AO面分光　で探る
（とか）
原始銀河内部構造の進化

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すばる次世代AOワークショップ　9 Sep. 2011

IPMU INSTITUTE FOR THE PHYSICS AND MATHEMATICS OF THE UNIVERSE

SuMIRe project

Thanks for the contributions

- Science cases:
  - K.Shimasaku, M.Ouchi, H.Sugai, K.Matsubayashi, Y.Matsuda, et al.
- Kyoto 3DII:
  - H.Sugai, A.Shimono, K.Matsubayashi et al.
- Instrumental issues - general:
  - S.Ozaki, et al.

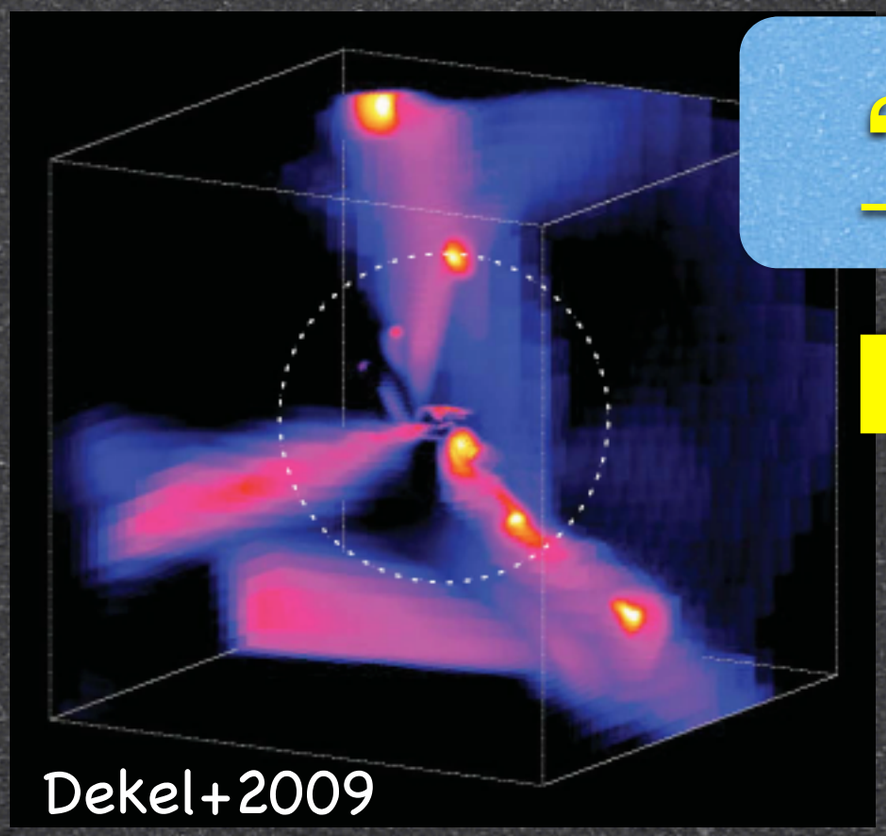
Contents

- Probing the “protogalaxies”
- Studies with Kyoto 3DII
- Demands for A0

Evolutin of protogalaxies

- Protogalaxies evolves through cold accretion, initial starbutst, and galaxy-scale outflow
- Details of “transission” is unknown

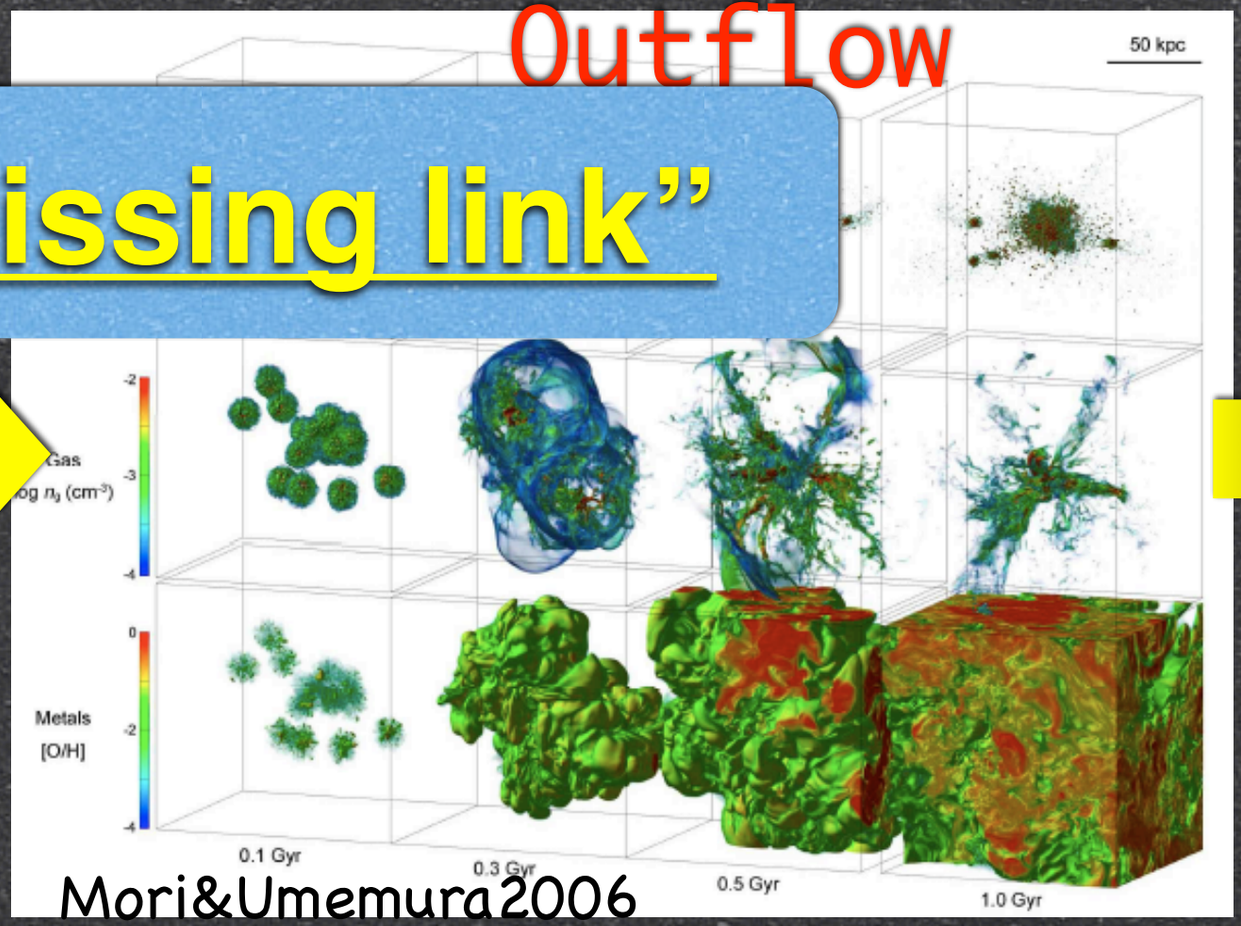
Accretion



Dekel+2009

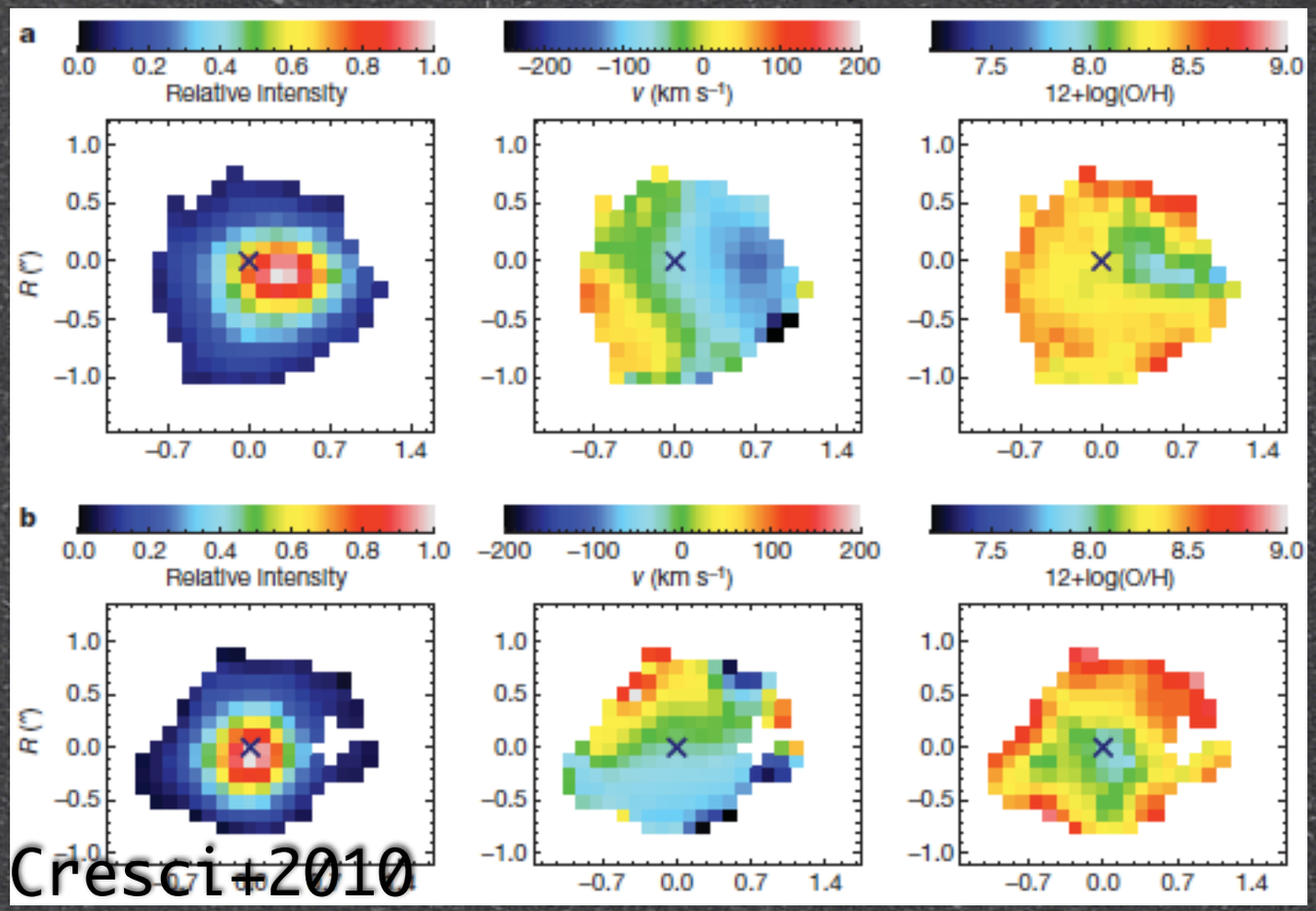
“Missing link”

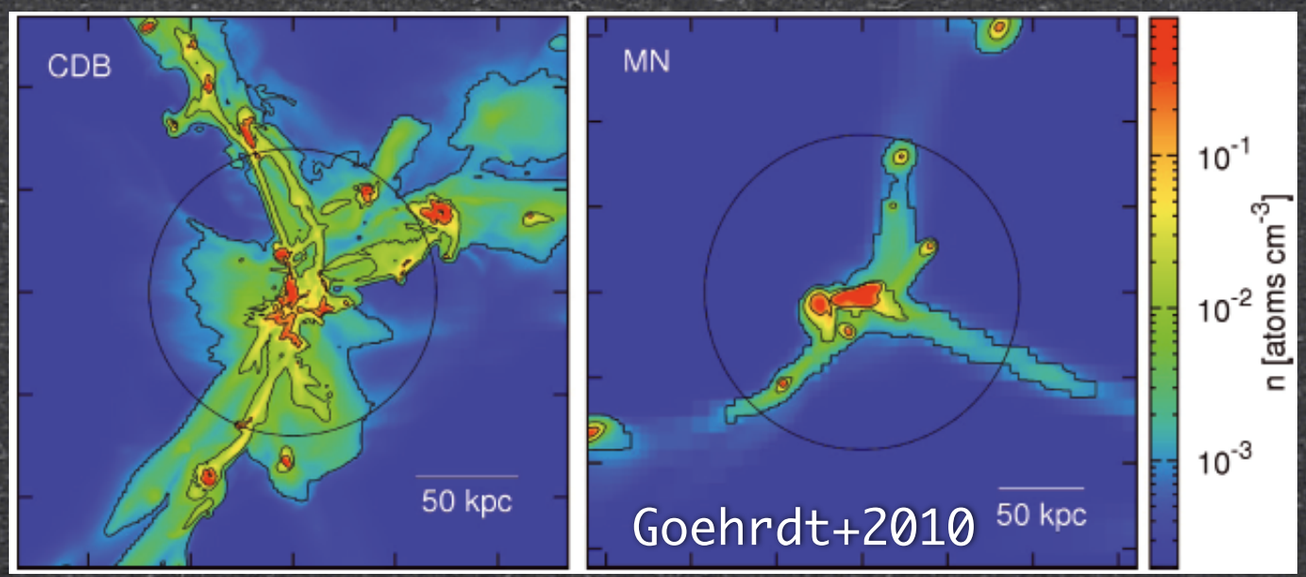
Outflow



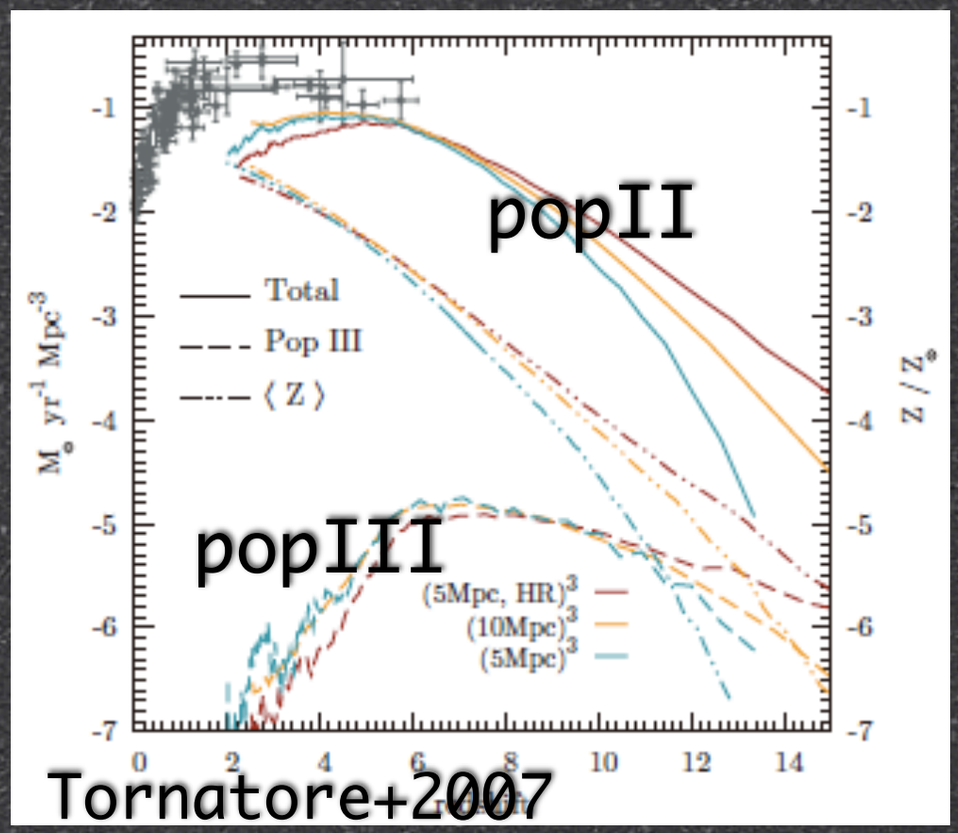
Mori&Umemura2006

Probing the initial phases w/ Lyα





- Cold accretion can be traced with extended Lyα emission
- PopIII can survive down to z~2-3



すばる+可視AOの重要性

–「原始銀河」(追観測) の観点より–

もちろん近赤も大事

サーベイはまた別

- 8-10mによるTMTへの準備研究:
  - surface dimming の効果 → z < 5-6? 7？
  - とはいえ遠方に行きたい → z > 2-3?
  - Lyα輝線が最も観測しやすい → 可視域
    (可能なら ~6000A を切りたい)
- 高空間分解能+波長情報 の必要性:
  - 形態と運動から物理的起源を知る → 高感度の面分光
  - 宇宙望遠鏡と比較できる解像度 → やっぱりAOは必要

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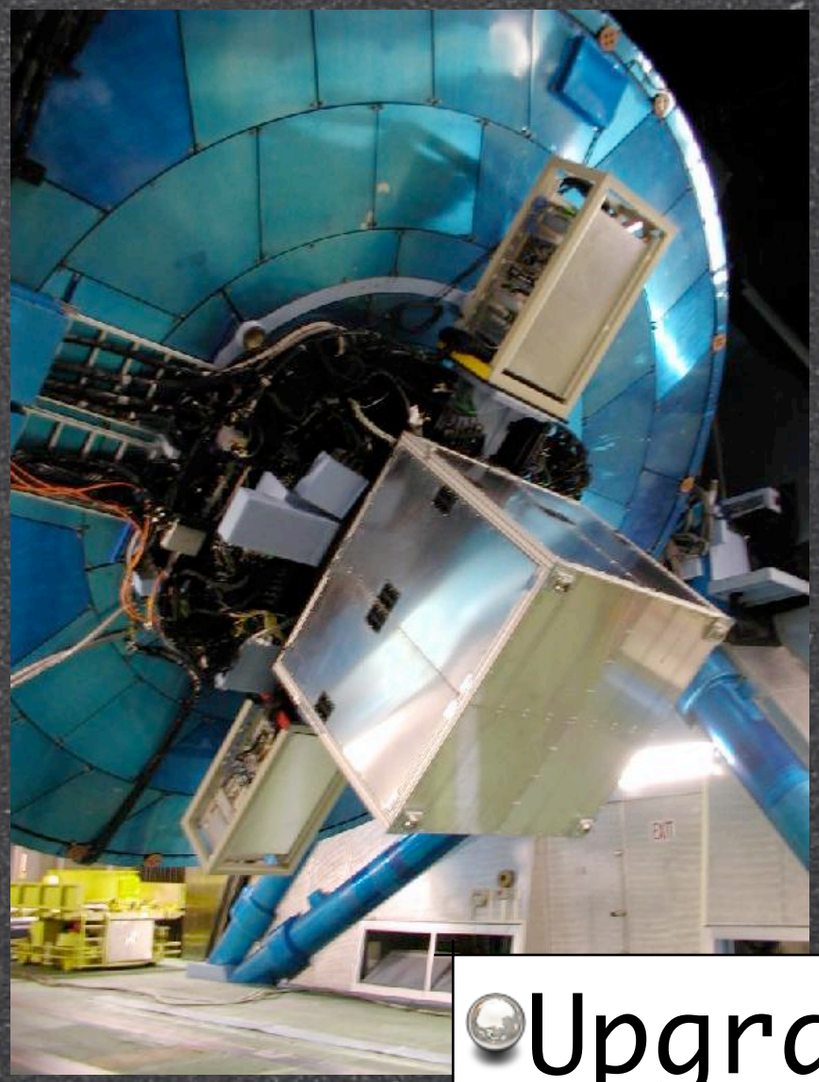
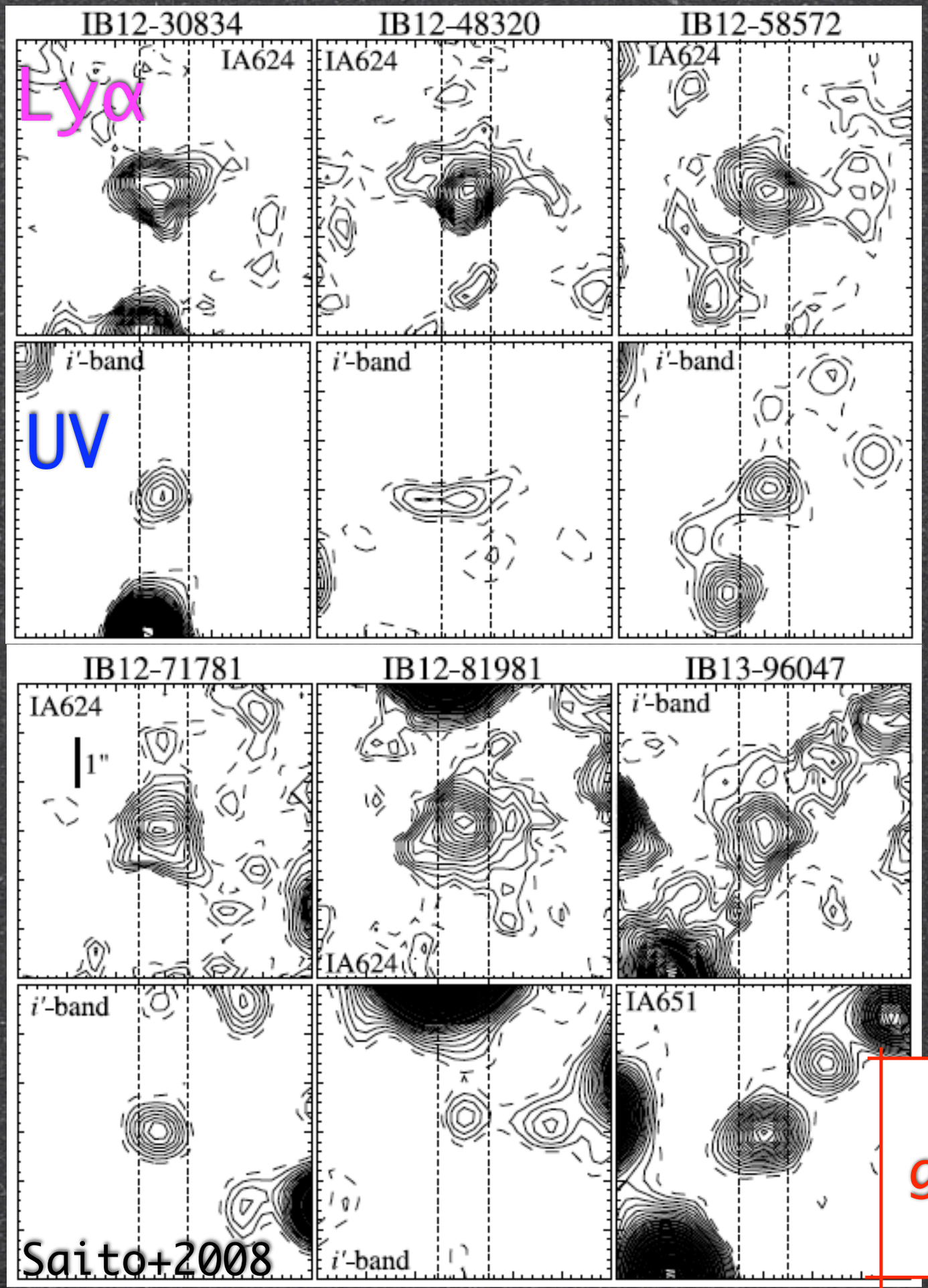
Works w/ Kyoto 3DII



- Upgraded coating
- Improved PSF w/ AO188
- HamamatsuCCD-ready
- etc.



The Sample

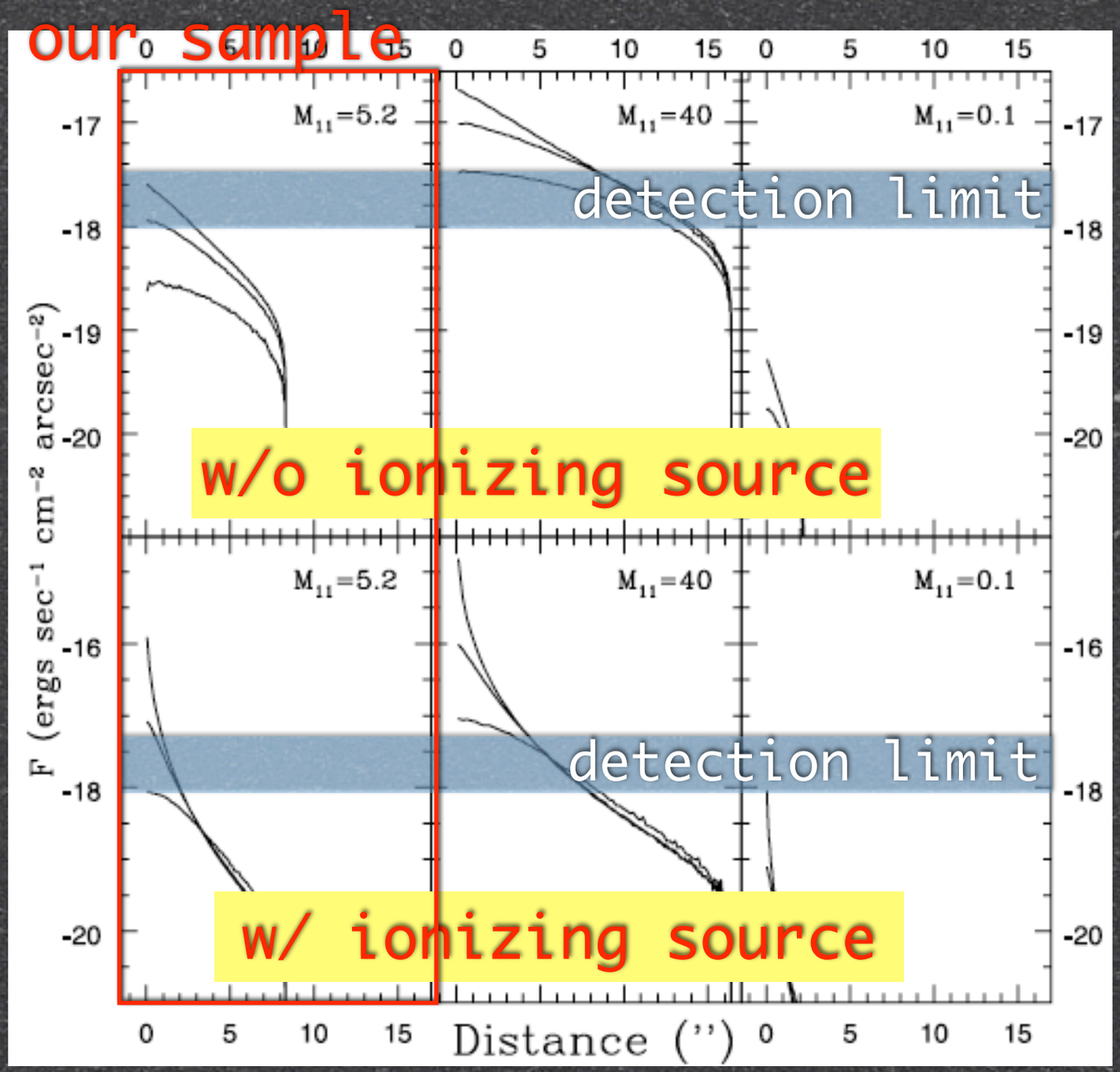
Medium-band selected Extended Lyα sources
- z~3-5
- Large EWs

- Photometric sample
  - 41 obj.
  - 21? obj. @ z>4.1
- Spectroscopic sample
  - 19 obj.
  - 8 obj. @ z>4.1

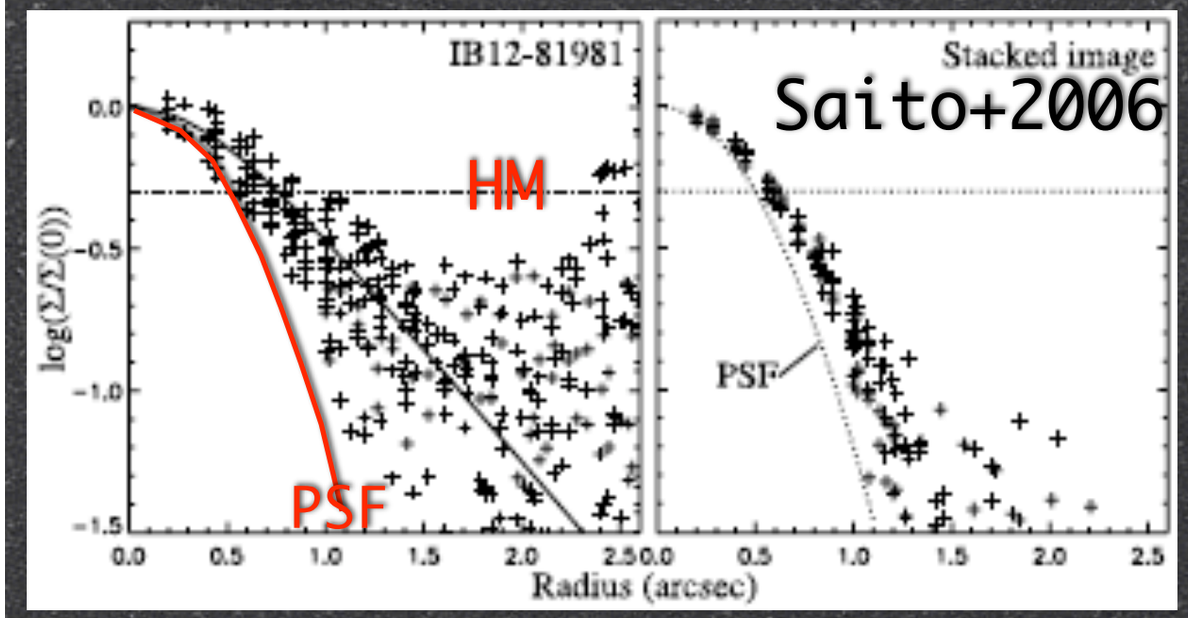
Can probe galaxy-IGM interaction in the very young galaxies

F-P imaging w/ natural seeing

- Surface brightness profile reflects the central activity
- Model fitting can predict the ionizing sources



Dijkstra+2006

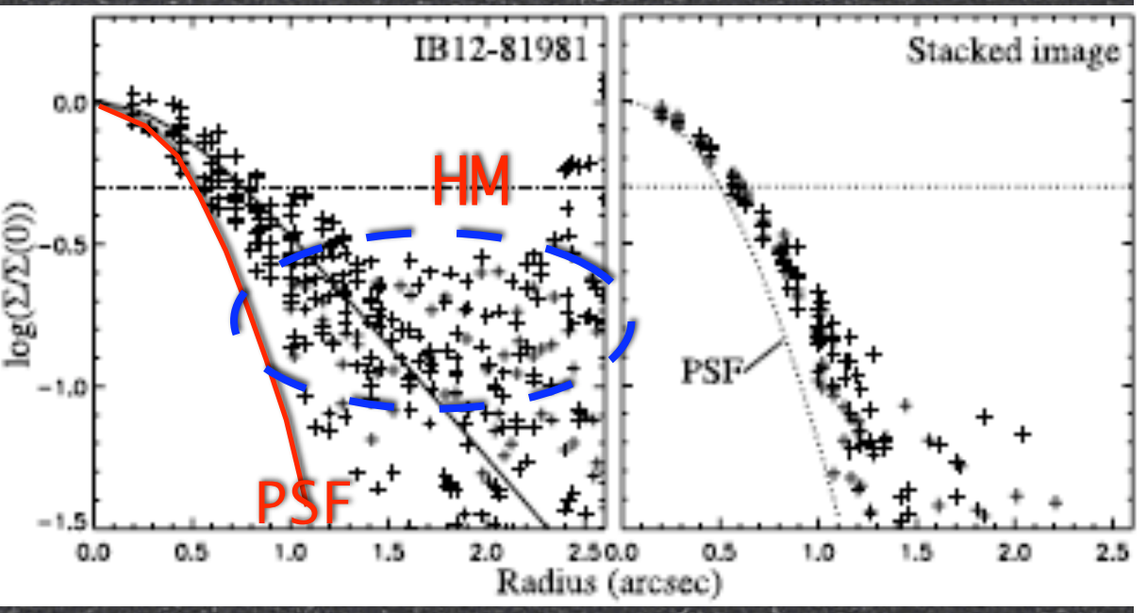


Saito+2006

Imaging of the diffuse outskirt!

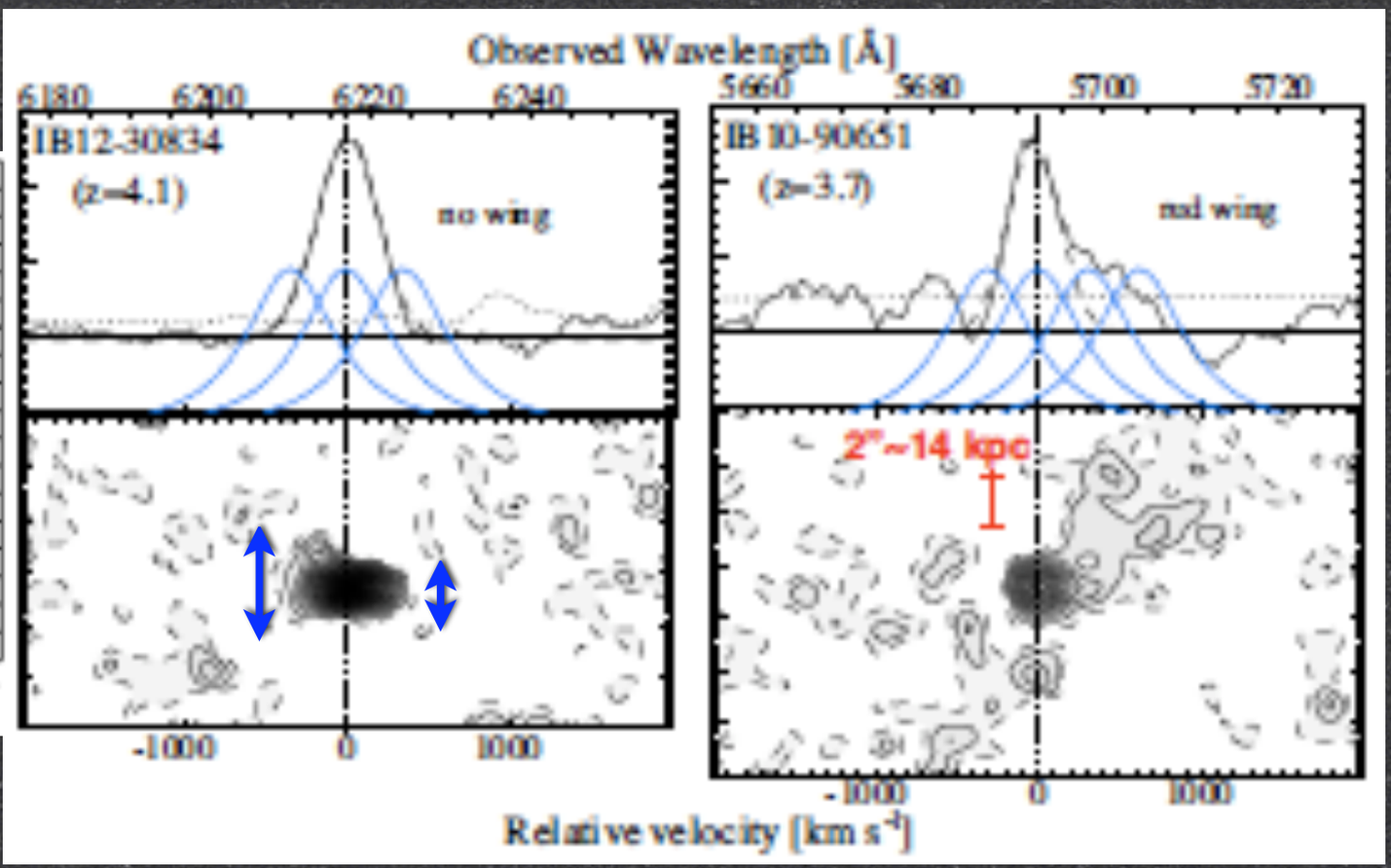
F-P imaging w/ natural seeing

- Deep imaging of diffuse emission on the both side of the Lyα line
- Morphology, velocity structure, etc.



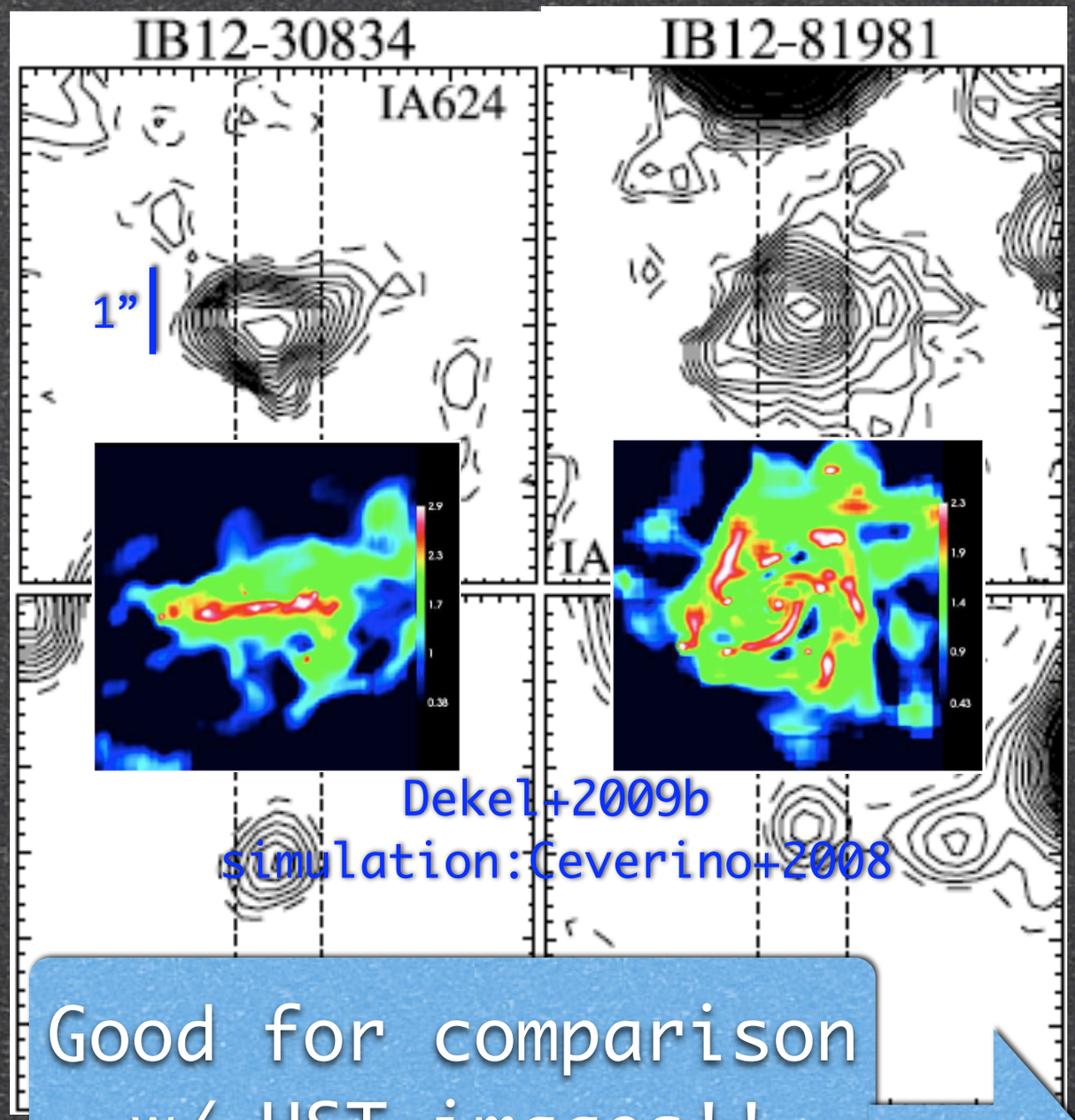
inflow-like
EW~360A
ΔV~411km/s
no wing

outflow-like
EW~870A
ΔV~560km/s
red wing



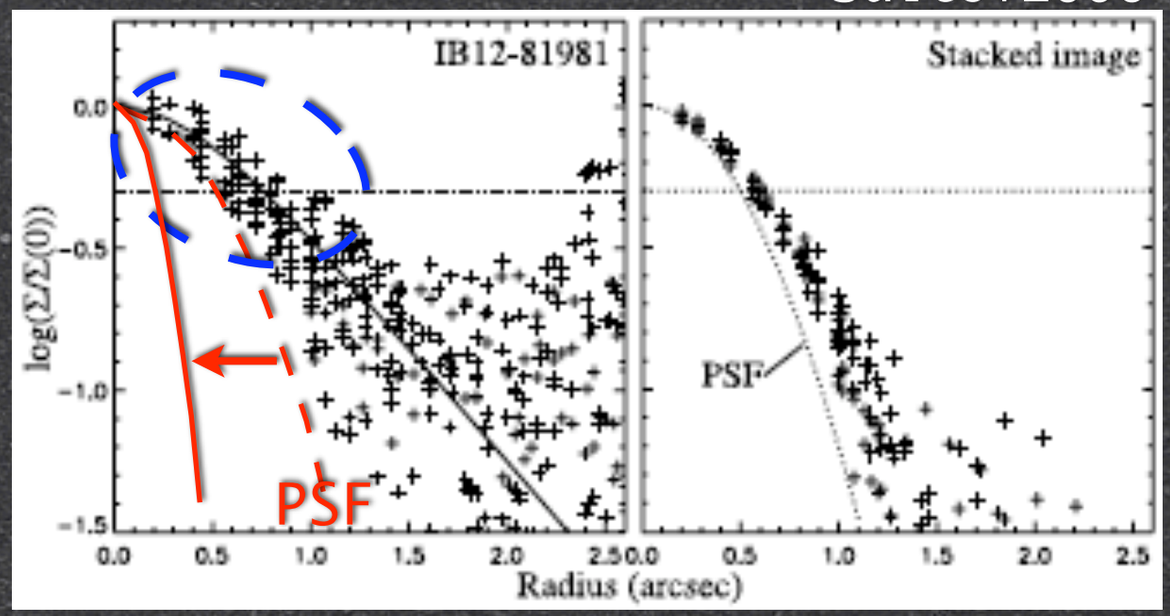
F-P imaging w/ improved PSF

Saito+2008



What’s happening inside the PSF??

Saito+2006



Good for comparison w/ HST images!!
PSF: 0.1-2 vs. 0.3

Detailed morphology w/ velocity fields

IFU spectroscopy of central regions

- Abovementioned studies at one time, if:
  - Sensitivity is sufficiently high (1σ ~ several 10^{-17} erg/s/cm^2/□” or so)
  - FoV is sufficiently wide (>several arcsec, or even wider)

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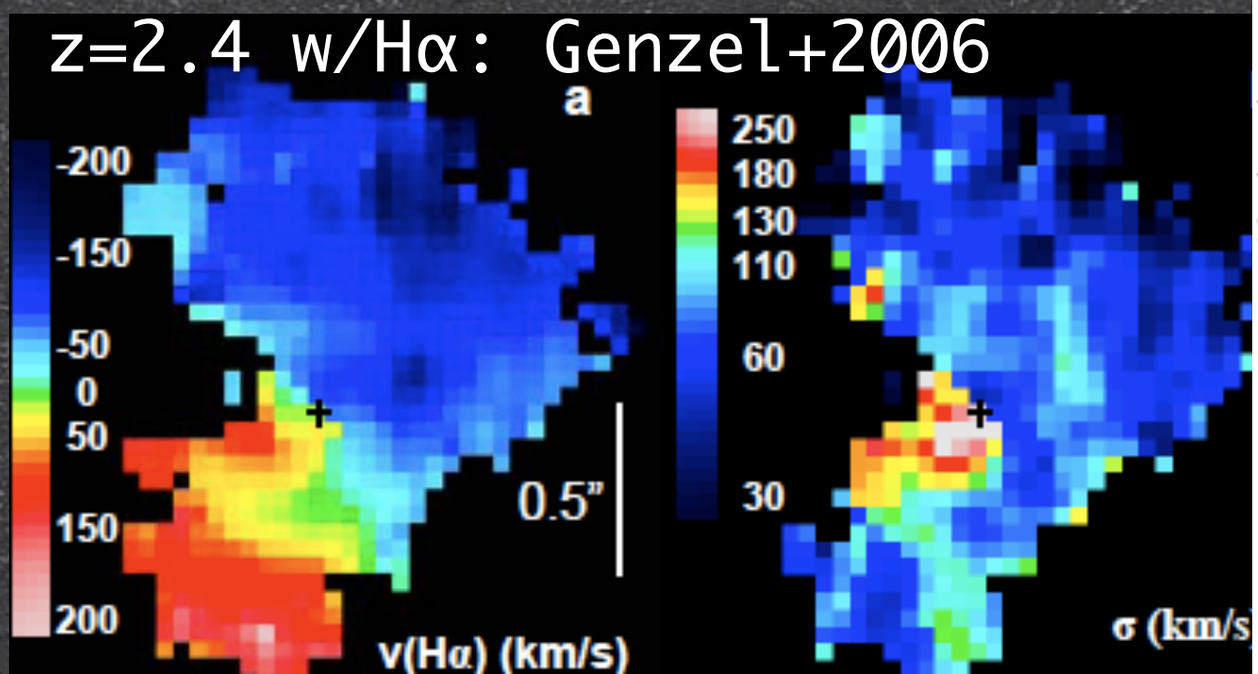
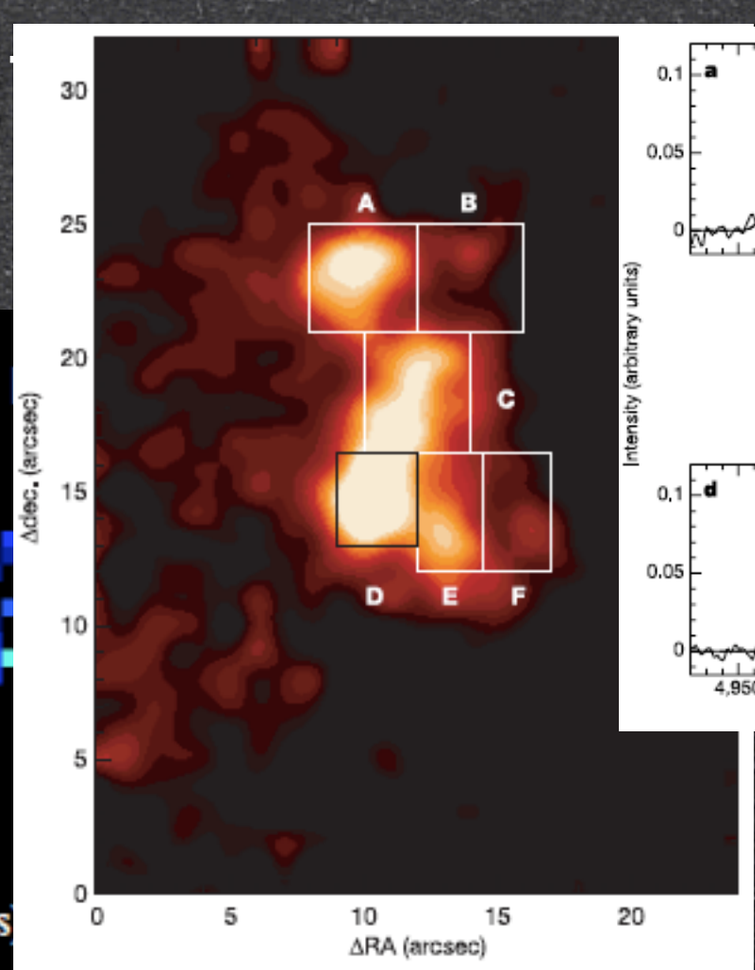
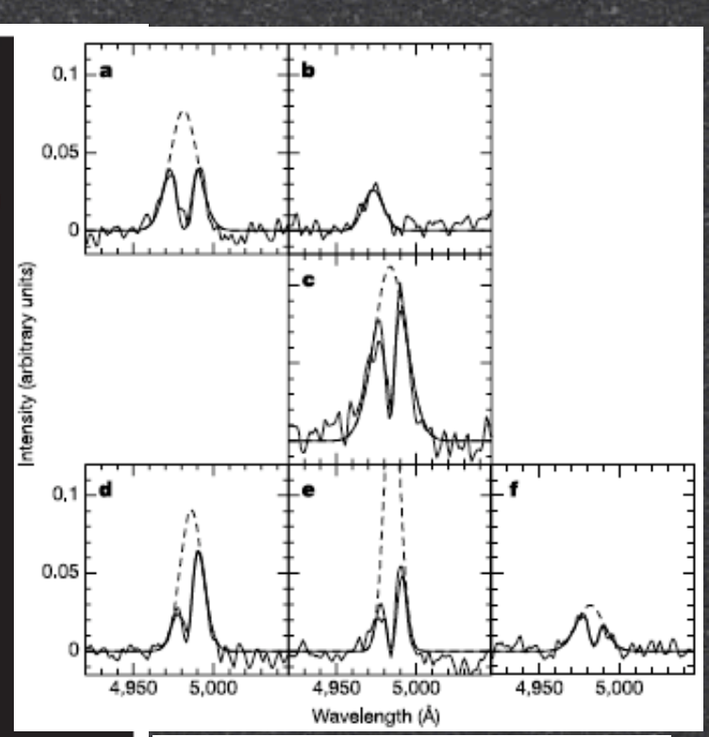
z=2.4 w/Hα: Genzel+2006







z=3.1 w/Lyα: Wilman+2005

IFU spectroscopy of central regions

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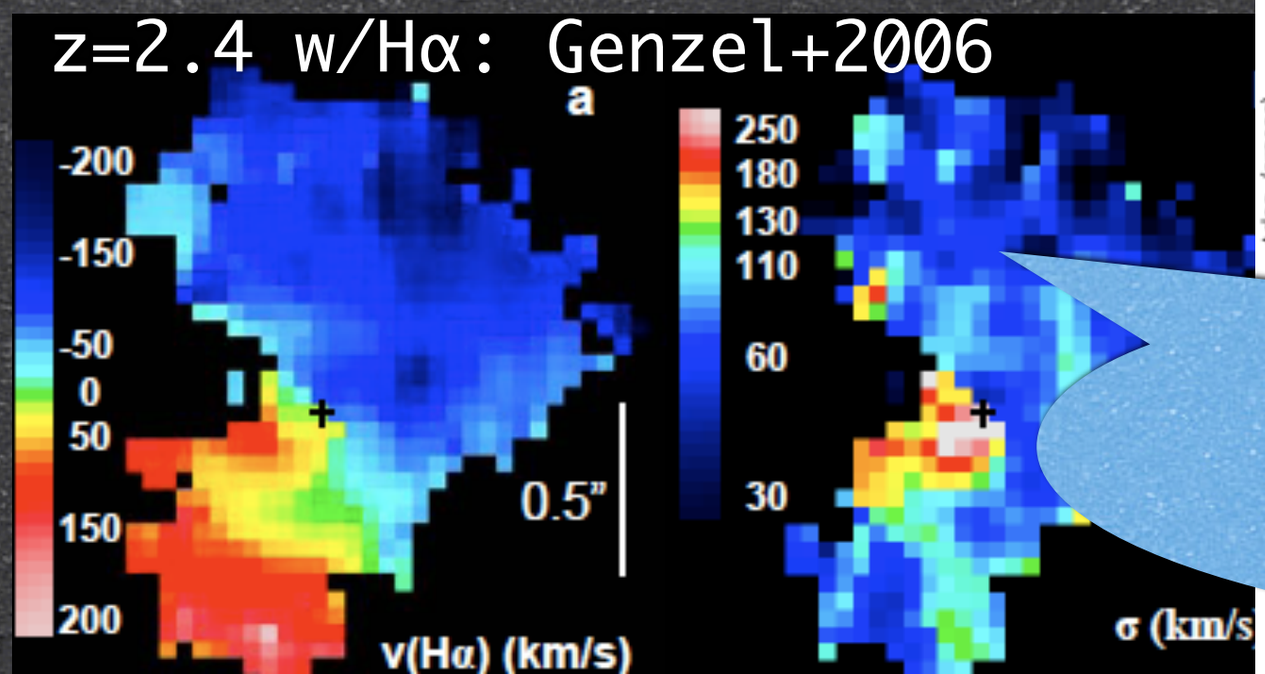

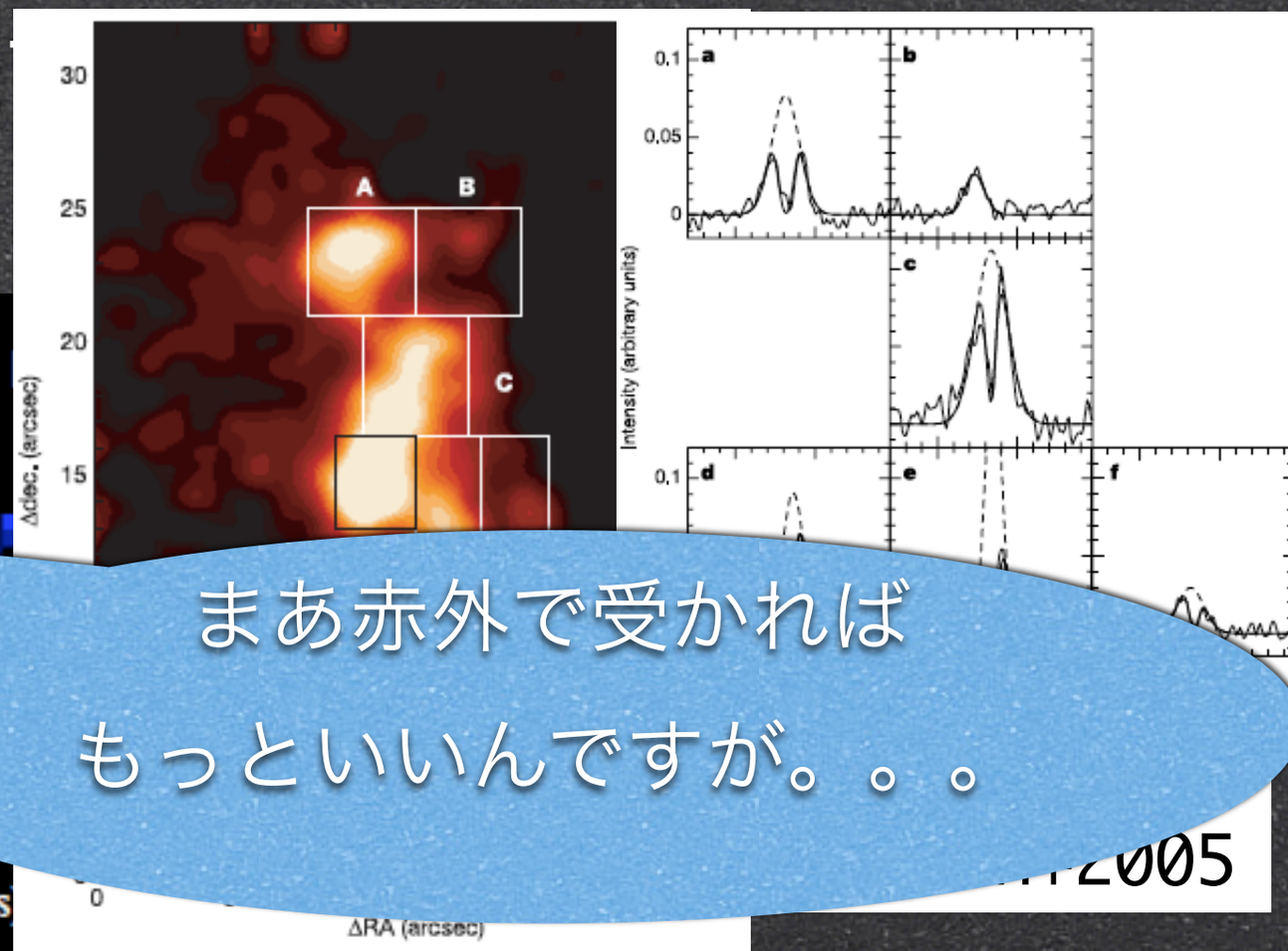

まあ赤外で受かれば
もっといいんですが。。。

2005

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もちろん
広視野だと
嬉しい

強いて “GLAO or MCAO” というなら...?

- photometrically-selected sample の追観測なら: FoV~10” とかの MCAO かな…？??
  - Multiplicity があればうれしい。
  - サーベイをするなら GLAO …は自明か。
    - diffuseな天体の追観測なら「シーイング改善」でも割といける。広視野も嬉しい。
  - やっぱり可視AOもほしい。TMT と相補的。