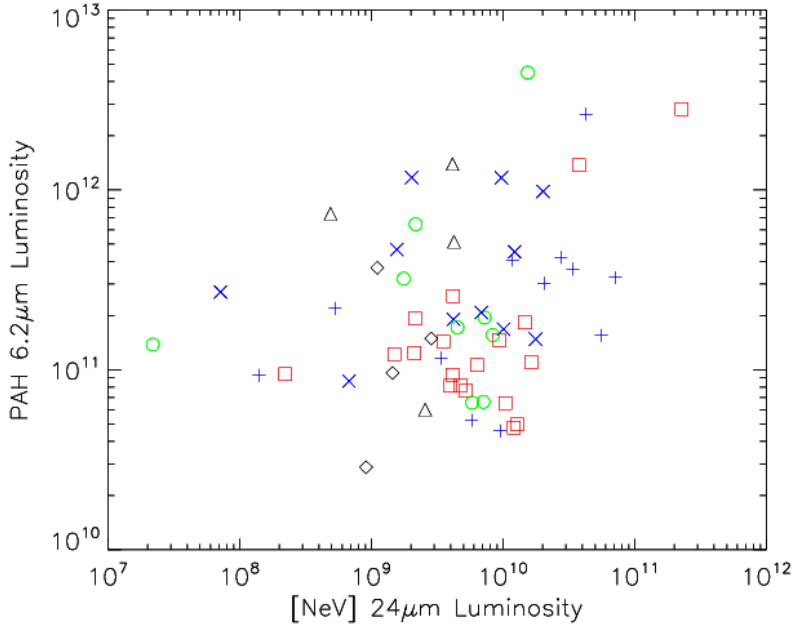
SB/AGN connection

- Correlation of tracers of SF and AGN ionizing luminosity
  - Confirming previous results
  - May be feedback or simply available fuel supply



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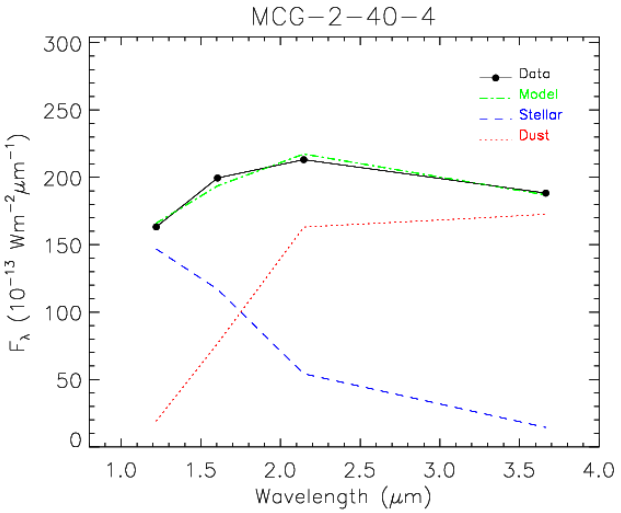
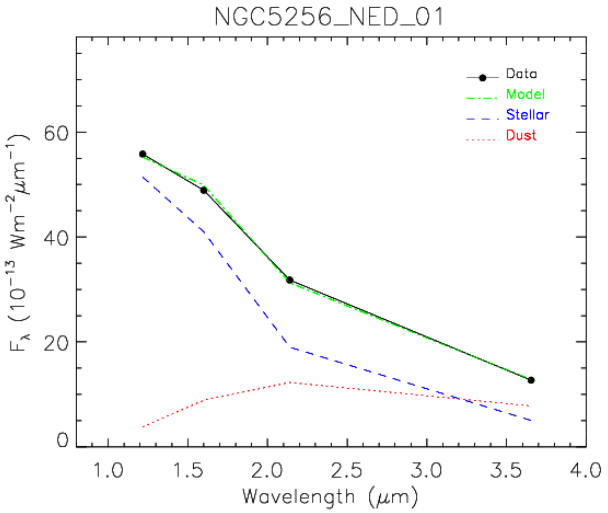
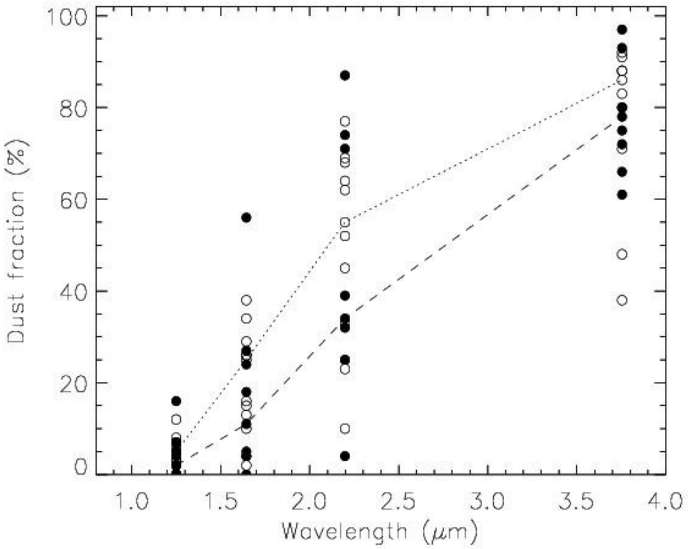
Near-infrared SEDs







- Hot dust component not very hot
- Slight difference between Sy 1s and 2s
  - Consistent with previous findings, AGN begins to dominate at K and L bands for both Seyfert types

Conclusions and future work

- AGN and stellar contributions to the SED:
  - Seyfert 1s are AGN-dominated
  - Seyfert 2s with HBLR are similar to Seyfert 1s (support for unified scheme)
  - Seyfert 2s without HBLR are SF-dominated – selection effect in the sample
- Clumpy torus can account for the observed SEDs
- AGN/SB connection seen in the infrared SED
  - may be feedback or available fuel supply
- Incorporating the NIR SED into the modelling
- Expanding the database
  - NIR spectroscopy – starburst contribution in NIR
  - Optical spectroscopy – uniform Seyfert types, ionising luminosity