

New insights on nuclei of galaxies
from high angular resolution mid-
infrared observations

高空間分解中間赤外線観測で拓か
れる近傍銀河中心核の研究

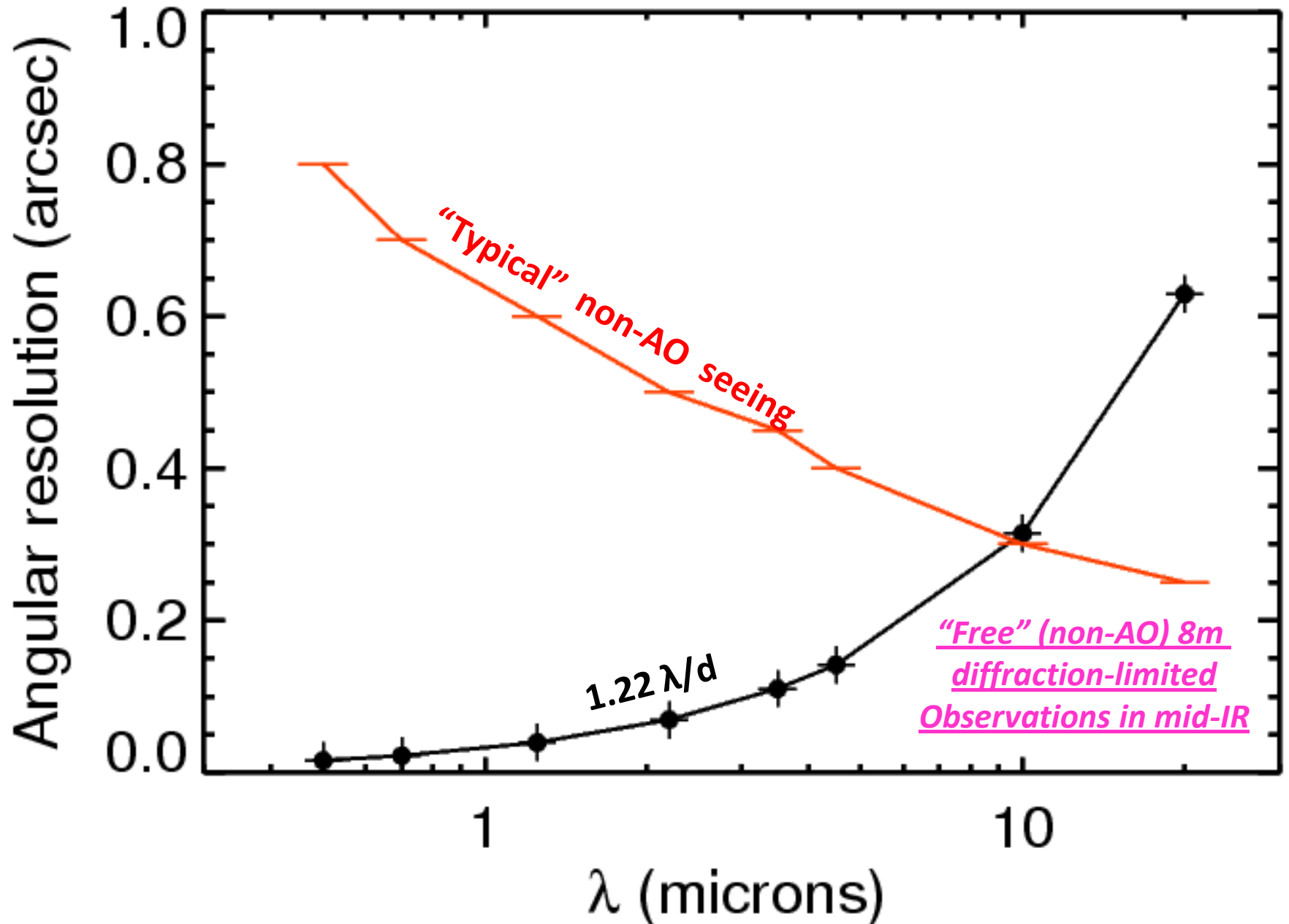
Poshak Gandhi (ガンディ ポシヤク)

RIKEN 理研

国際特別研究員



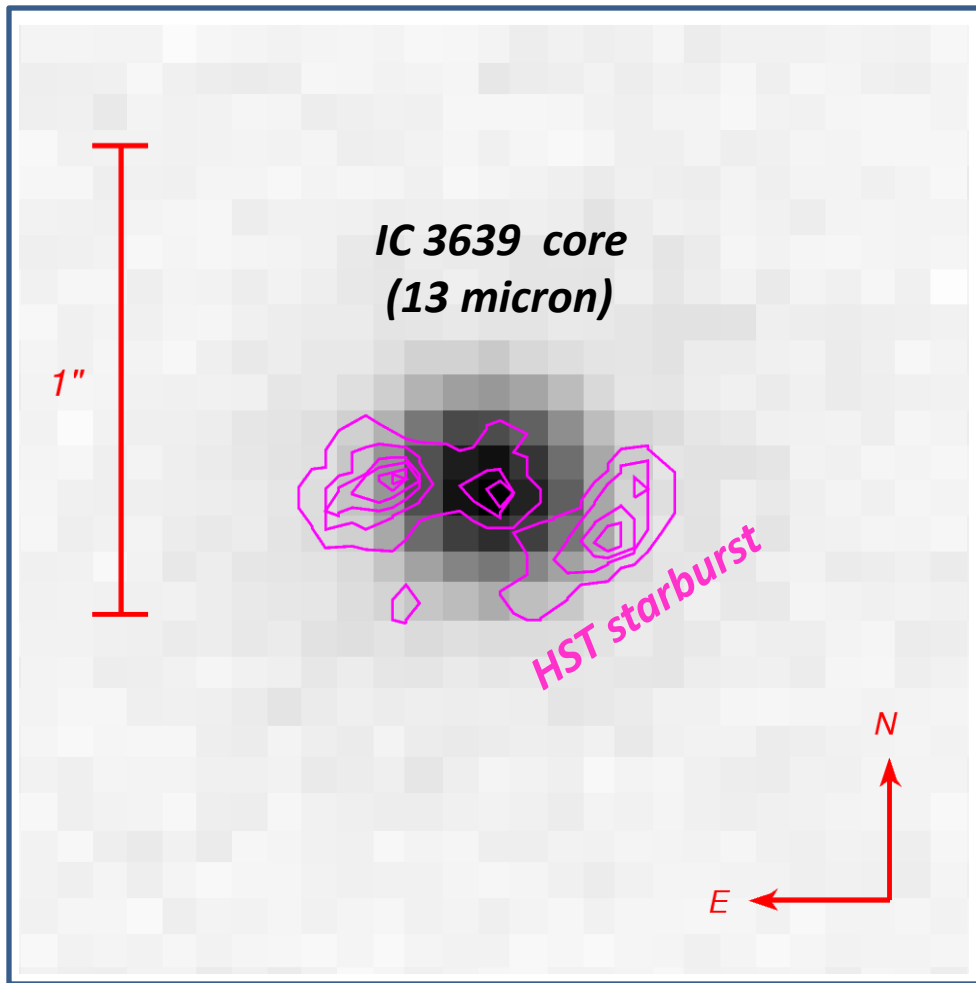
Ground telescope (8m) angular resolution



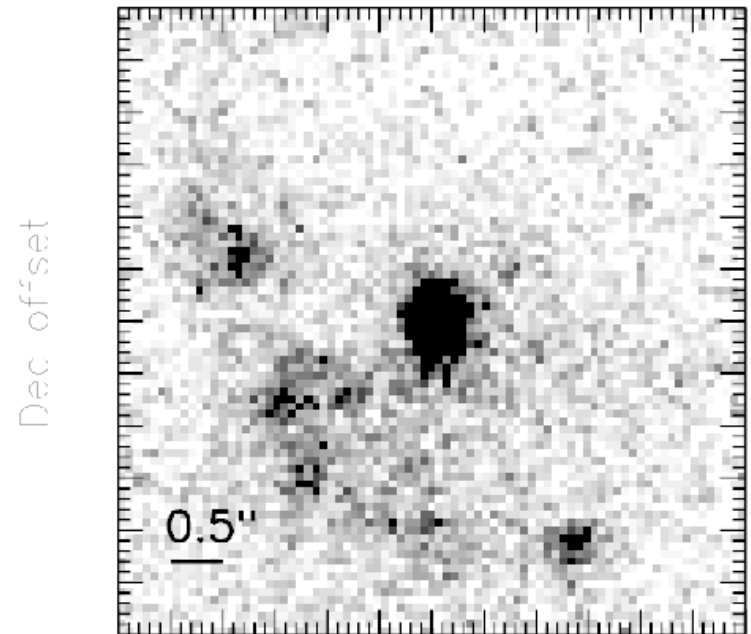
Local Seyfert survey

近傍セイファート銀河サーベイ

(Collaboration: D. Asmus, W.J. Duschl, P. Gandhi, S. F. Hönig, H. Horst, A. Smette)



VISIR/VLT:
Gandhi+2009, Horst+09+08+06

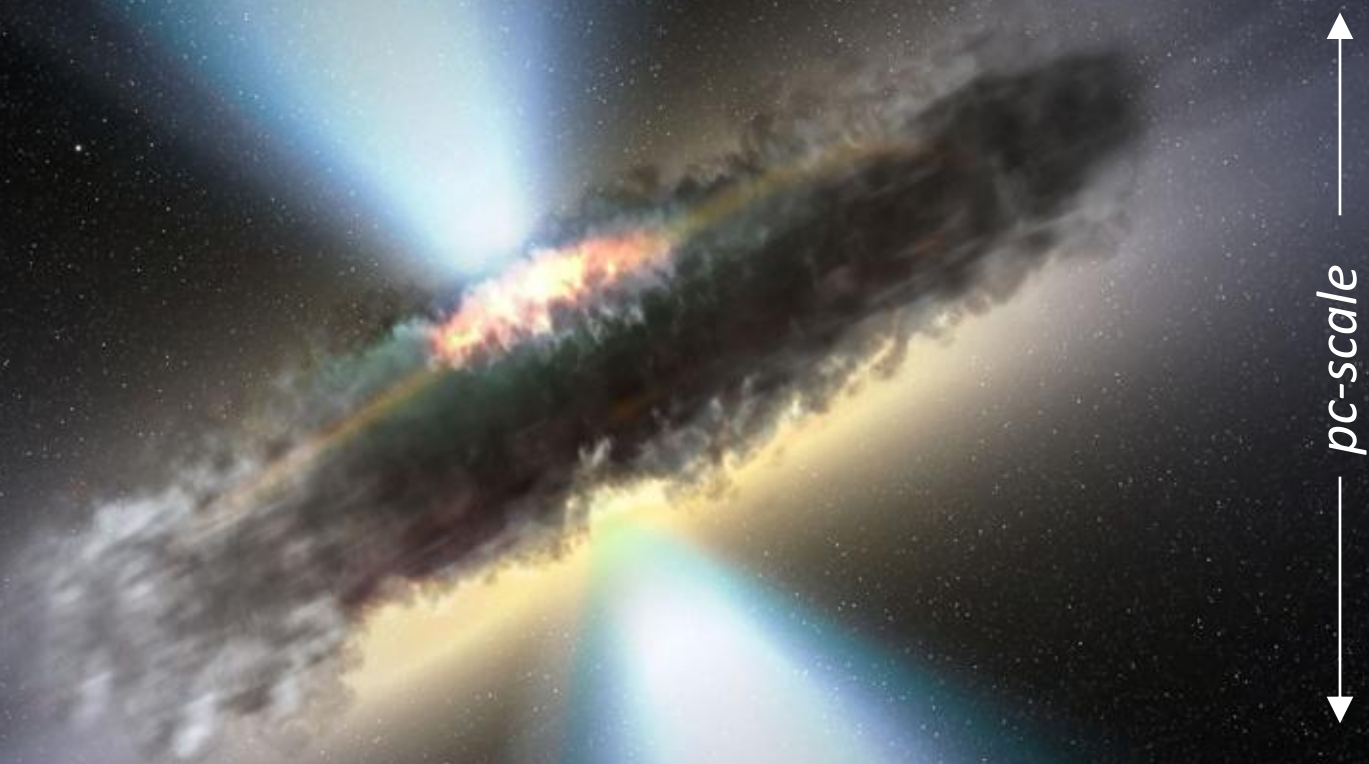


NGC 5135
(13 micron)

Mid-IR resolution better than any current or planned space mission!

Unified AGN schematic picture

AGN 統一モデル



Dusty torus clouds absorb and thermalize intrinsic AGN emission
=> **Observed Infrared** \propto **Intrinsic emission** (e.g. **X-rays**)

Mid-IR/X-ray relation for local Seyferts

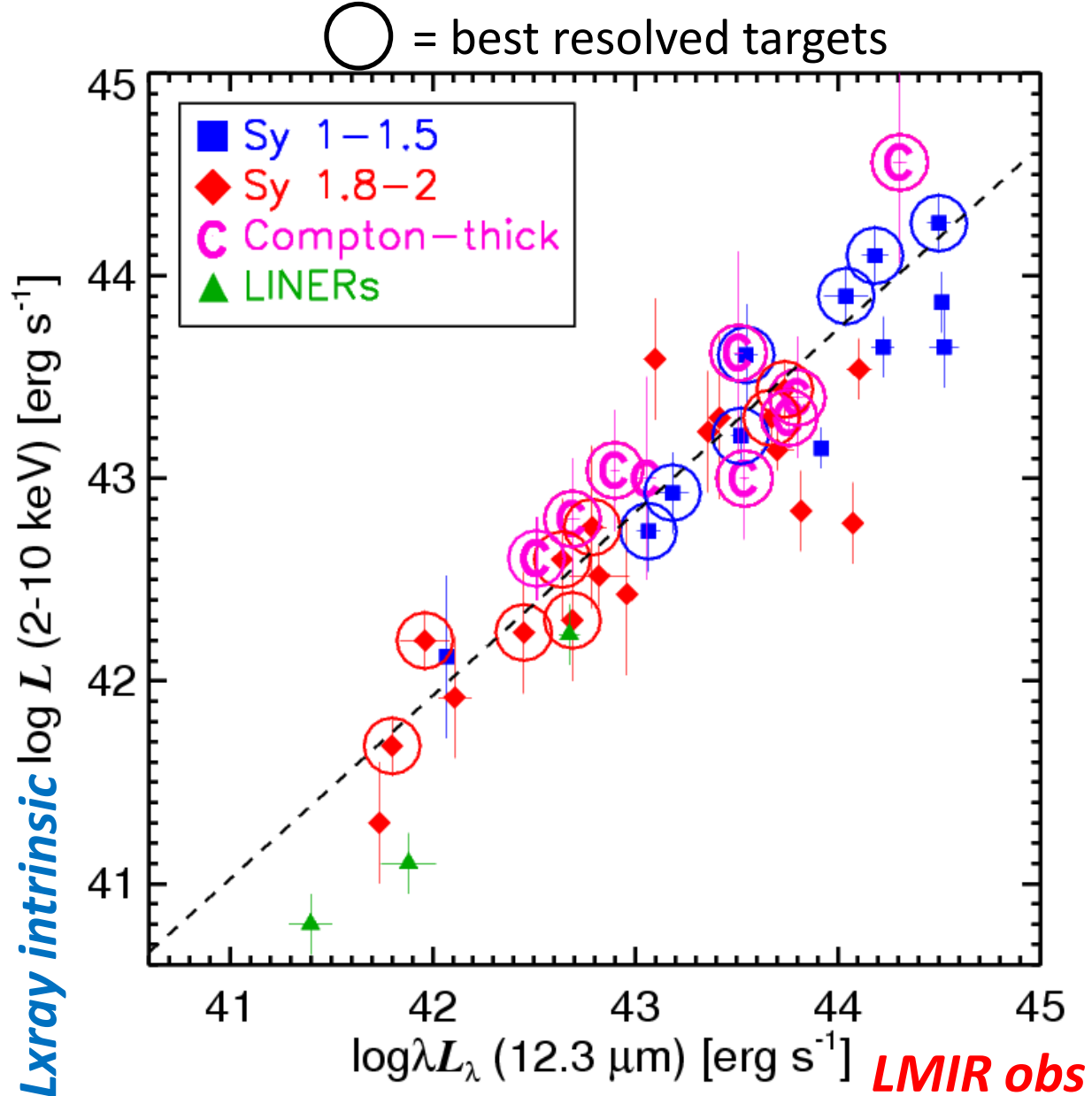
VISIR/VLT:

Gandhi+09, Horst+2008

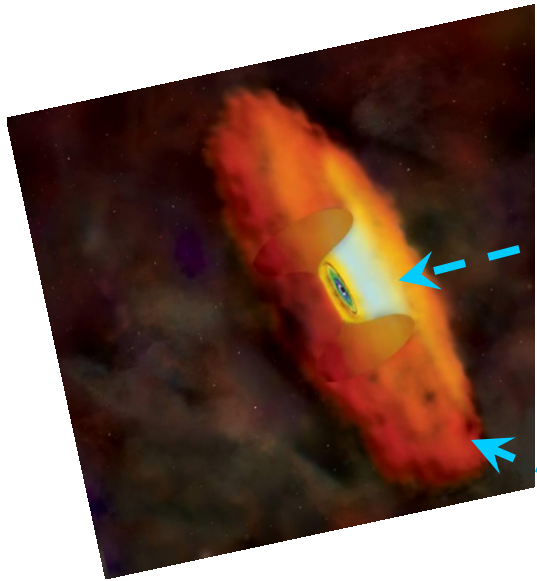


Results:

- Small dispersion in L_X/L_{IR} relation
- Type 1 and Type 2 follow same relation



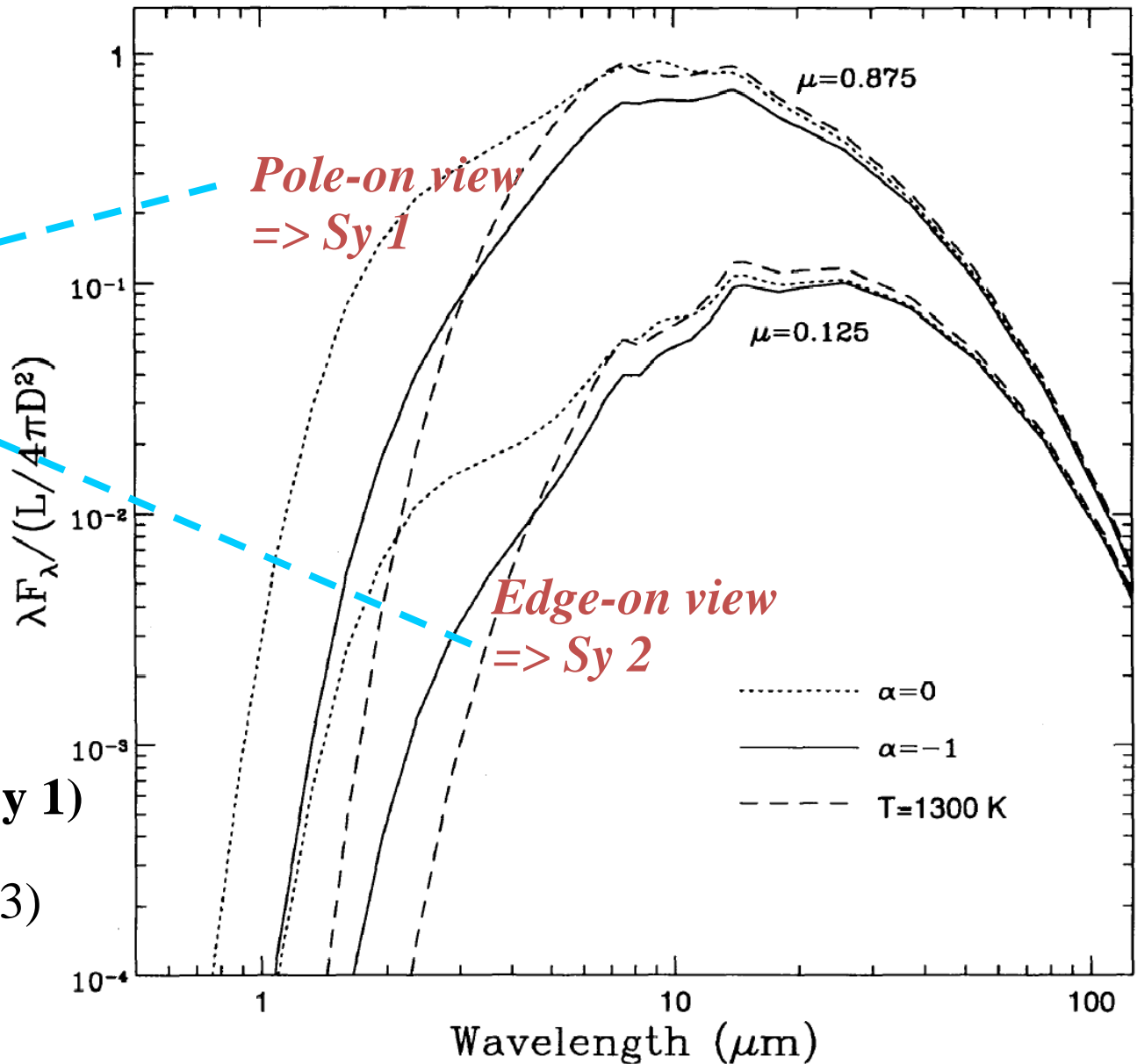
Mid-IR difference between obscured / unobscured AGN 一般的なスムーズダスティートーラスモデル



Usual Models :

Same $L_{X\text{-ray}} \Rightarrow$
 $L_{\text{MIR}} (\text{Sy 2}) \ll L_{\text{MIR}} (\text{Sy 1})$

(e.g., Pier & Krolik '93)



Mid-IR/X-ray relation for local Seyferts

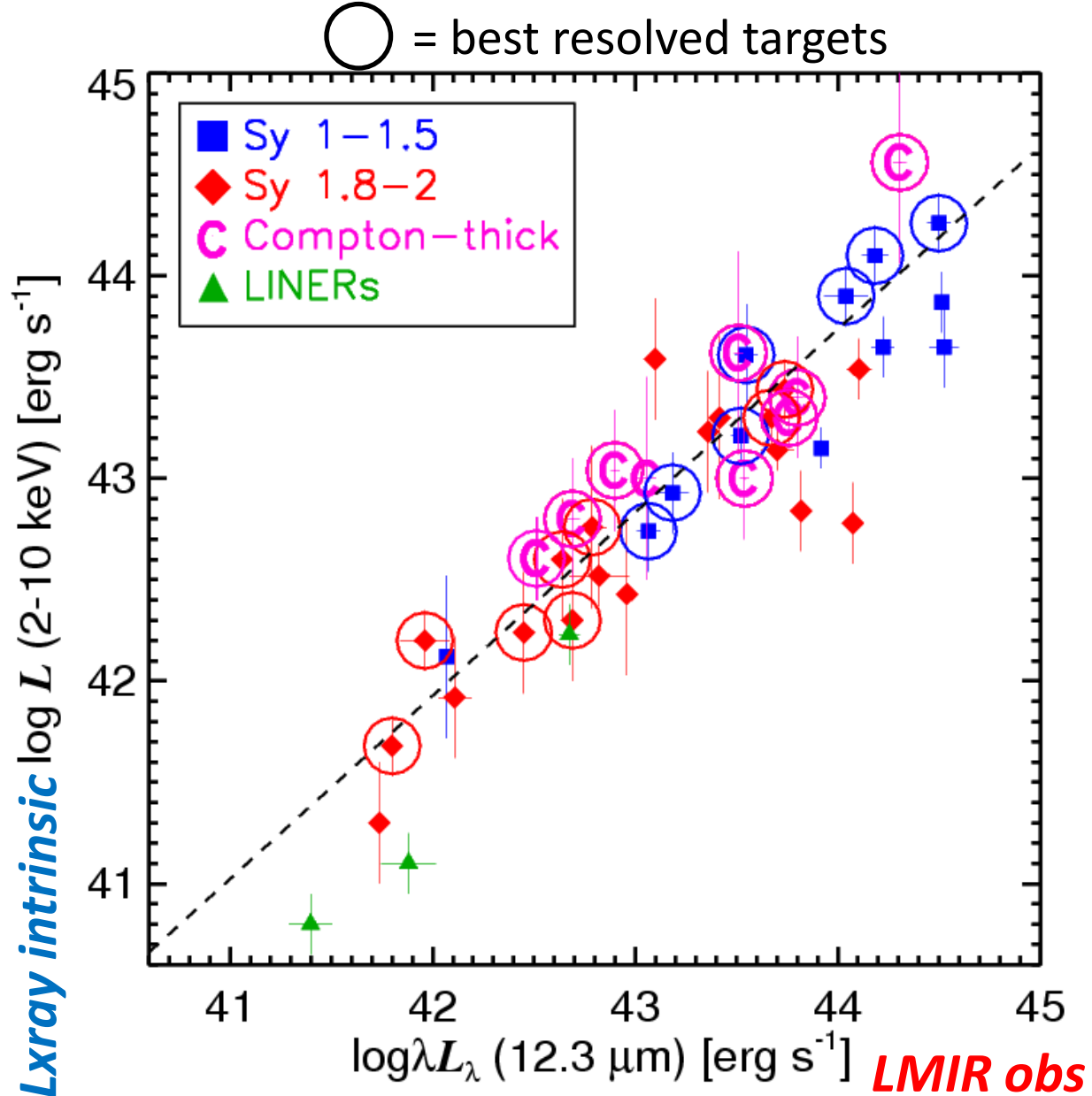
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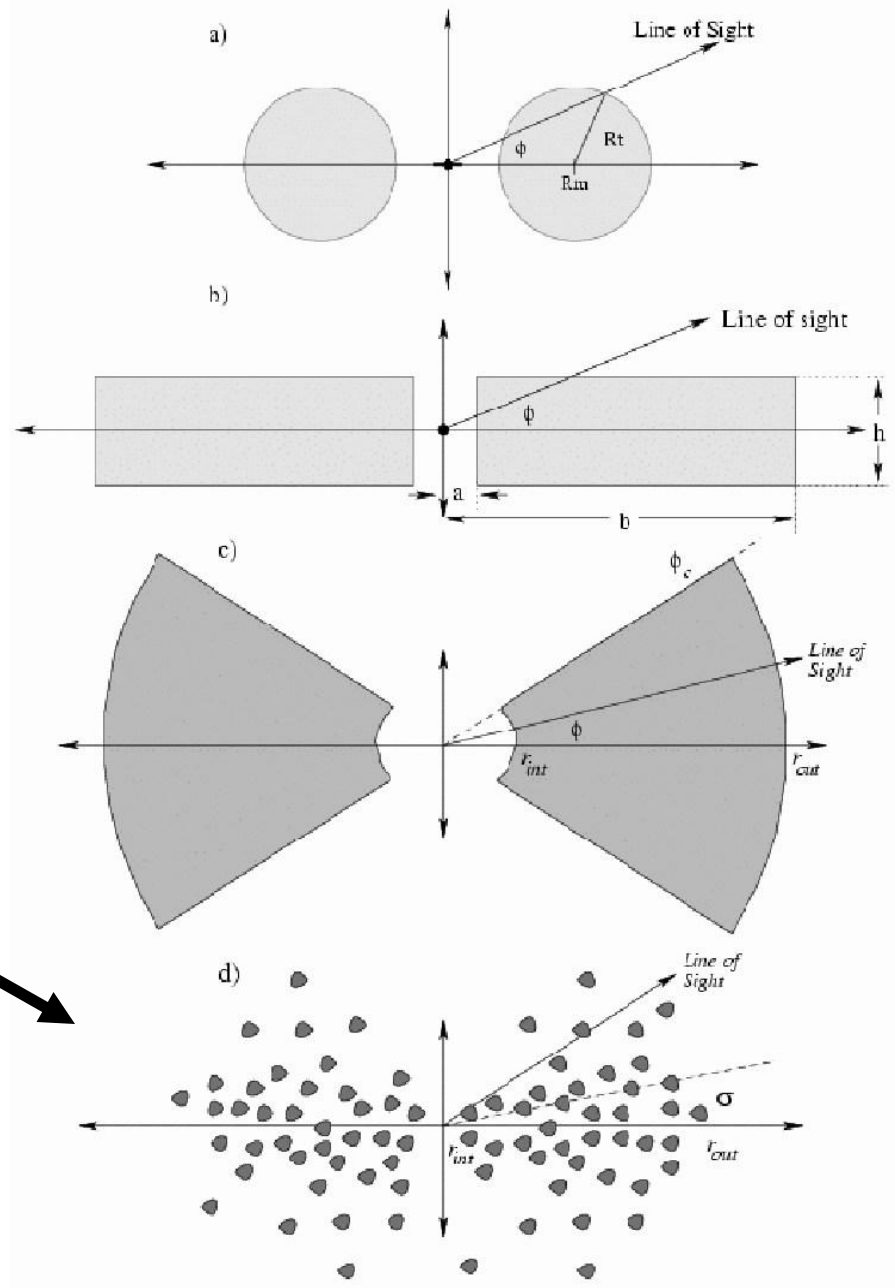


Torus Models トーラス モデル

Clumpy torus models

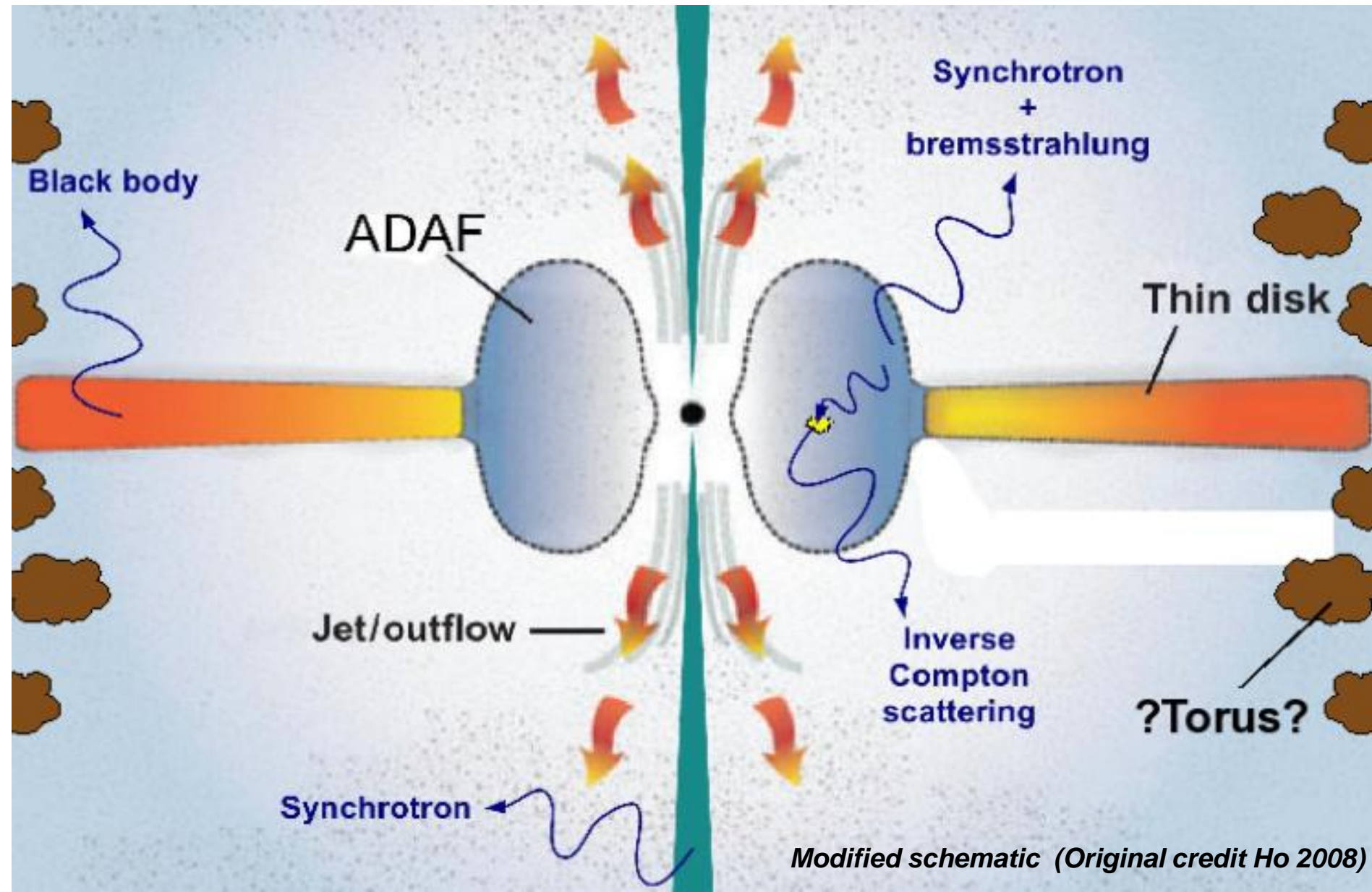
Decreased effective
IR optical depth
towards centre.

(e.g., Hoenig et al. 2006,
Nenkova et al. 2008)



Picture from : Ibar & Lira (2006)

Study low-luminosity AGN: will they show MIR or X-ray excess, deficit or agree with Seyfert relation?



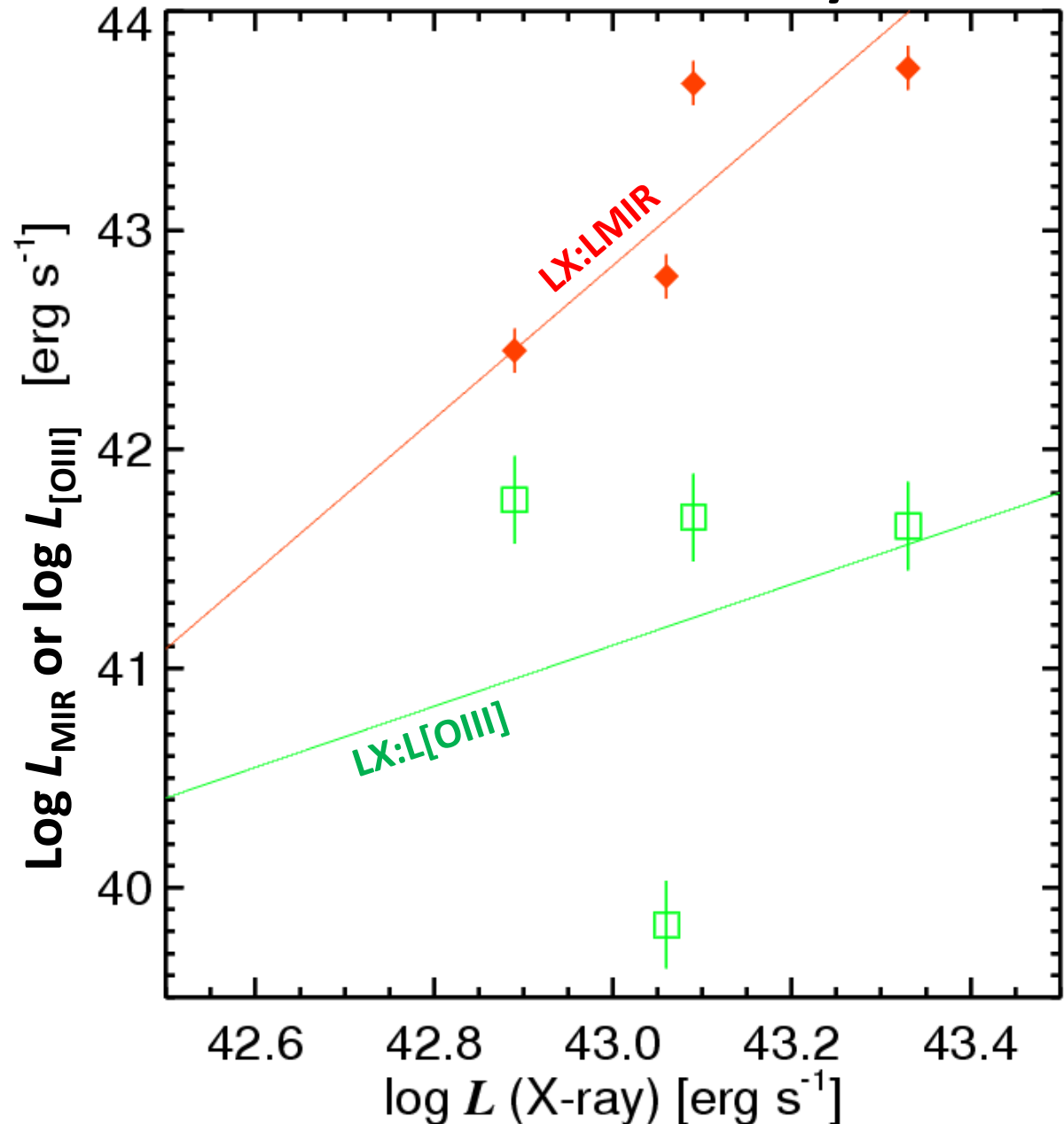
Mid-IR/X-ray relation for local Seyferts

Results:

- Mid-IR best way to probe very highly obscured AGN:
 - Compton-thick
 - “Buried” AGN

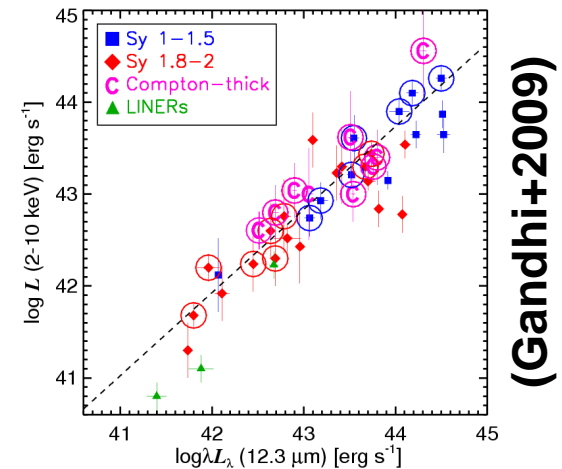
Comparison with ***buried***
AGN sources from
Noguchi et al. (2009) and
Ueda et al. (2007) =>

small dispersion for
LX:LMIR, as compared to
LX:L[OIII]



Summary (まとめ)

- X-ray + high resolution Mid-IR observations => new insight on AGN accretion physics



- Mid-infrared instruments on 8m telescopes give “cheap” access to diffraction-limited obs., better than any current or near-future space mission, and their continued operation is thus vital.

ありがとうございました