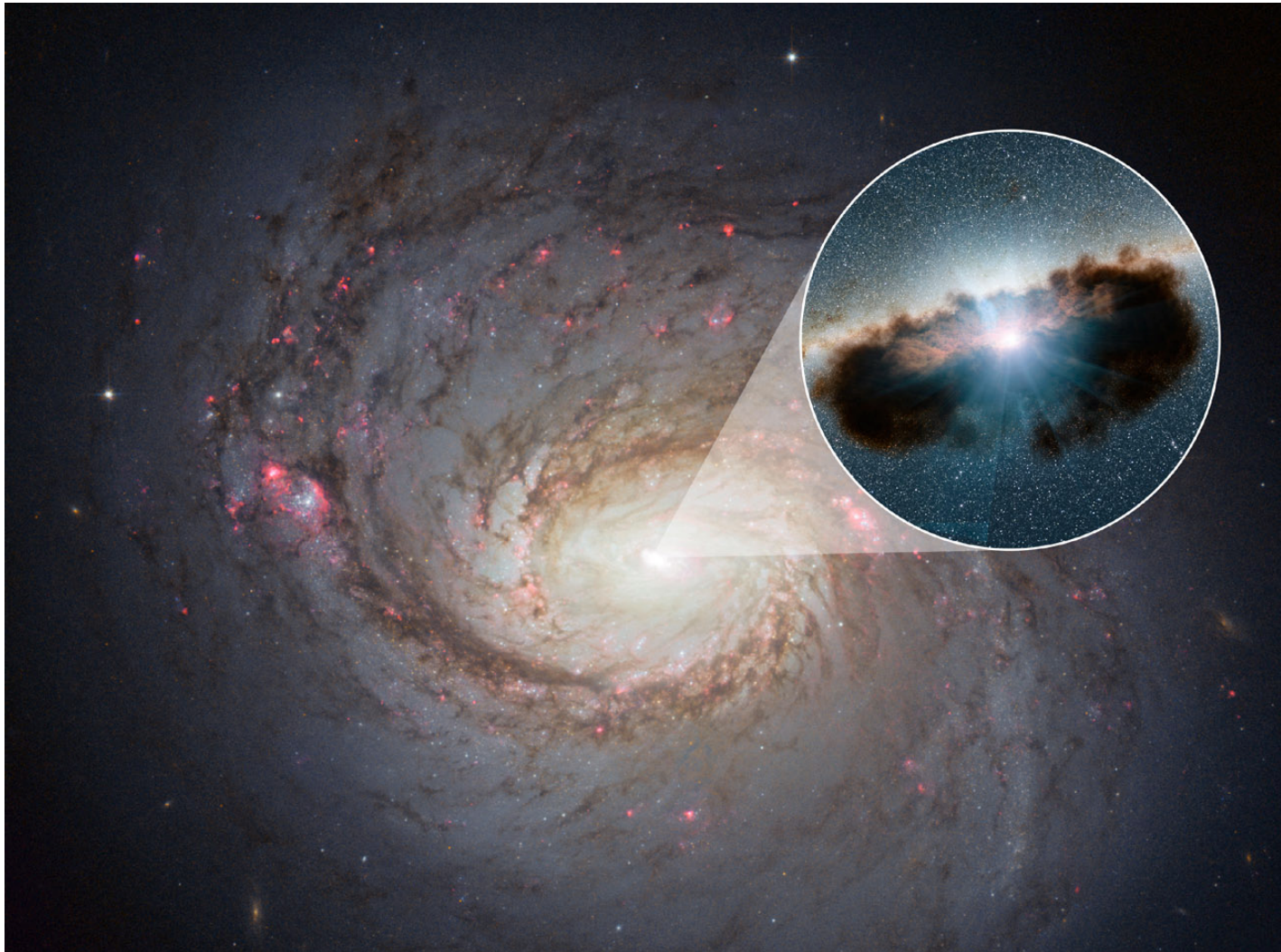


BH mass scaling relations: the case of Local AGN2



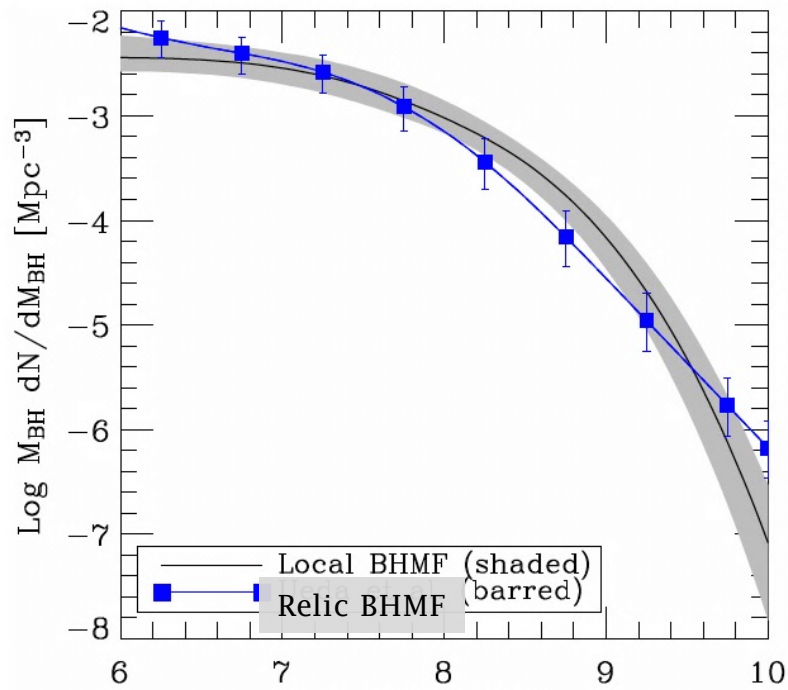
The Team:

Eleonora Sani – ESO Chile

Federerica Ricci (Univ. Roma Tre),
Francesca Onori (SRON), Fabio La
Franca (Univ. Roma Tre), Francesco
Shankar (Univ. Southampton),
Marcella Brusa (Univ. Bologna),
Roberto Maiolino (Cavendish
Laboratory), Angela Bongiorno (OA
Roma), Fabrizio Fiore (OA Roma),
Alessandro Marconi (Univ. Firenze),
Christian Vignali (Univ. Bologna)

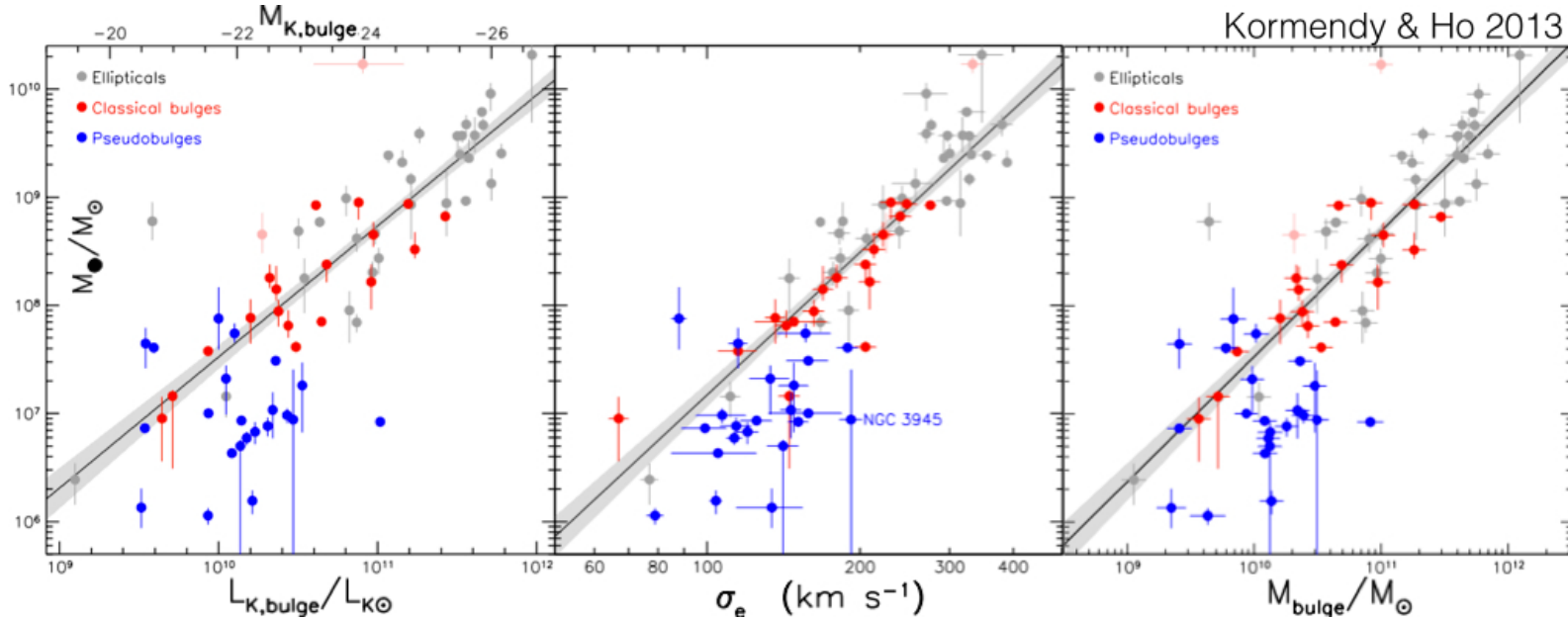
BH mass scaling relations: the case of Local AGN2

- AGN trace growth of supermassive BH ($M_{\text{BH}} > 10^6 M_{\odot}$)
- Quiescent BH are present in almost all galaxies and are AGN relics



Marconi+ 2004 $\text{Log } M_{\text{BH}} [M_{\odot}]$

Soltan 1982, Merloni & Heinz 2009, Shen & Kelly 2012



Magorrian 1998, Ferrarese & Merritt 2000, Gebhardt 2000, Marconi & Hunt 2003, Haring & Rix 2004, Hu +2009, Gültekin +2009, Sani +2011

- Evidence of a direct link between the formation of spheroids and the growth of the central black holes.

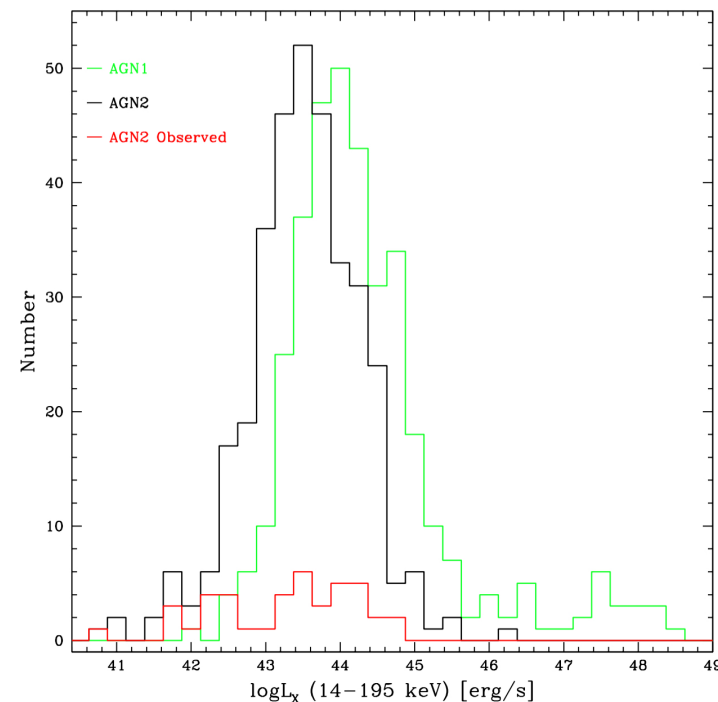
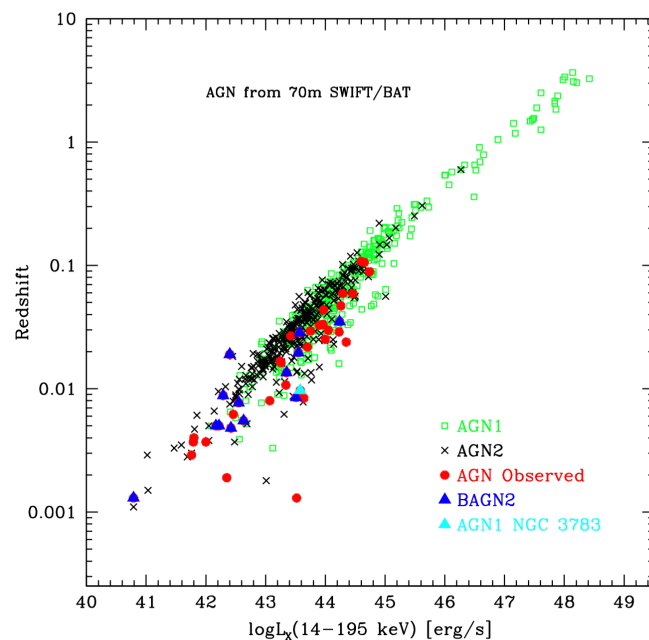
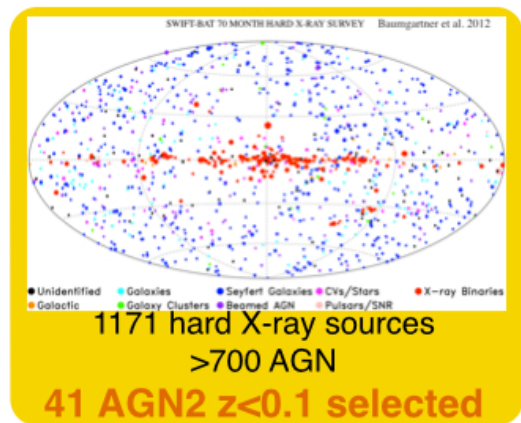
BH mass scaling relations: the case of Local AGN2

Optical (rest-frame):

- no broad line component \rightarrow NIR (Paschen series, HeI)
- AGN continuum obscured and/or contaminated by host galaxy

Swift BAT Hard X-ray selection:

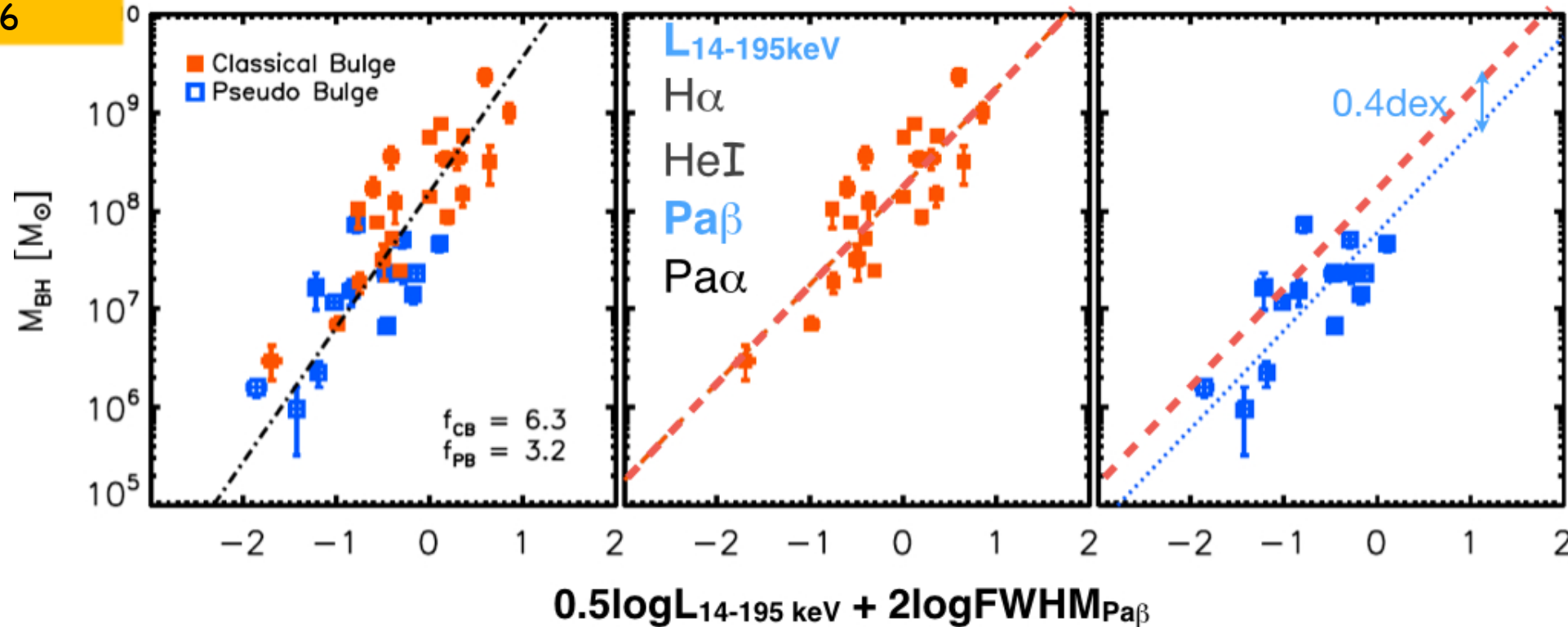
- Complete sample of Compton thin AGN2 ($\log N_H > 21$)
- No contamination from the host galaxy to L_X



BH mass scaling relations: the case of Local AGN2

La Franca +2015
Ricci +2016

Calibrating virial M_{BH} estimators for AGN2 Kim +2010,+2015; Landt +2013

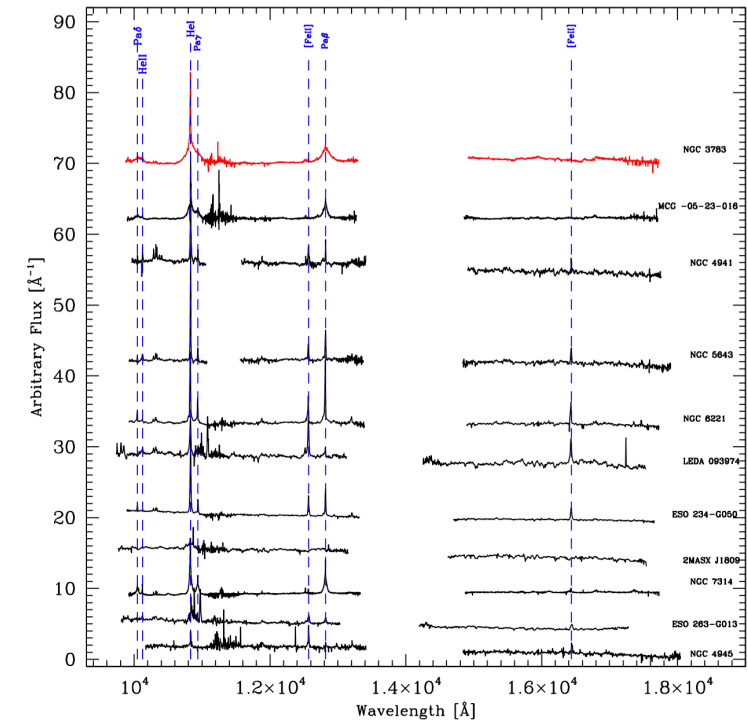
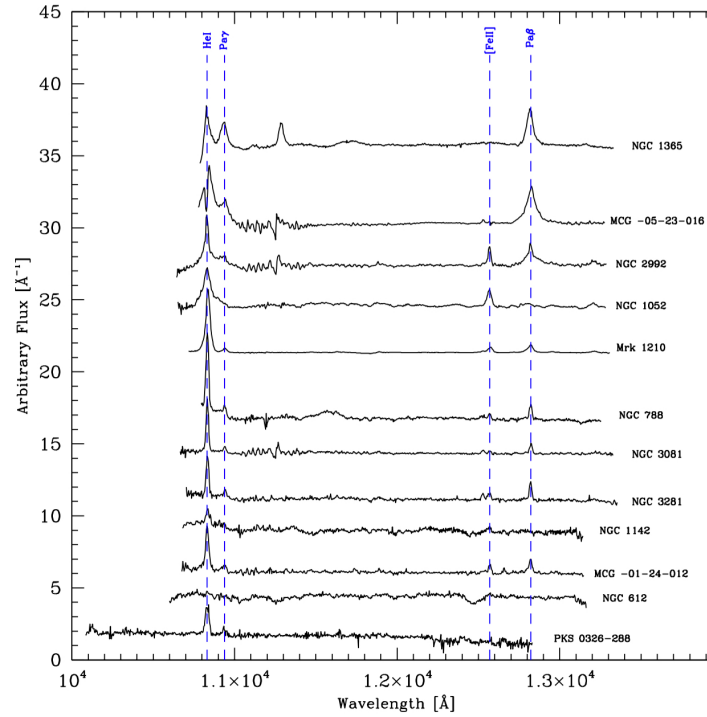
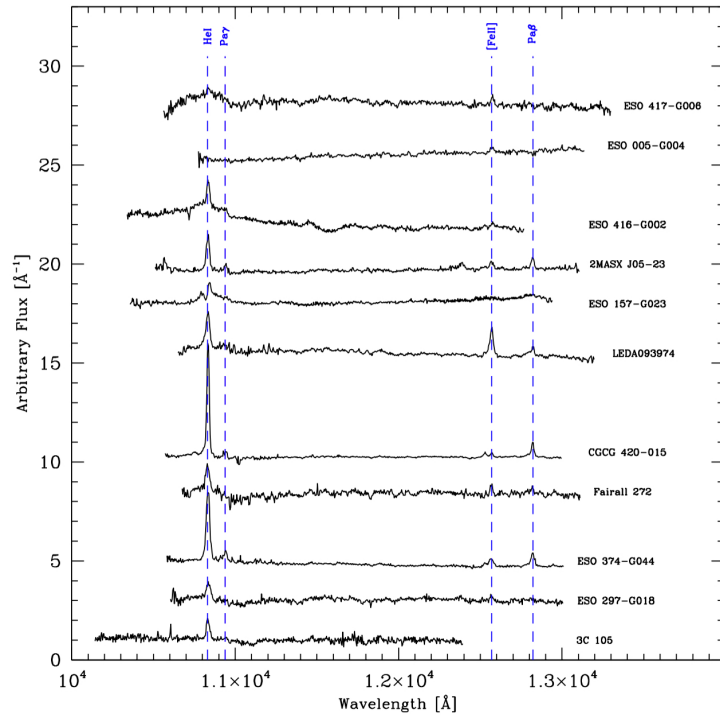


Sample of RM AGN1 to calibrate new virial M_{BH} estimators

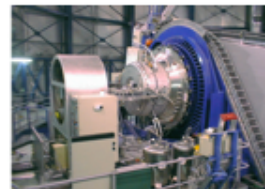
FWHM of H α H β Pa α Pa β HeI all correlate each other

$\langle f \rangle$ for bulges and pseudobulges (Ho & Kim 2014) $\rightarrow M_{\text{BH}}$ in pseudobulge/AGN smaller than bulge/AGN

BH mass scaling relations: the case of Local AGN2



10 AGN2
zJspec slit 1"
R=1360
 $\Delta V \approx 220$ km/s



23 AGN2
JLR, MR, slit 0.8"
R=730 (LR)
R=4700 (MR)
 $\Delta V \approx 60$ km/s (MR)



11 AGN2
slit 1"/0.9"/0.9"
R=4350/7450/5300
 $\Delta V \approx 70/40/60$ km/s
(UVB/VIS/NIR)

Onori +2017a

BH mass scaling relations: the case of Local AGN2

Multi-Gaussian fitting

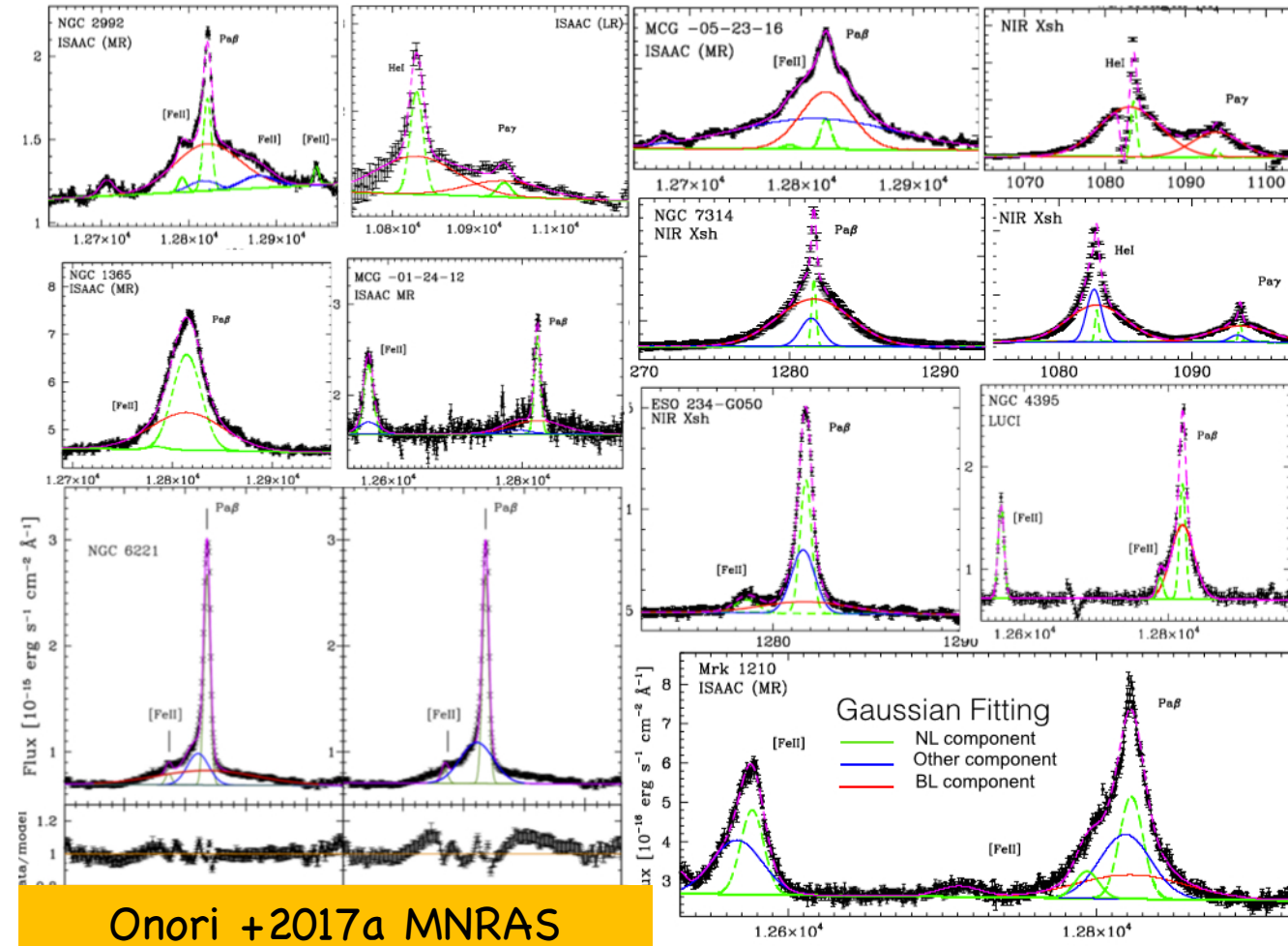
NL component

BL component

Other component

Significant broad line components are found in 13 over 41 AGN2 observed

800 km/s < FWHM < 2250 km/s

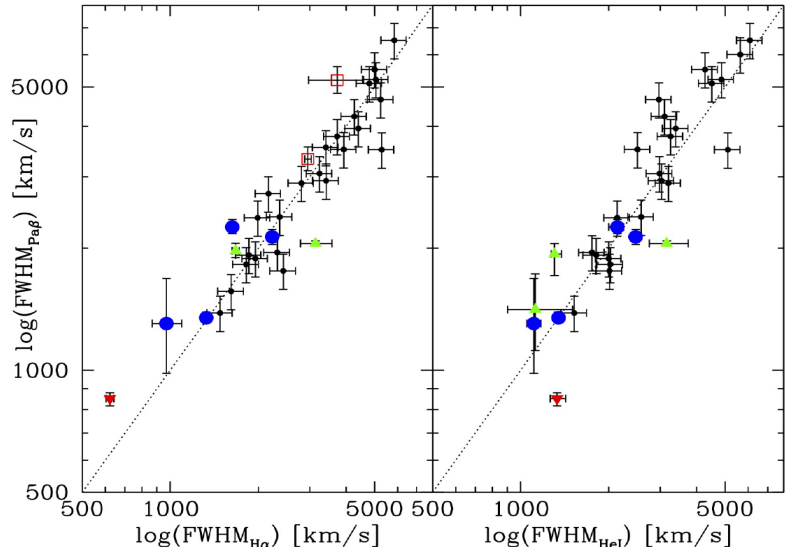
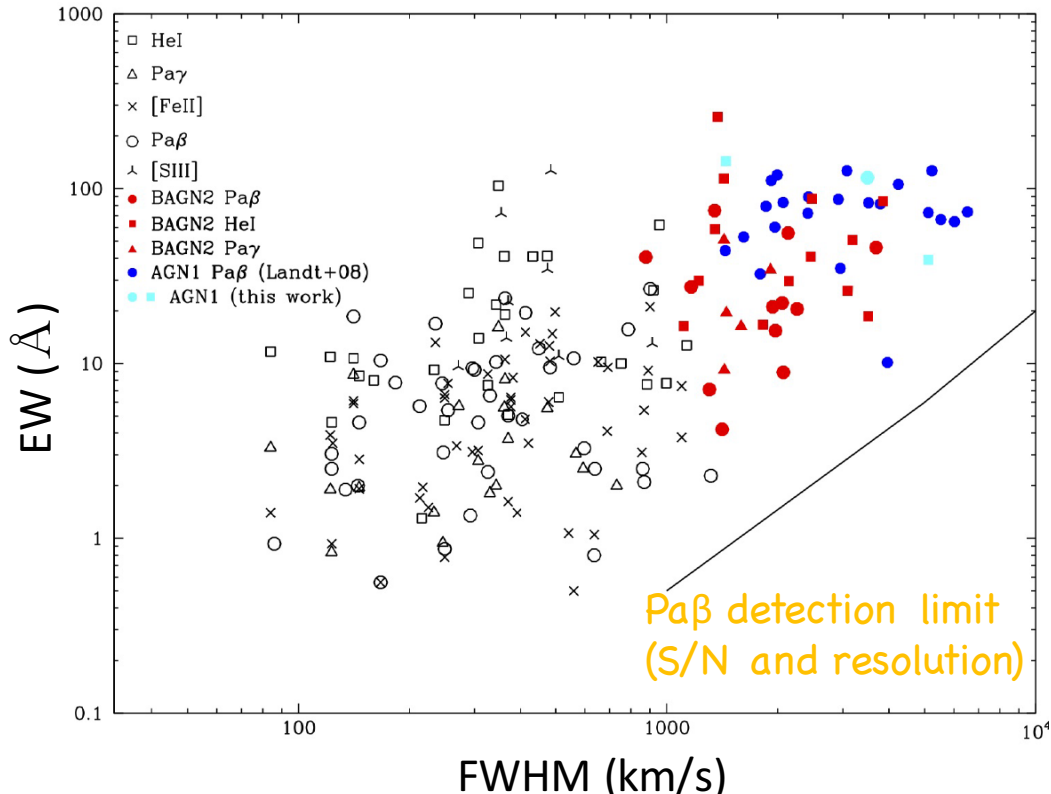


Onori +2017a MNRAS

BH mass scaling relations: the case of Local AGN2

AGN1:
 FWHM= 3360 ± 310 km/s
 EW= 80 ± 6 Å

AGN2:
 FWHM= 1970 ± 145 km/s
 EW= 44 ± 9 Å

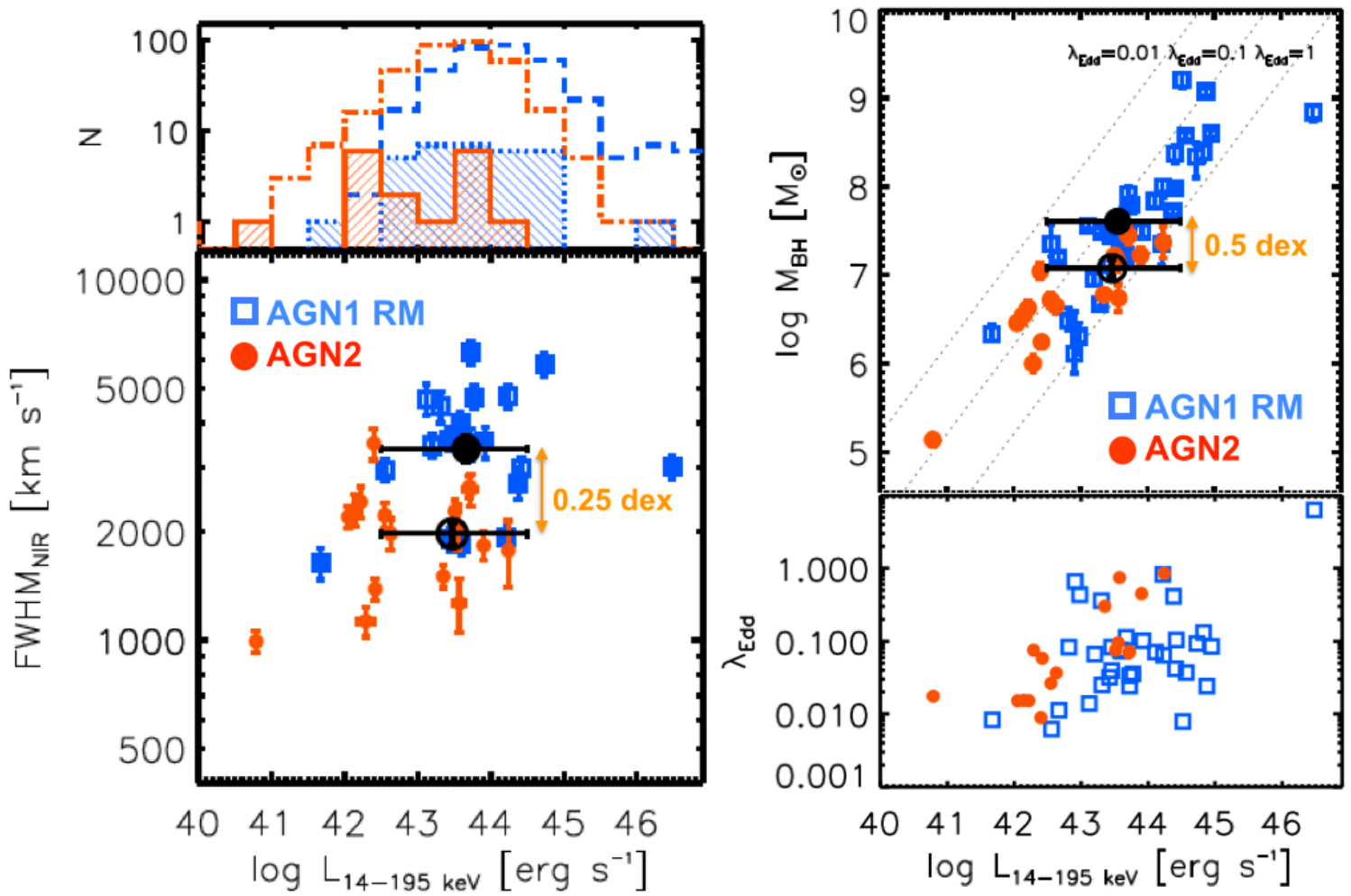


As for RM AGN1: fair agreement among emission line FWHM (see also Landt+2008)

→ The **broad lines** in **AGN2** are **less wide and less intense** than in **AGN1**

Biases against: S/N, IR and x-ray flux and luminosity, column density, host orientation have been tested and ruled out

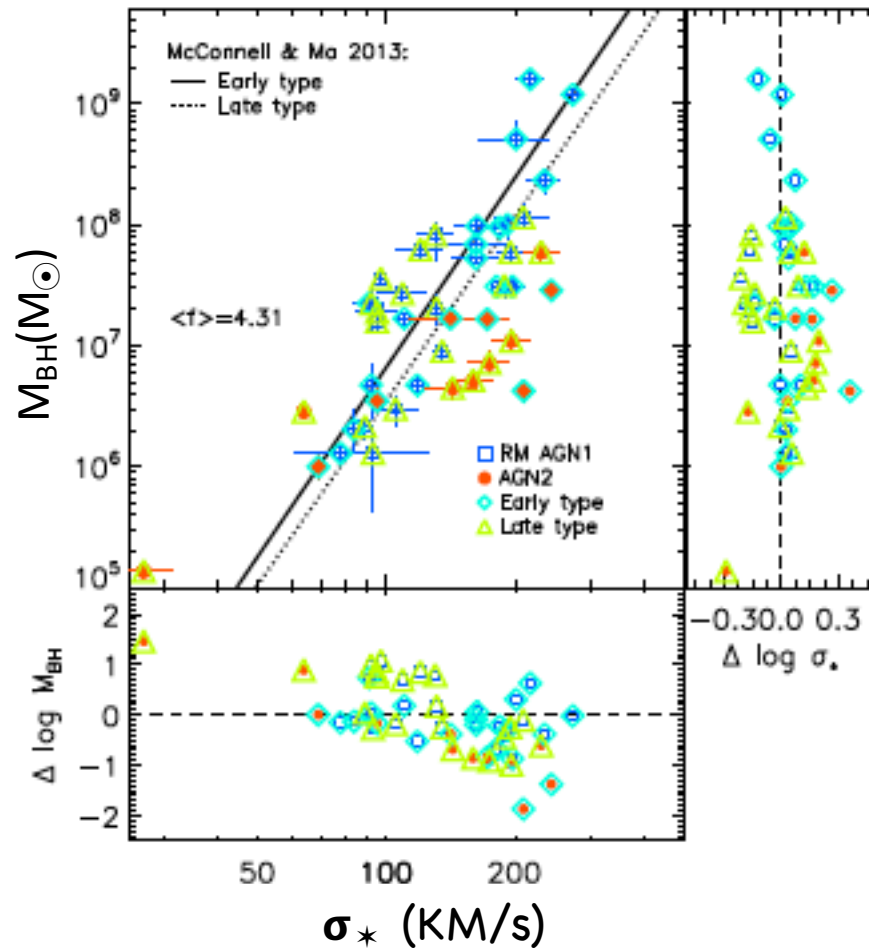
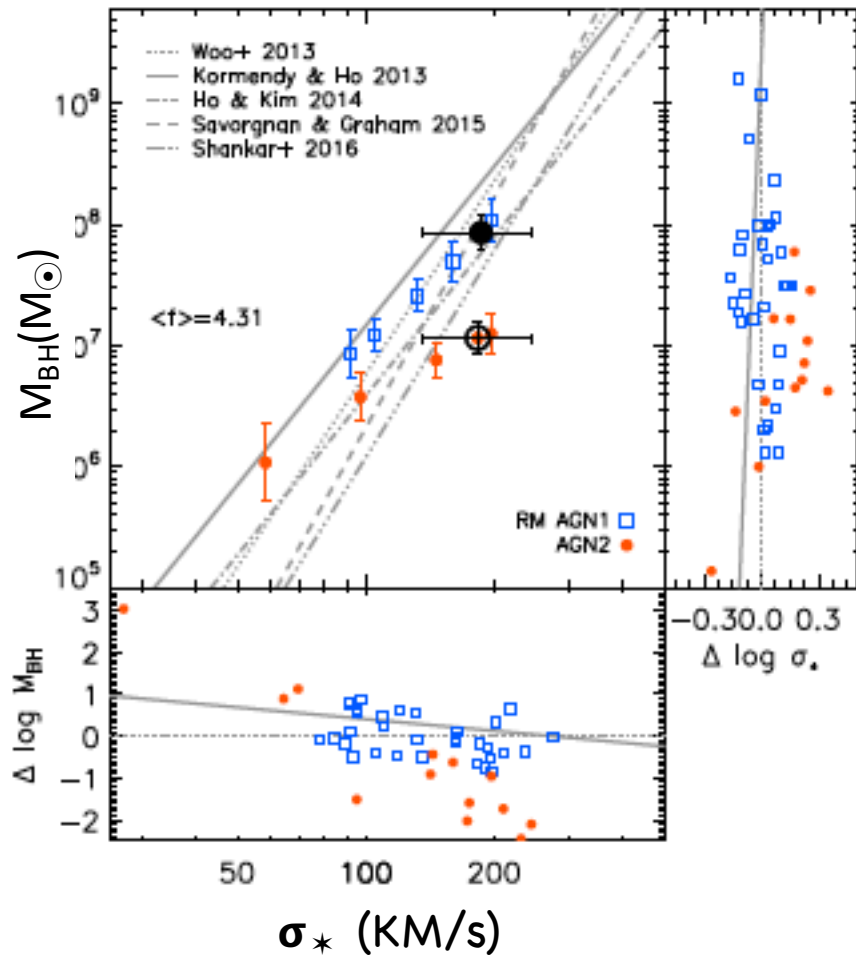
BH mass scaling relations: the case of Local AGN2



- Over the same L_x range:
- $M_{\text{BH}}(\text{AGN2}) < M_{\text{BH}}(\text{AGN1})$ of ~ 0.5 dex
 - $\lambda_{\text{Edd}}(\text{AGN2}) > \lambda_{\text{Edd}}(\text{AGN1})$

Onori +2017b MNRAS

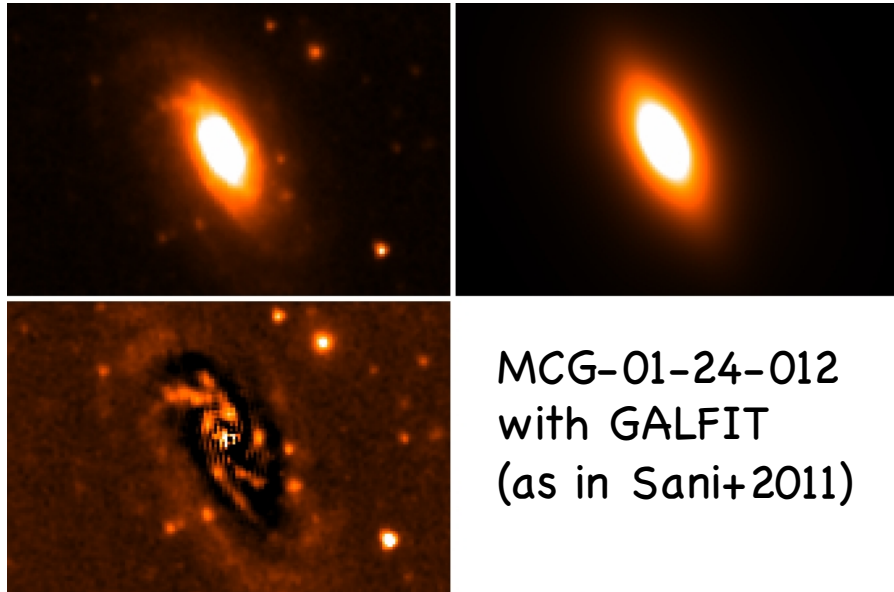
BH mass scaling relations: the case of Local AGN2



At a given σ_*
 $M_{\text{BH}}(\text{AGN2}) < M_{\text{BH}}(\text{AGN1})$
 of ~ 0.9 dex regardless
 the early/late type
 classification

Note: $\langle f \rangle$ is the same
 for RM AGN1 and SE
 AGN2

BH mass scaling relations: the case of Local AGN2

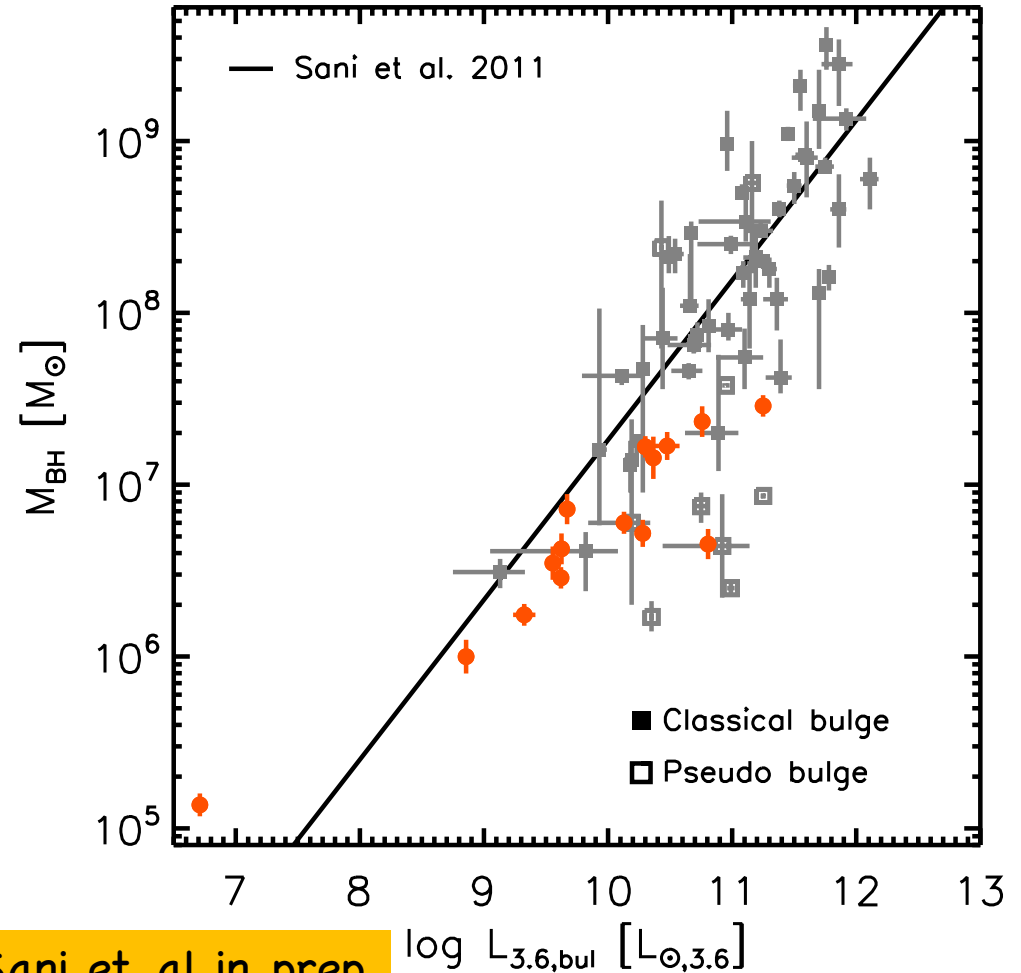


MCG-01-24-012
with GALFIT
(as in Sani+2011)

AGN2 could play a peculiar role in the BH-galaxy co-evolution scenario: AGN2 tend to be below the $M_{\text{BH}}-L_{3.6,\text{bul}}$ relation



Must add: AGN1, pseudobulge classification



Ricci, Sani et. al in prep

BH mass scaling relations: the case of Local AGN2

Summary

- New SE estimators for M_{BH} in faint and obscured AGN
- Broad emission lines detected in 13 type2 and intermediate AGN \rightarrow are narrower and fainter than in AGN1
- AGN2 harbor smaller BHs, accreting at higher λ_{Edd}
- At a given σ_* , BHs are smaller in AGN2 than in AGN1 regardless the host morphology
- At a given L3.6, BHs are smaller in AGN2 than in AGN1. Pseudobulges could play a role \rightarrow different evolutionary pattern?

