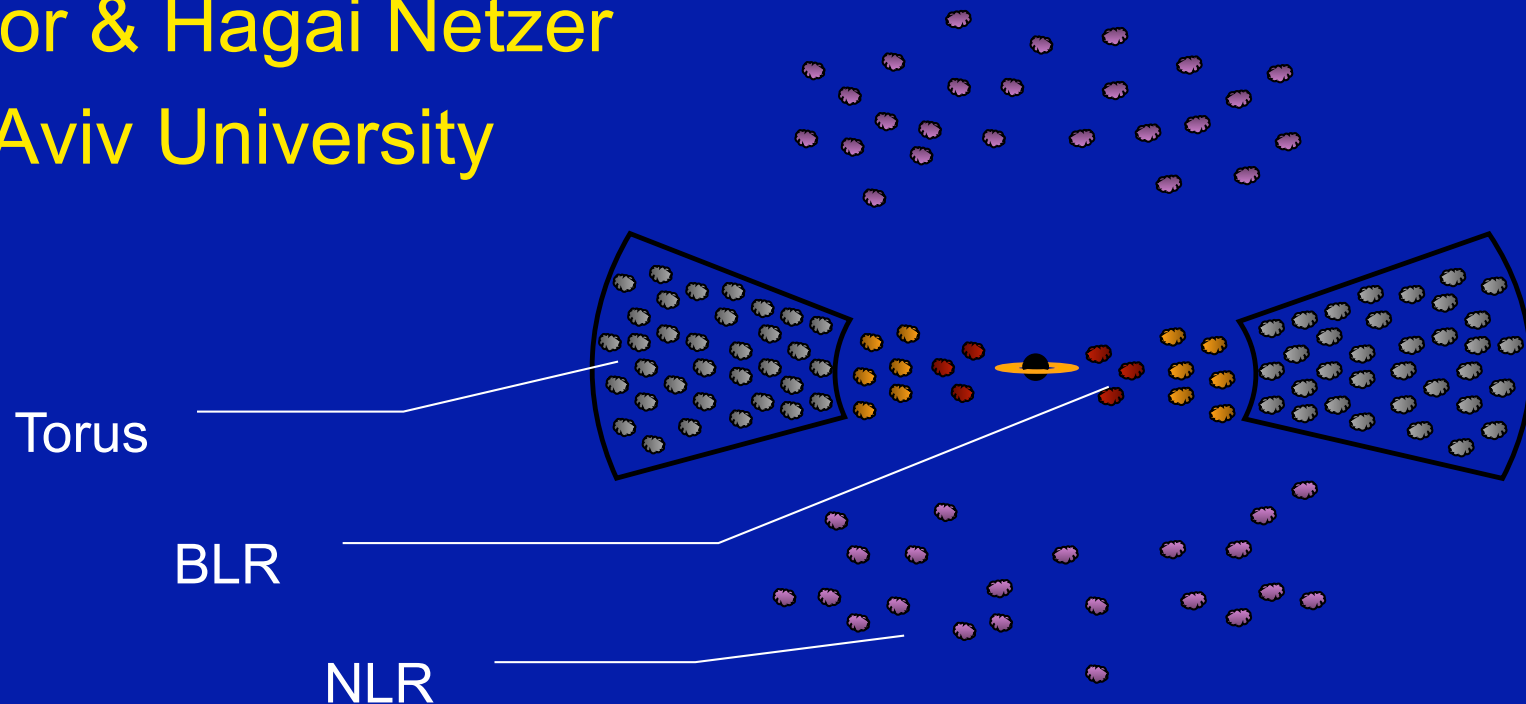


Hot dust, warm dust and star formation in NLS1s

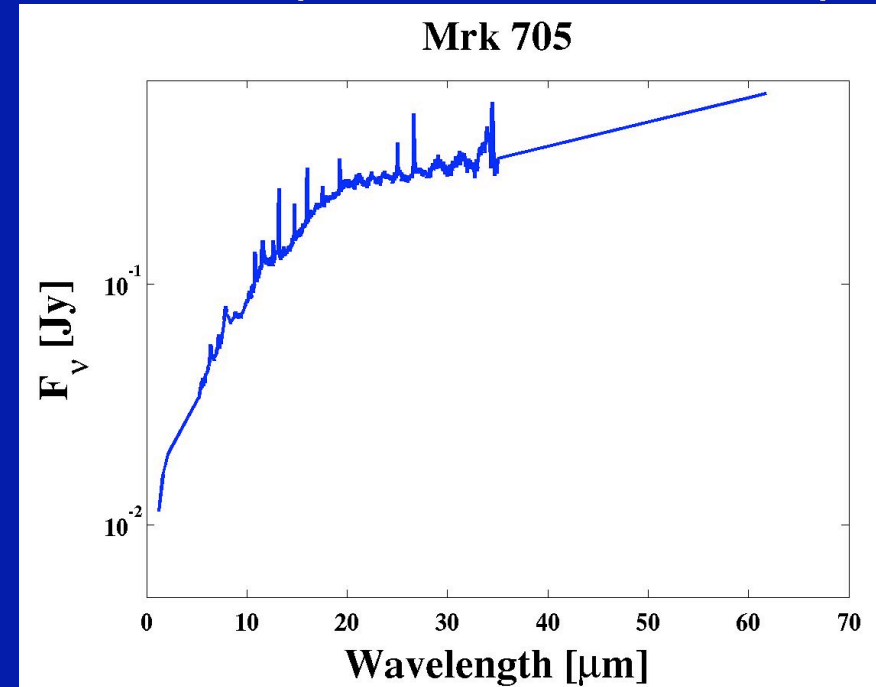
Rivay Mor & Hagai Netzer
Tel Aviv University



NARROW-LINE SEYFERT 1 GALAXIES AND THEIR PLACE IN THE UNIVERSE
April 4-6 2011 - Milano, Italy

Sample and Observations

- Most of Sani+09 & *QUEST* QSOs (Schweitzer+06)
- 51 NLS1s 64 BLS1s
- $\text{Log}(L_{\text{bol}}) = 43.3\text{-}46.7$
- *Spitzer*/IRS 2-35 μm
- 2MASS NIR photometry
- IRAS 60 μm



Objective:
Decompose the NIR+MIR SED of AGNs
into its different physical components.

Star Formation Subtraction

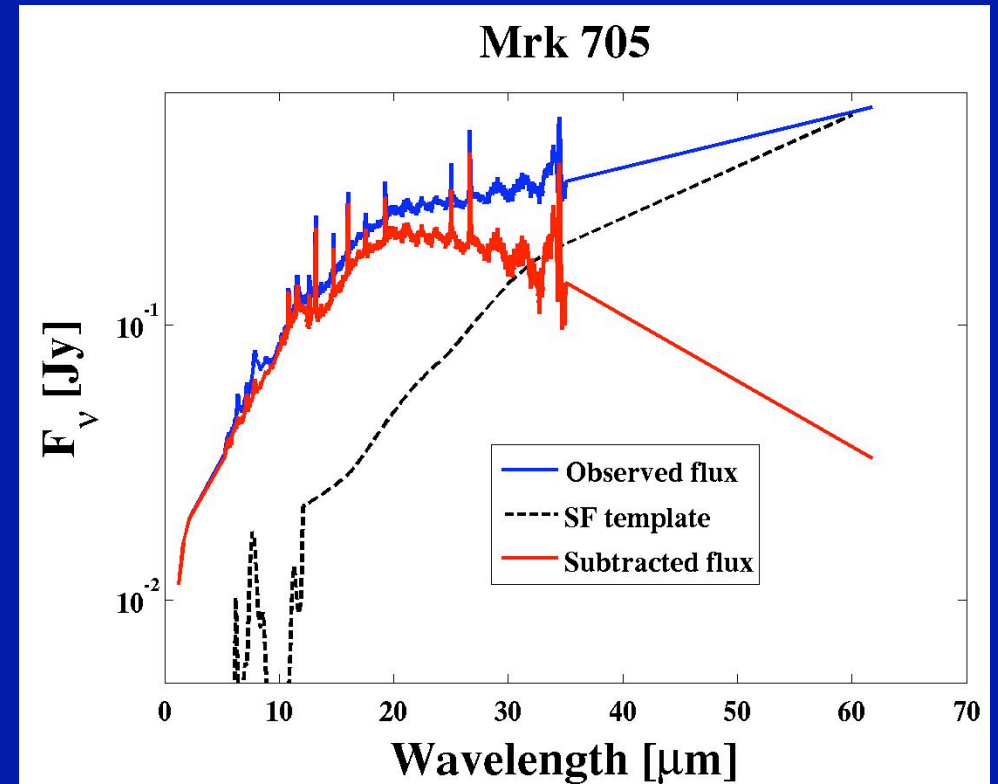
- Templates using 5 SF galaxies
 $\log(L_{\text{IR}}/L_{\text{Sol}}) = 10.5 - 12.2$

- 2 criteria for subtraction:
 - PAH features diminished
 - FIR dominated by SF

- Many NLS1s have SF dominated MIR SED

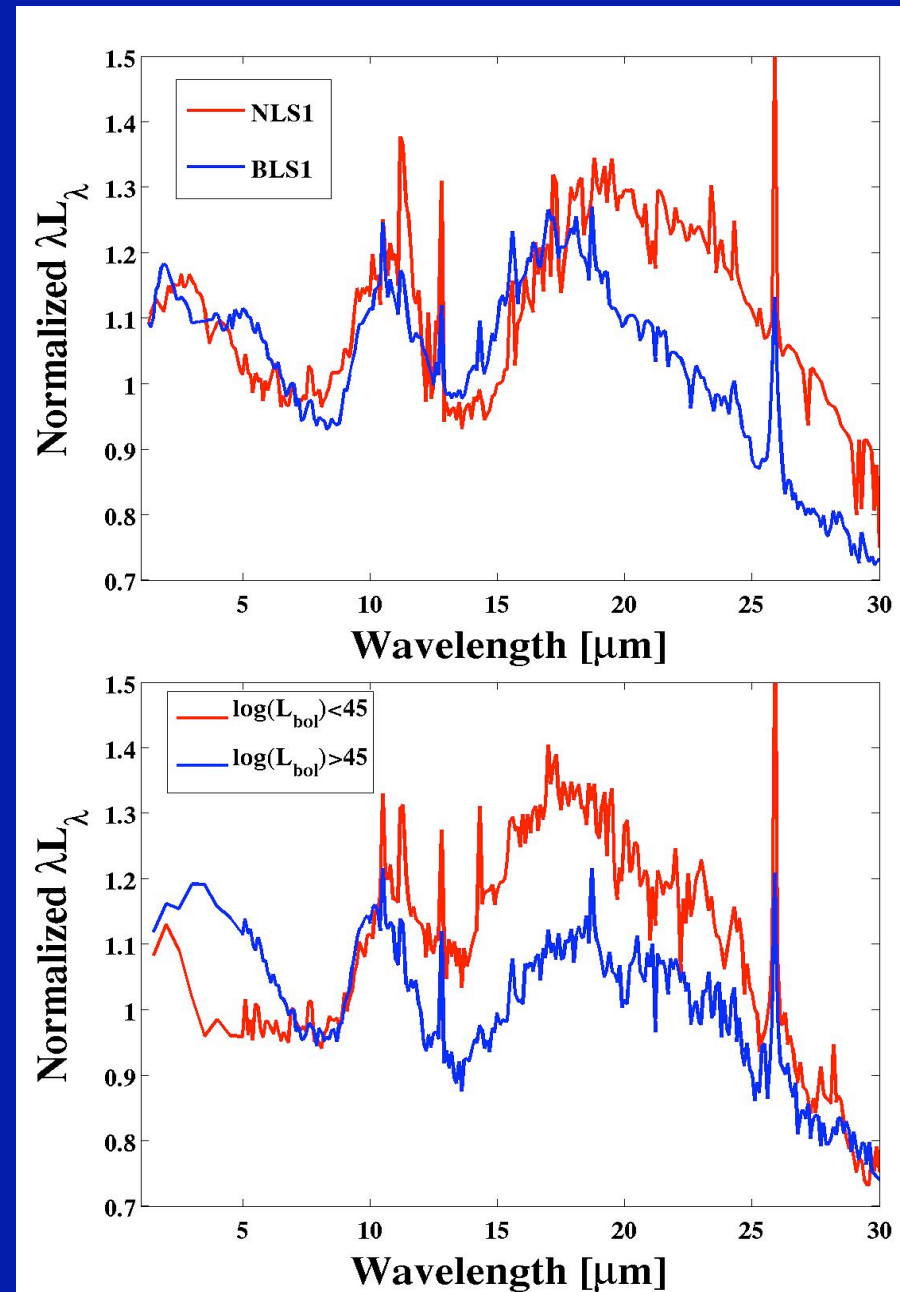
Large SF
contribution

Small AGN
contribution



Intrinsic AGN SED

- Warm dust:
peak at $\sim 20 \mu\text{m}$
(e.g., Netzer+07; Deo+09)
- NLS1s similar to
BLS1s – perhaps
colder “warm” dust.
- $18 \mu\text{m}$ silicate feature
stronger in low-L
AGNs.



Decomposing the NIR+MIR AGN SED

- 3 component model:

Clumpy torus (Nenkova+08a,b)

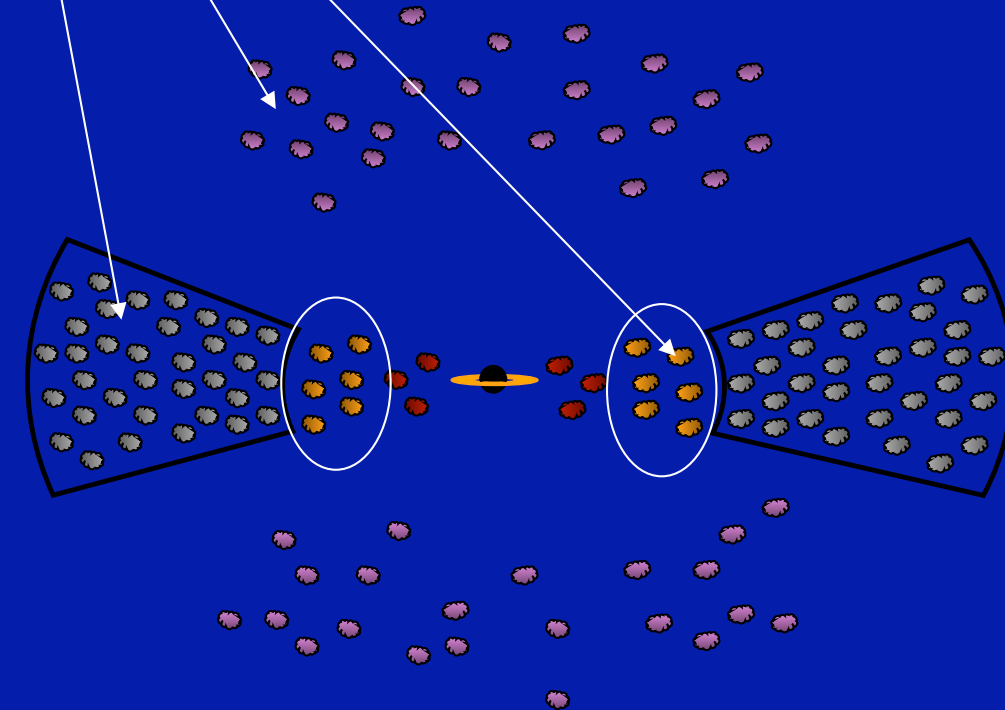
Dusty NLR clouds

Graphite-only hot dust clouds

} Mor+09

Hot dust:

A full radiative transfer model



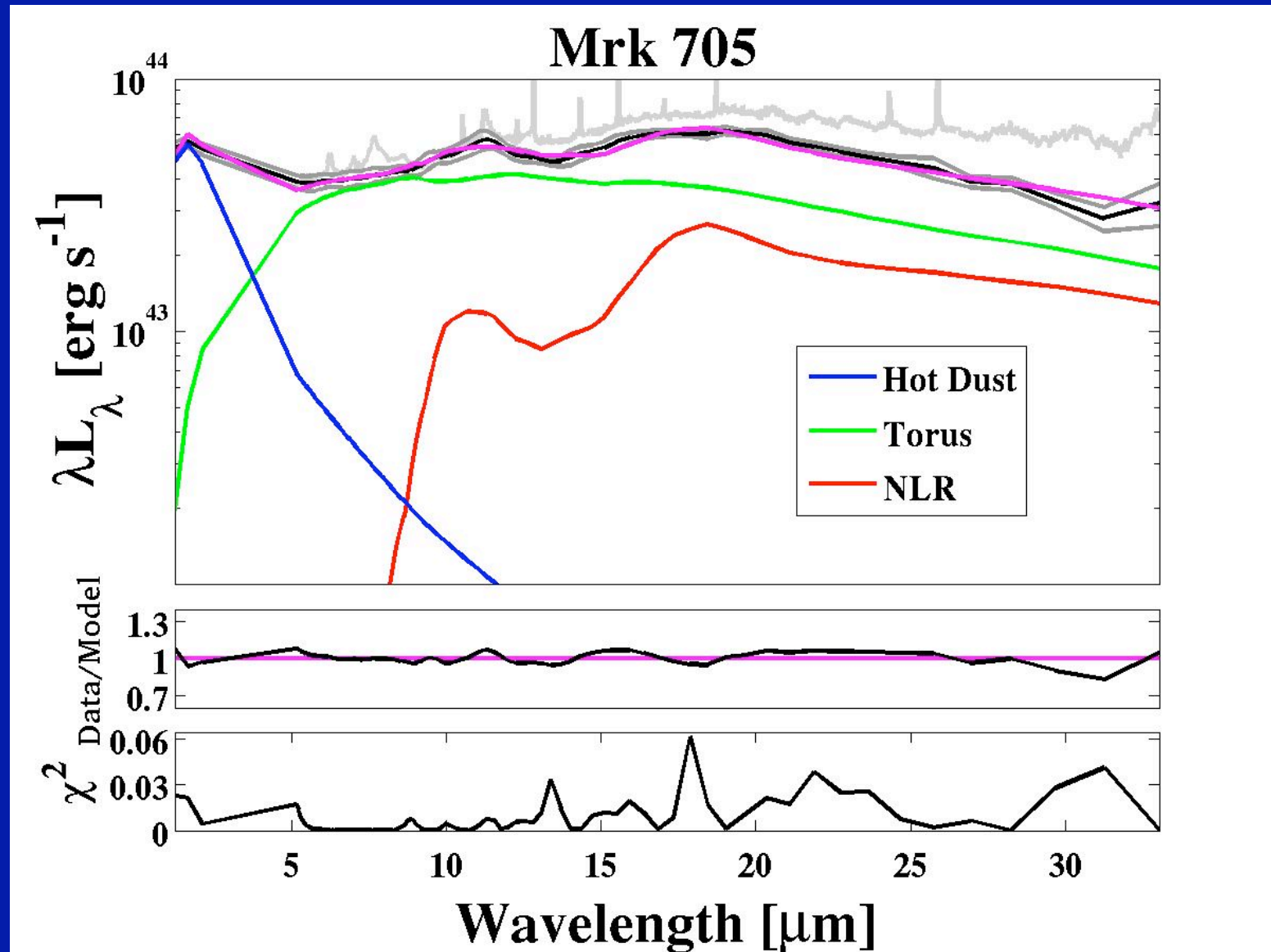
Graphite-only dust grains:
higher T_{sub} , closer
location

$$\text{Log}(n) = \sim 9.5 \text{ Log}(N_{\text{H}}) \\ = \sim 23$$

Free parameters:

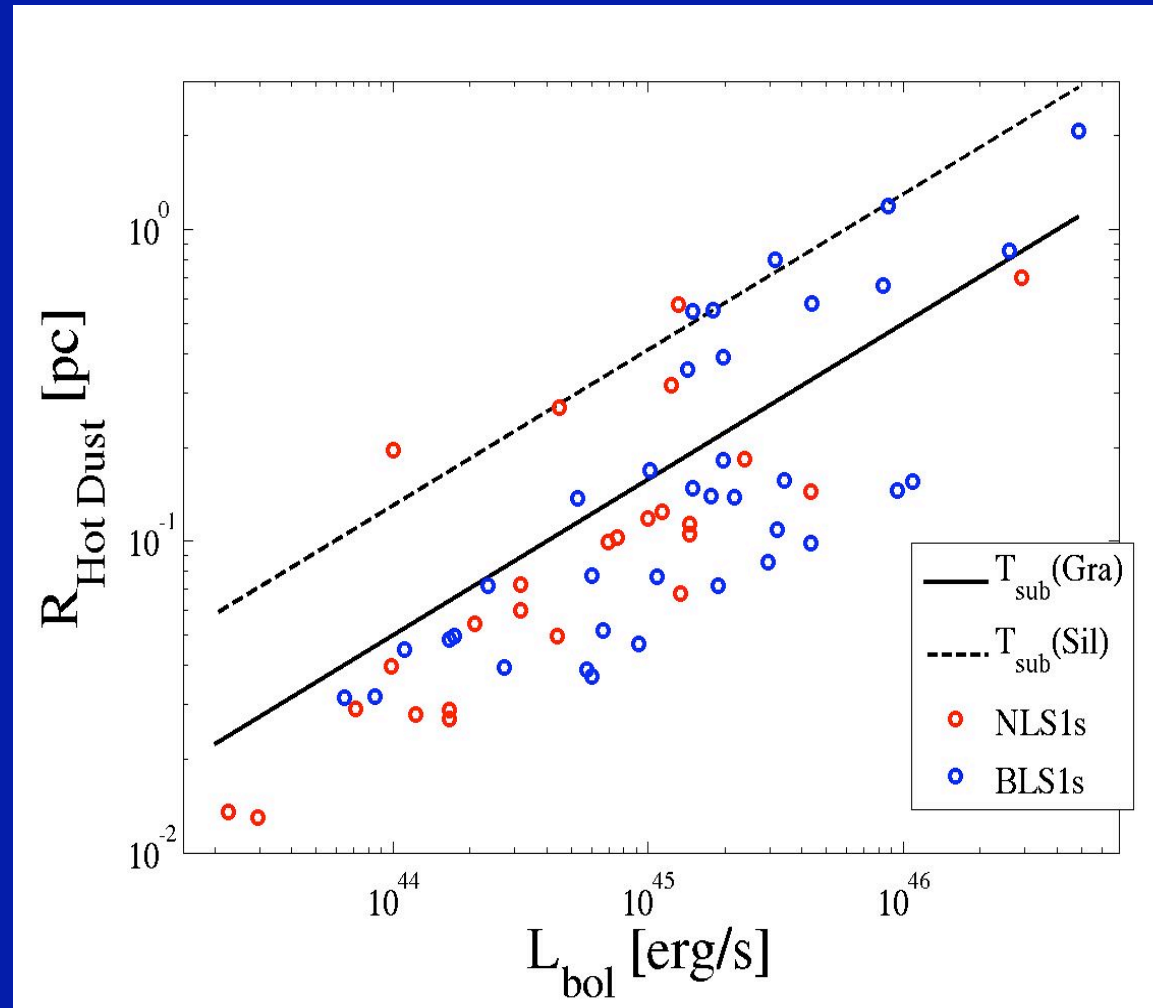
Temperature & Covering

Decomposing the NIR+MIR AGN SED



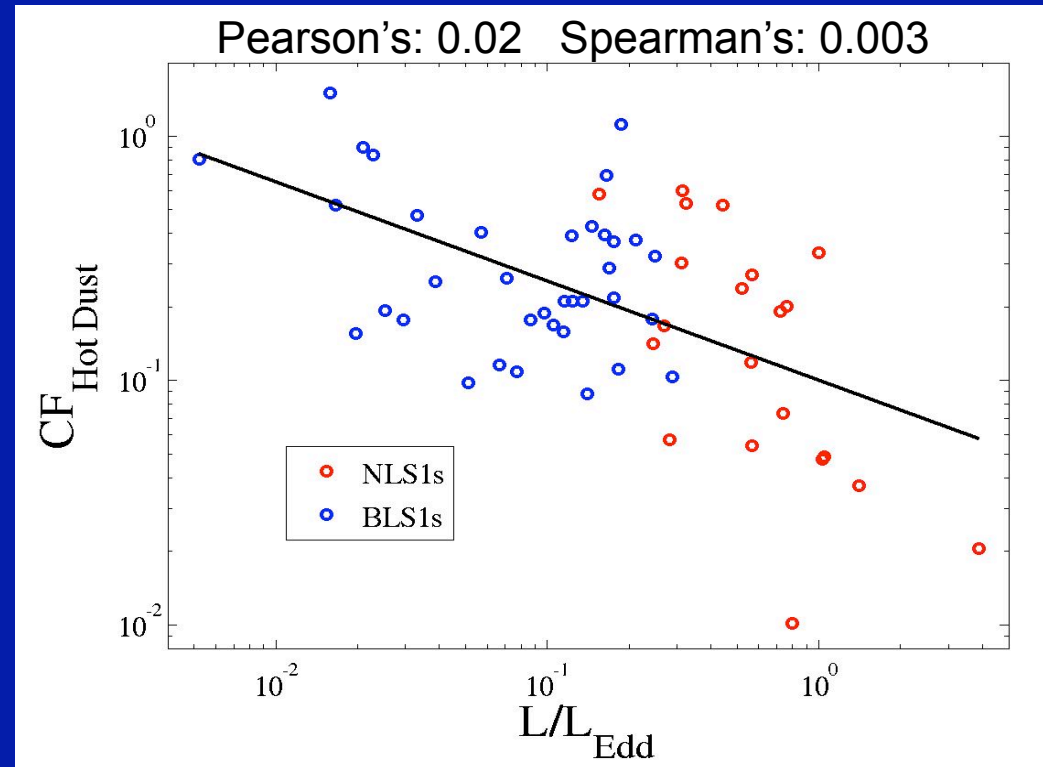
Location of the Hot Dust

- Same for NLS1s and BLS1s
- Just outside the BLR, Inner edge of the torus
- Slope ~ 0.54



Hot Dust – Covering Factor

- Definition: $CF = \frac{L_{HD}}{L_{bol}}$
- Median ~20%
- Covering factor decreases with increasing L/L_{Edd}



- Consistent with results for the BLR:
CF(H_β) (Netzer+04) ; CF(CIV) (Baskin & Laor 05)

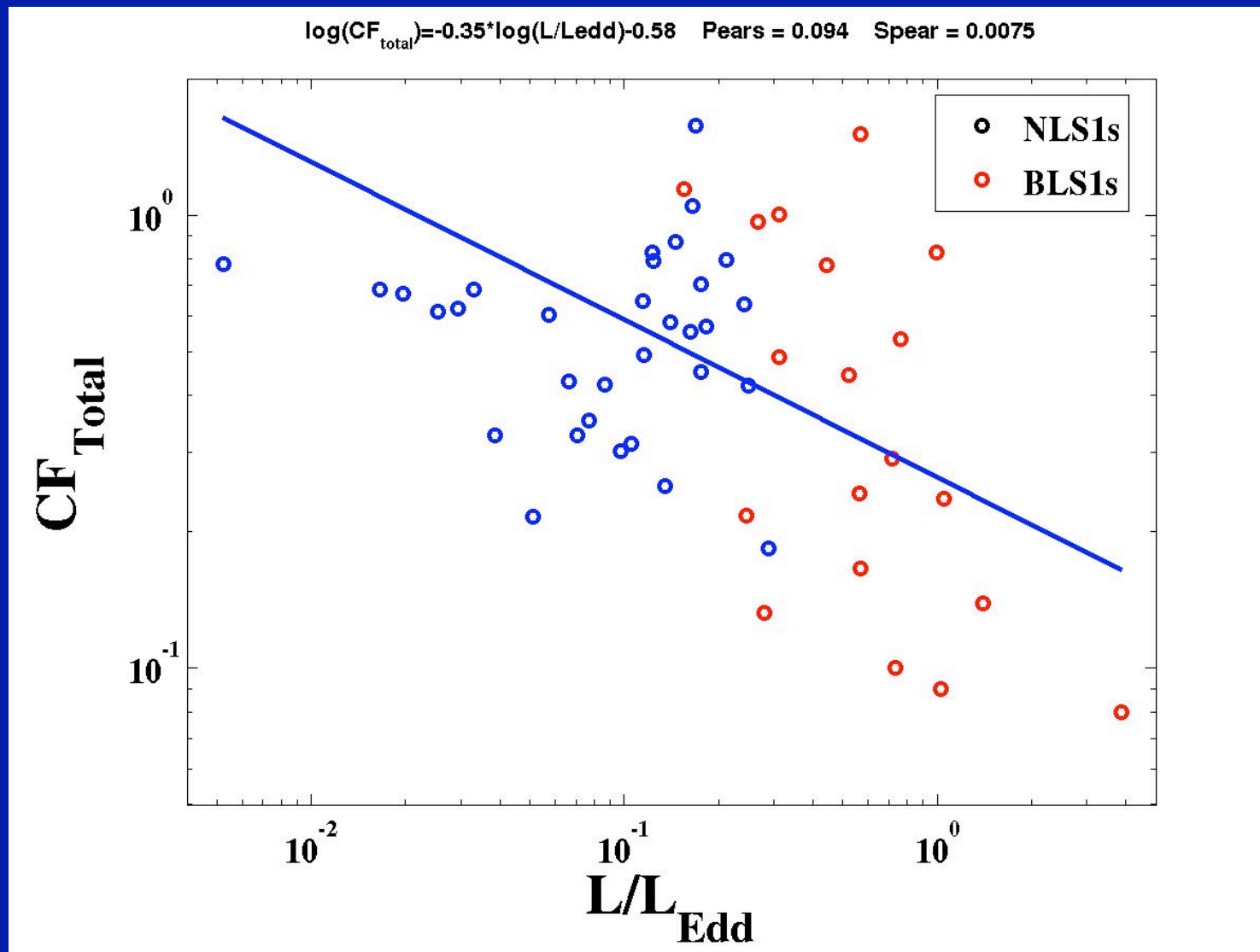
The hot **graphite** dust clouds may be the direct “dusty” extension of the BLR

Summary

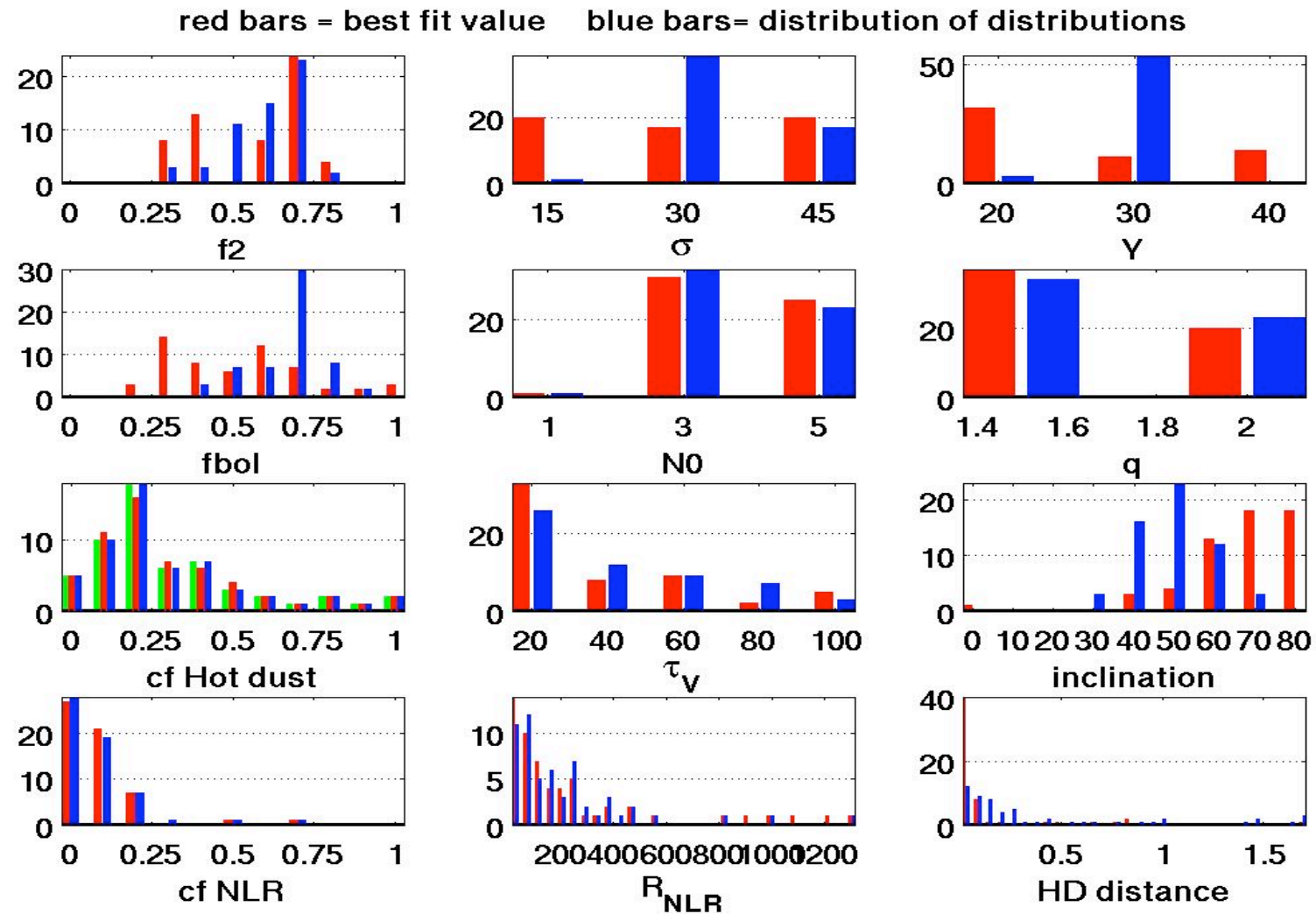
- NLS1s often exhibit SB dominated MIR SED
- Intrinsic AGN SED – warm dust peaks at $\sim 20 \mu\text{m}$
- NLS1s may harbor colder (AGN) dust than BLS1s
- The covering factor of the hot dust decreases with increasing L/L_{Edd}
- Graphite-only hot dust may be the direct extension of the BLR
- The accretion rate $\left(L/L_{Edd}\right)$ may link between SF in the host and the dusty structure around the BH

Thank You!

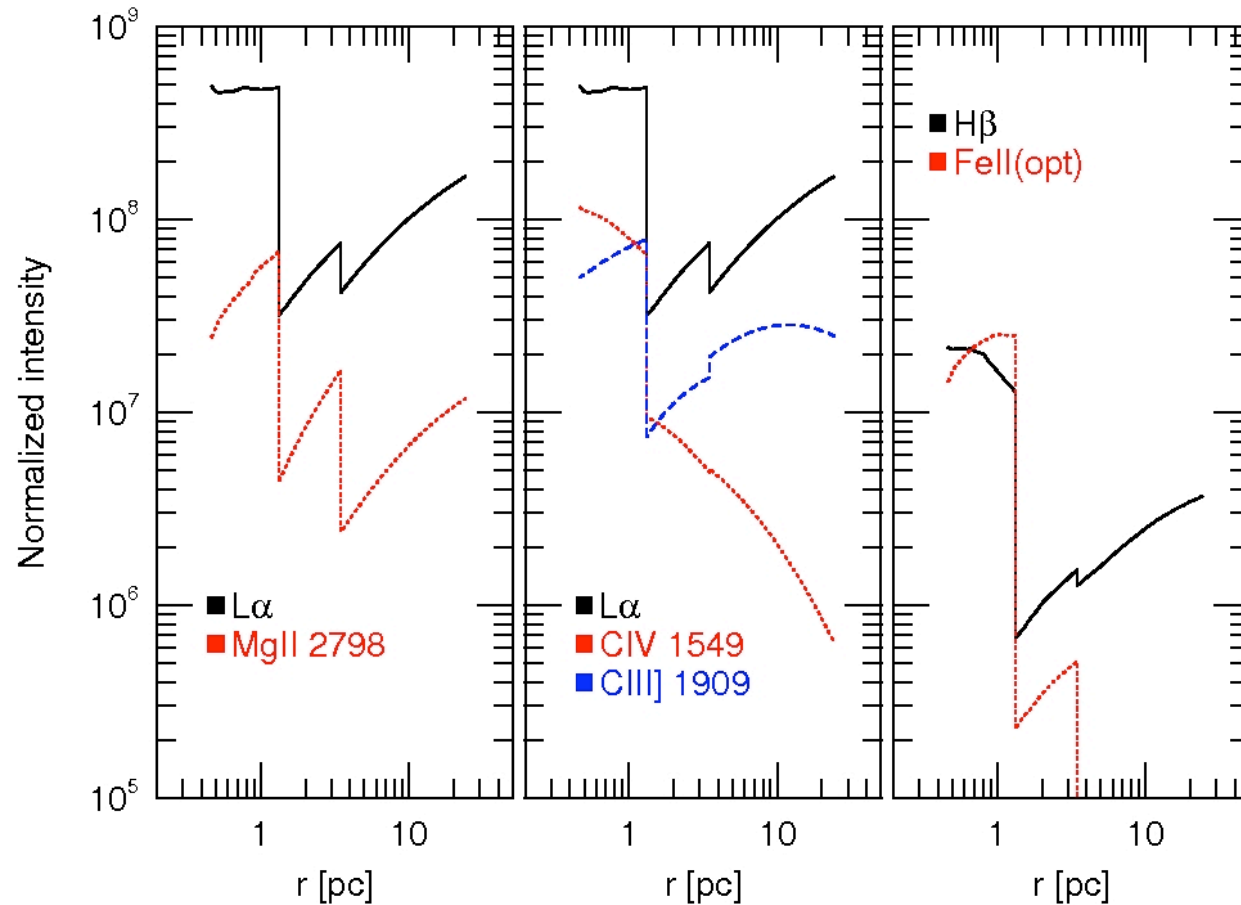
Total covering factor



Distributions of different parameters



Extended BLR – Line Intensities



Back
to CF