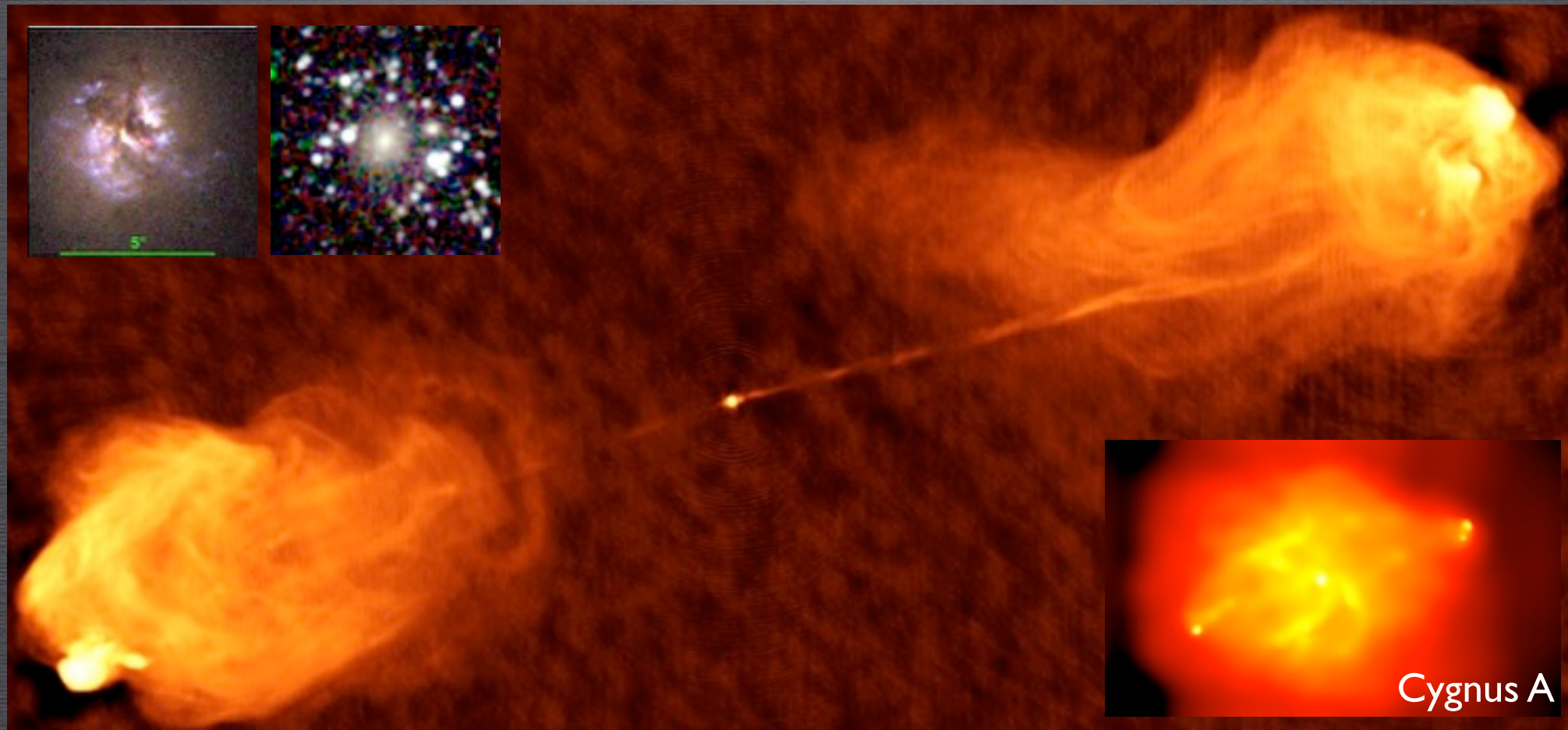




BROAD BAND SEDs OF HIGH-Z RADIO GALAXIES

COLLABORATORS: N. SEYMOUR (ICRAR/CIRA), T. NILSSON (ESO/IAP) C. DE BREUCK (ESO),
J. VERNET (ESO), B. EMONTS (CSIC-INTA), M. LEHNERT (IAP), R. TURNER (UTAS),
S SHABALA (UTAS), D. STERN (JPL), B. ROCCA (IAP)

G. DROUART (ICRAR/CIRA), SPARCS VII, 20 JULY 2017

4C 23.56

Restframe Wavelength (μm)

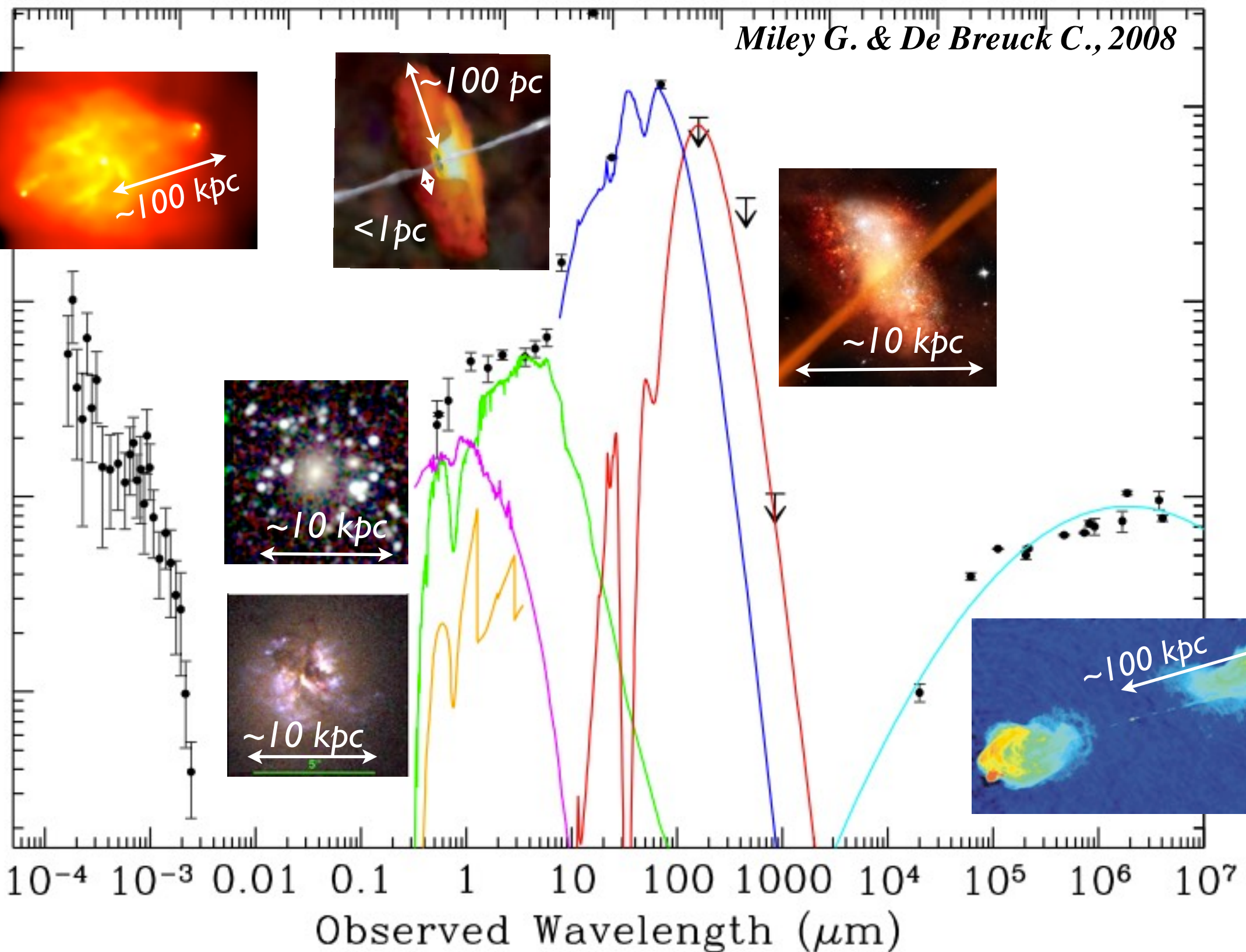
$z=2.46$

10^{-4} 10^{-3} 0.01 0.1 1 10 100 1000 10^4 10^5 10^6

Miley G. & De Breuck C., 2008

νf_ν (10^{-15} erg s $^{-1}$ cm $^{-2}$)

X-rays
neb. cont.
scat. AGN
stars
hot dust
cold dust
synchrotron





PROJET HERGÉ



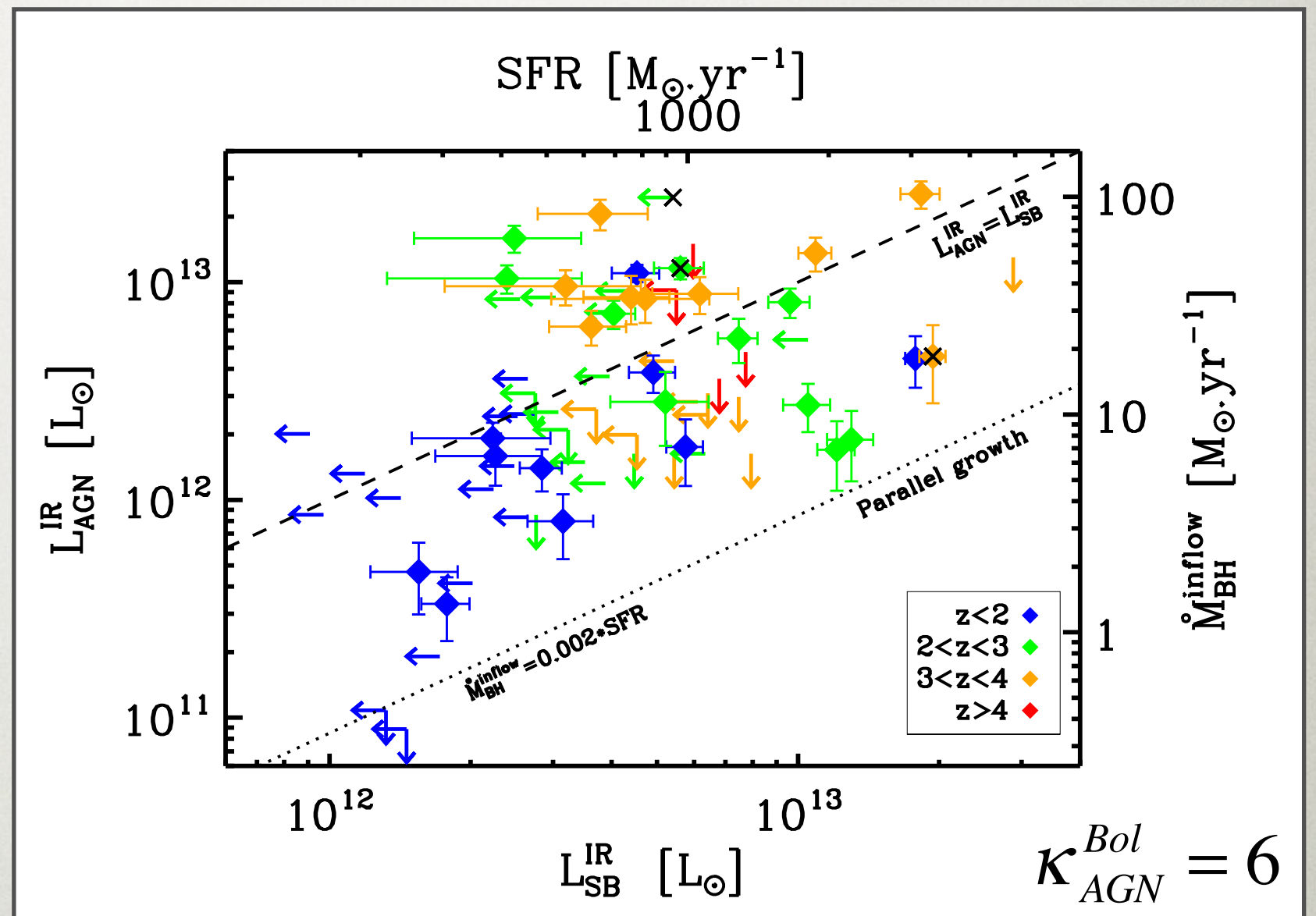
Herschel Radio Galaxy Evolution project
International team (~25 members)

- 70 powerful radio galaxies at $1 < z < 5.2$: Mostly USS radio source selected at 3GHz restframe, parent sample >200 objects, all-sky
- Supporting data: *HST*, VLT, Keck, *Spitzer*, *Herschel*, SCUBA, LABOCA, VLA, ATCA, MWA, ALMA
- SED coverage from UV to radio (>20 broad bands)

Some publications: Seymour et al., 2007, Miley & De Breuck 2008, De Breuck 2010, Galametz et al. 2012, Mayo et al. 2012, Seymour et al. 2012, Ivison et al. 2012, Wylezalek et al. 2013, Rocca et al. 2013, Drouart et al. 2014, Emonts et al. 2015-2016, Gullberg et al. 2016, Drouart et al. 2016, T. Falkendal in prep.

WHAT'S OLD(ER)?

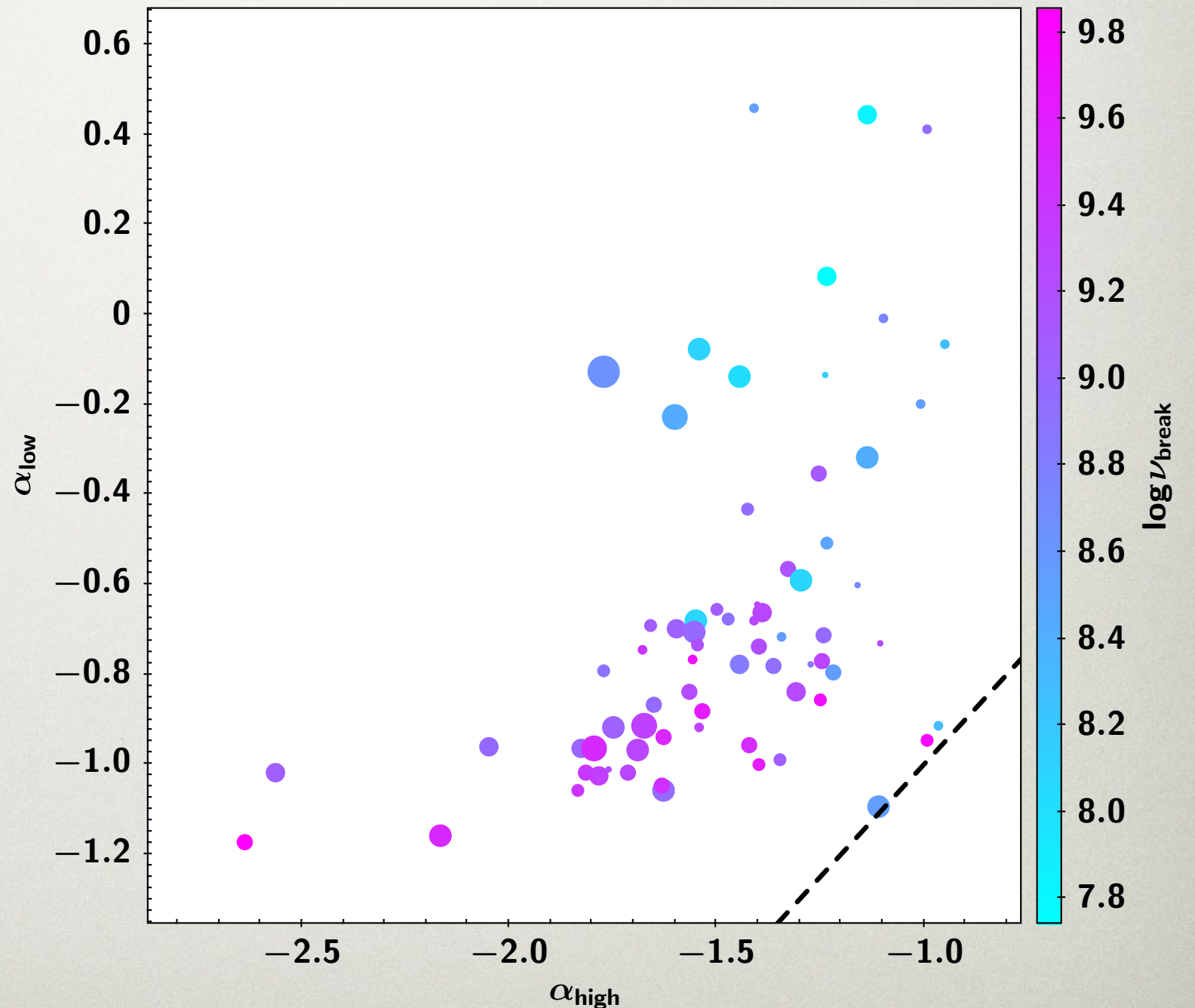
- HzRGs are massive galaxies sitting in denser environments (Seymour et al. 2007, De Breuck et al. 2010, Wylezalek et al. 2013,...)
- The radio emission betrays the presence of a SMBH having an impact on its environment (e.g. Nesvadba et al. 2009)
- They are the progenitors of the massive ellipticals in the local Universe (Rocca et al. 2004, Labbe et al. 2005)
- they are type 2 AGN (Obscured): Excellent laboratories to study host, to understand feedback impact and SMBH-host relation (e.g. Nesvadba et al. 2016, Drouart et al. 2016)



Drouart et al. 2014

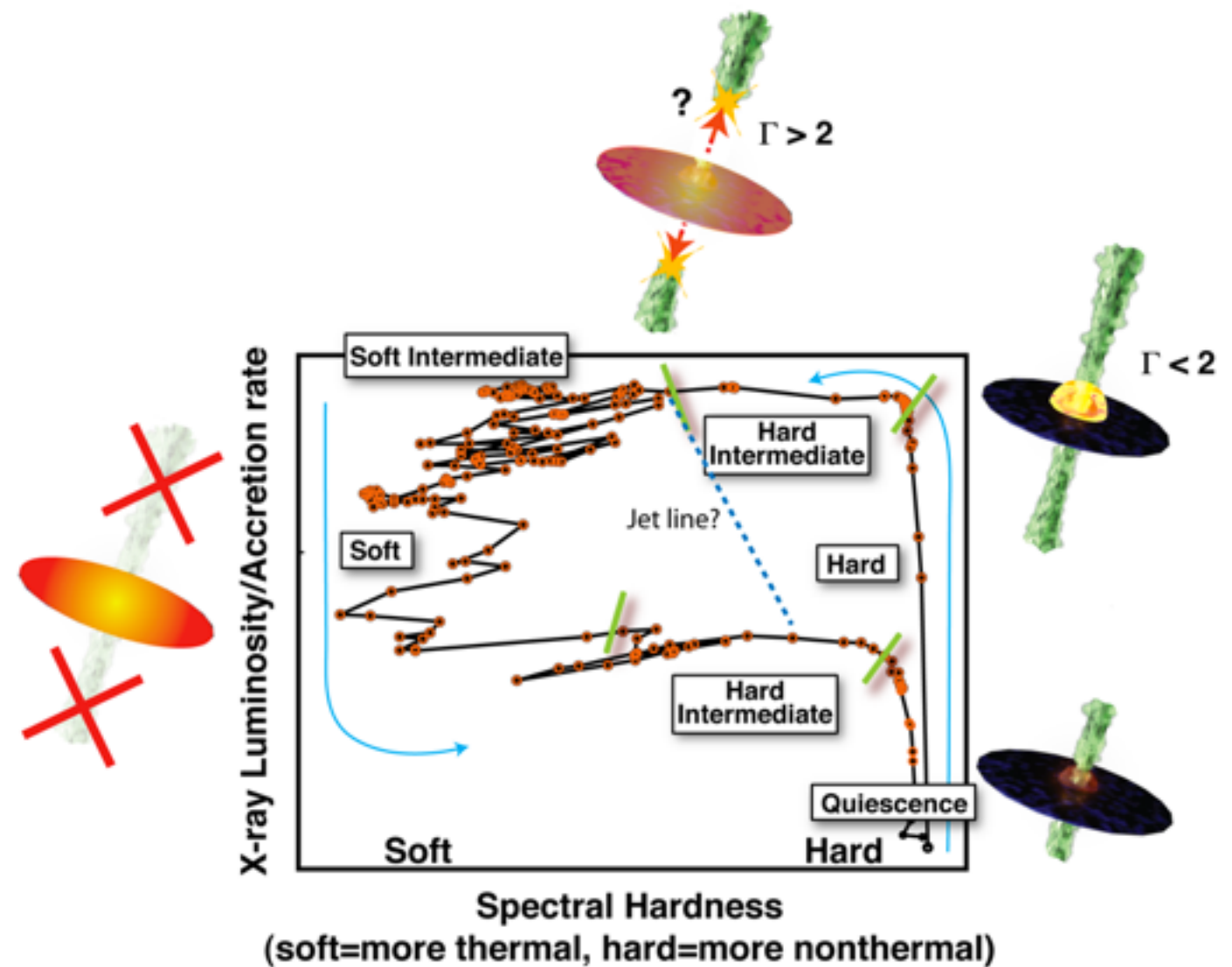
WHAT'S NEW(ER)?

- Fitting a double power law with a break frequency (MrMoose)
- At least 20 datapoints on most of the sample, covering the 50MHz-20GHz range
- Size refers to redshift
- Two different type of sources as the break do not correspond to the same physical process
- Contains environmental and intrinsic property information



WHAT'S NEW(ER)?

- Local galactic black holes and supermassive black hole are similar and some properties are scale invariant (Plotkin et al. 2015)
- The amount of energy emitted mechanically (jet) and radiatively (quasar) are similar (Nesvadba et al. 2017)
- X-rays data are very useful to assess this diagnostic as less sensitive to dust obscuration
- High synergy with radio required to create the full picture => multi-wavelength dataset

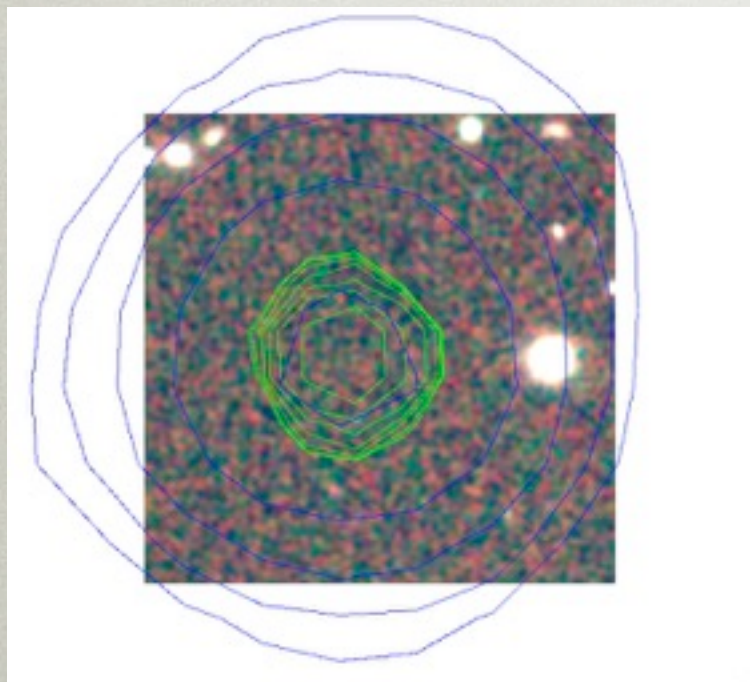


WHAT'S FOR?

better SEDs of HzRGs in the $1 < z < 5$ range

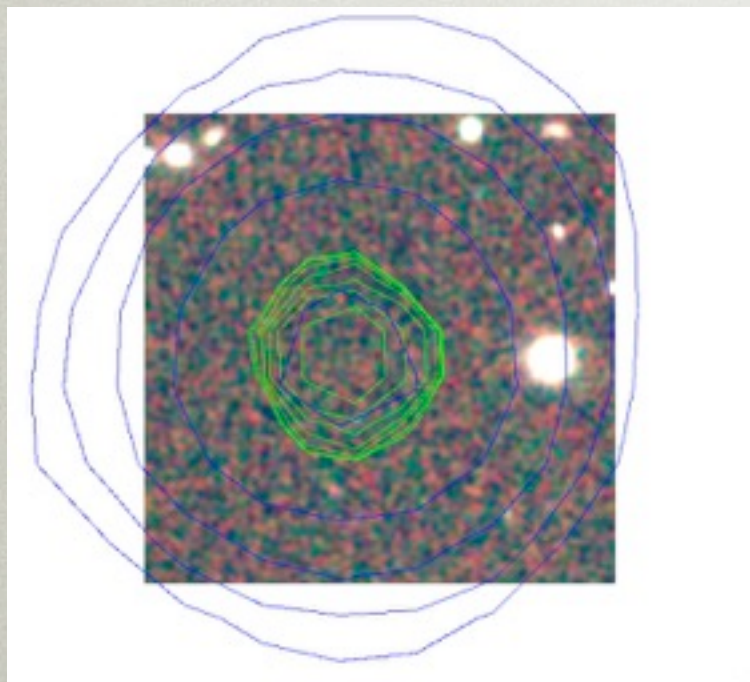
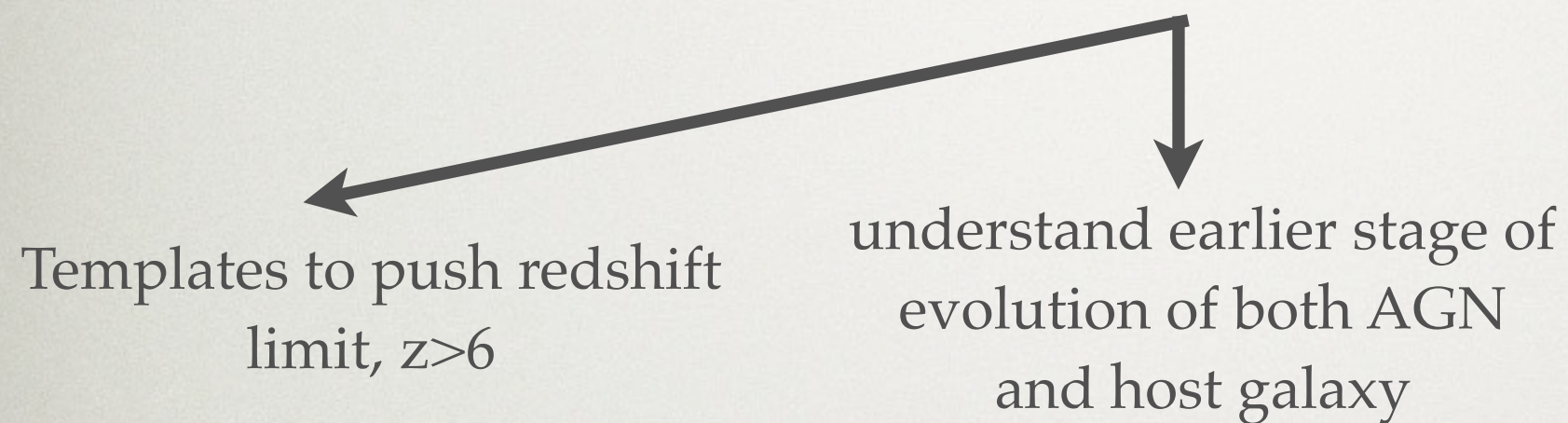


Templates to push redshift
limit, $z > 6$



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WHAT'S FOR?

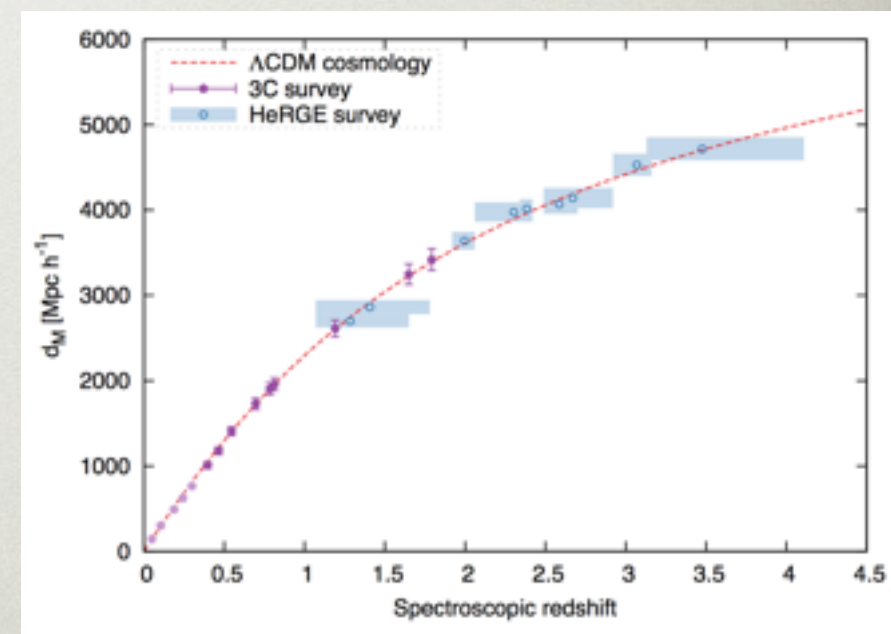
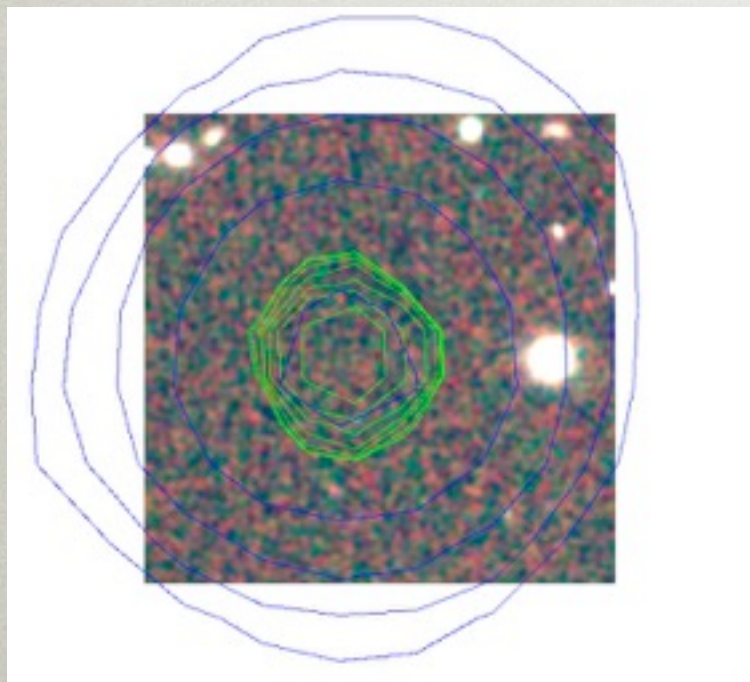
better SEDs of HzRGs in the $1 < z < 5$ range

Templates to push redshift
limit, $z > 6$

understand earlier stage of
evolution of both AGN
and host galaxy

feed this knowledge for
redshift estimates in radio

Turner et al., sub.



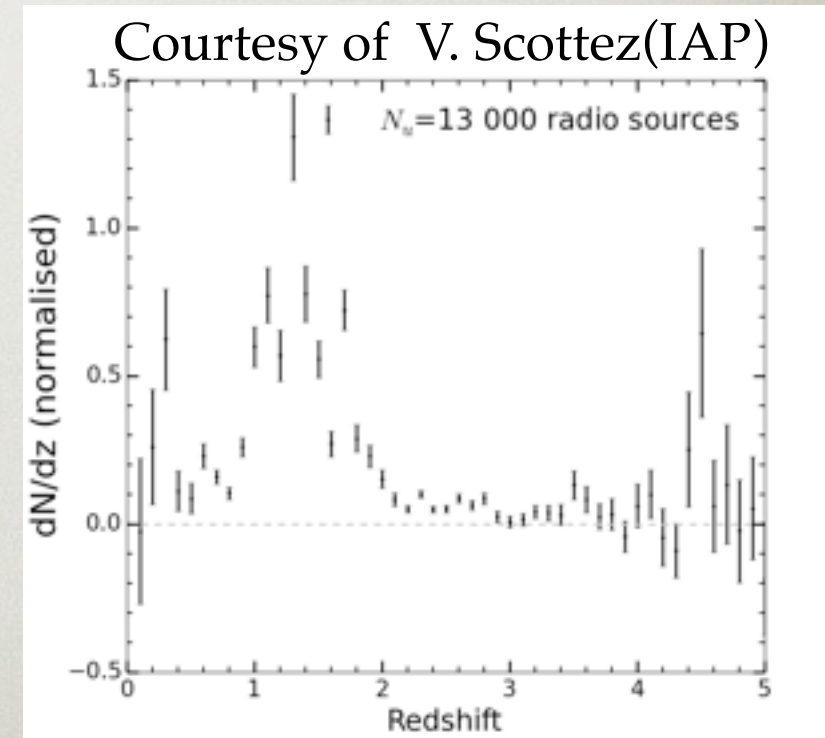
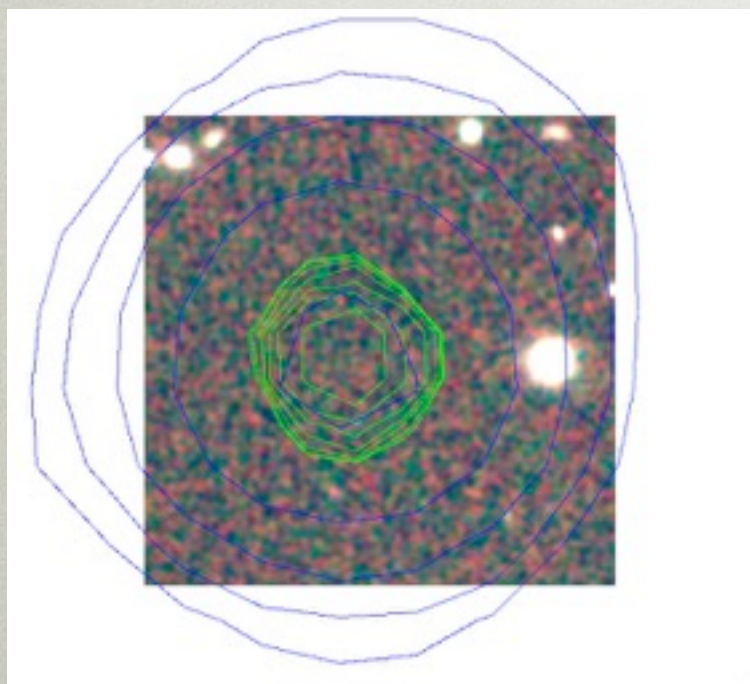
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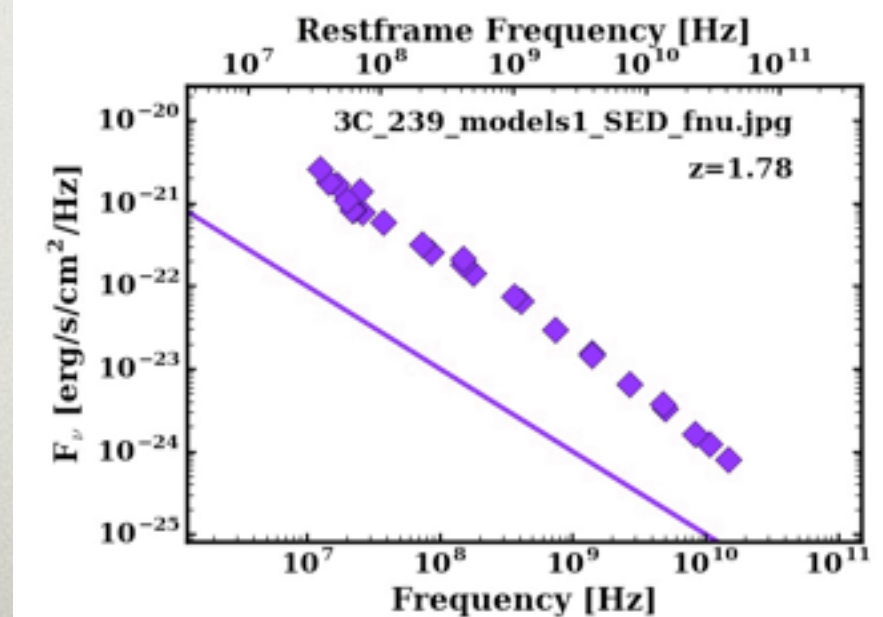
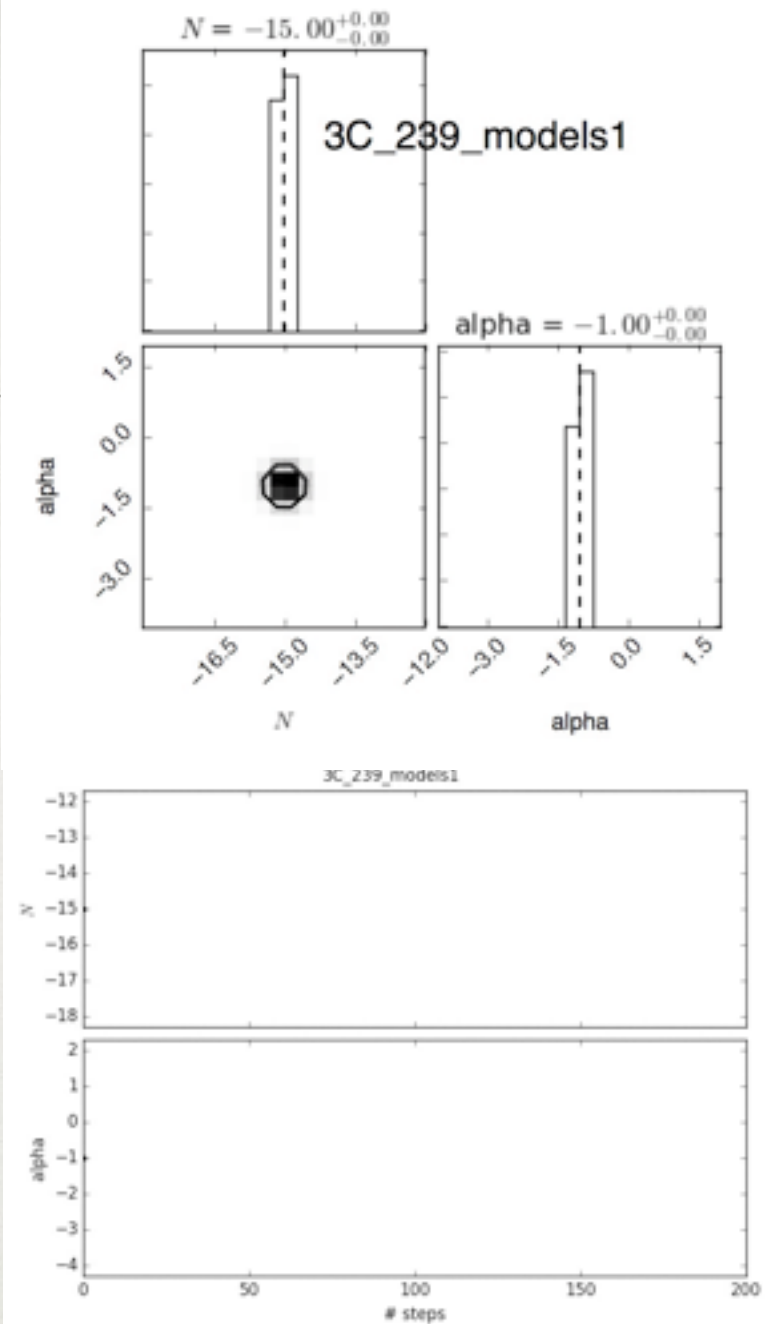


A WORD ABOUT SED FITTING

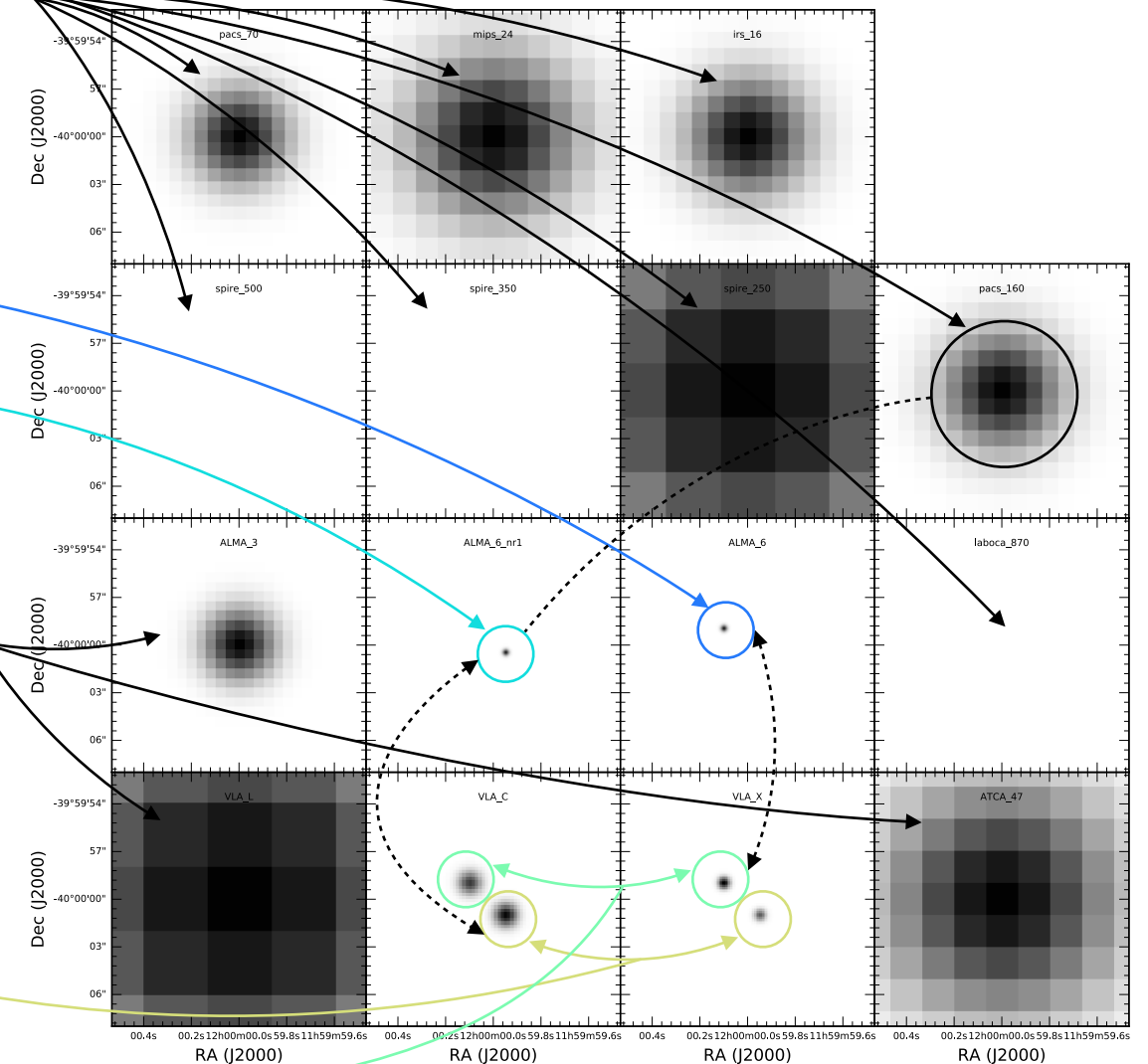
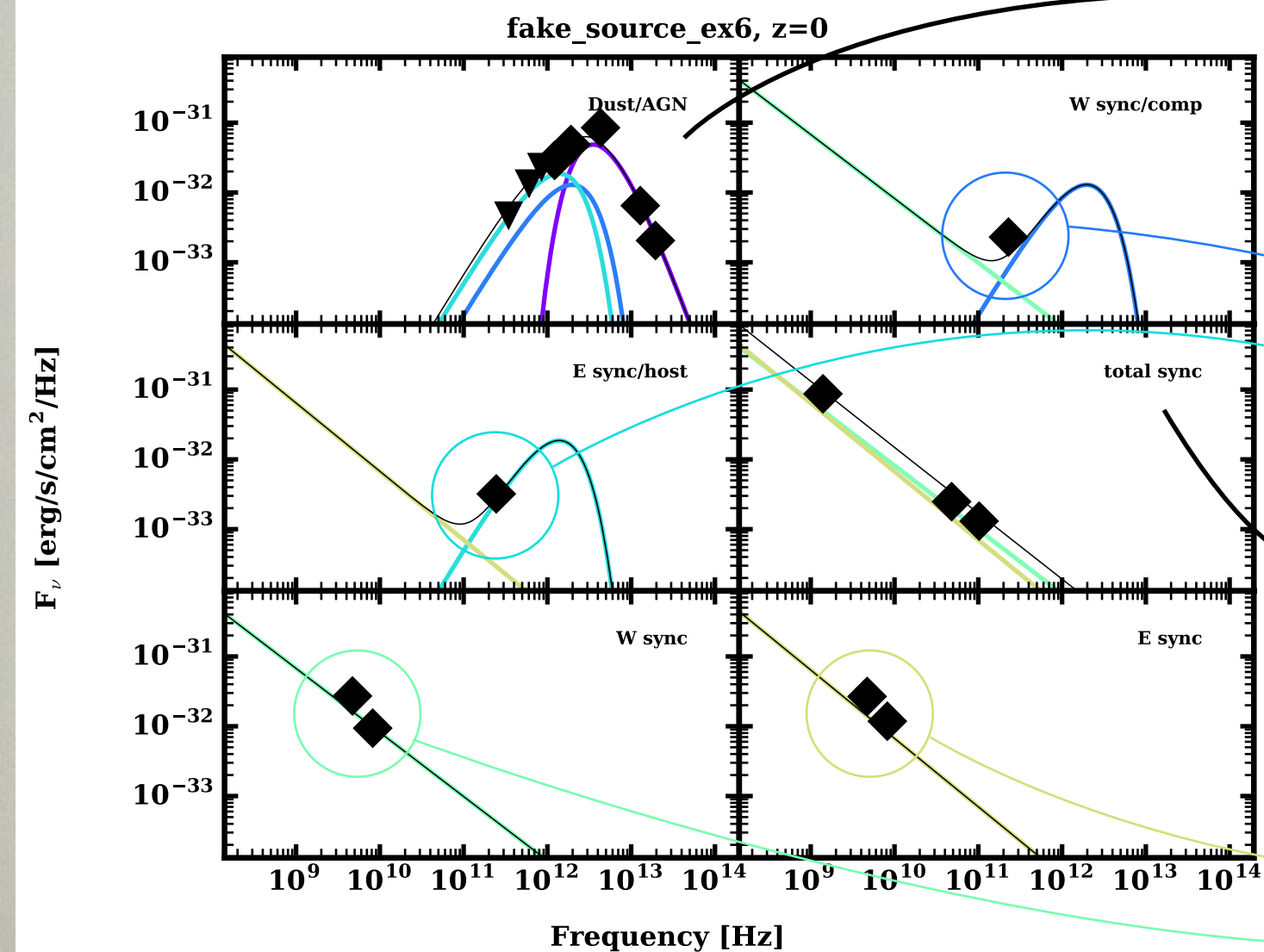
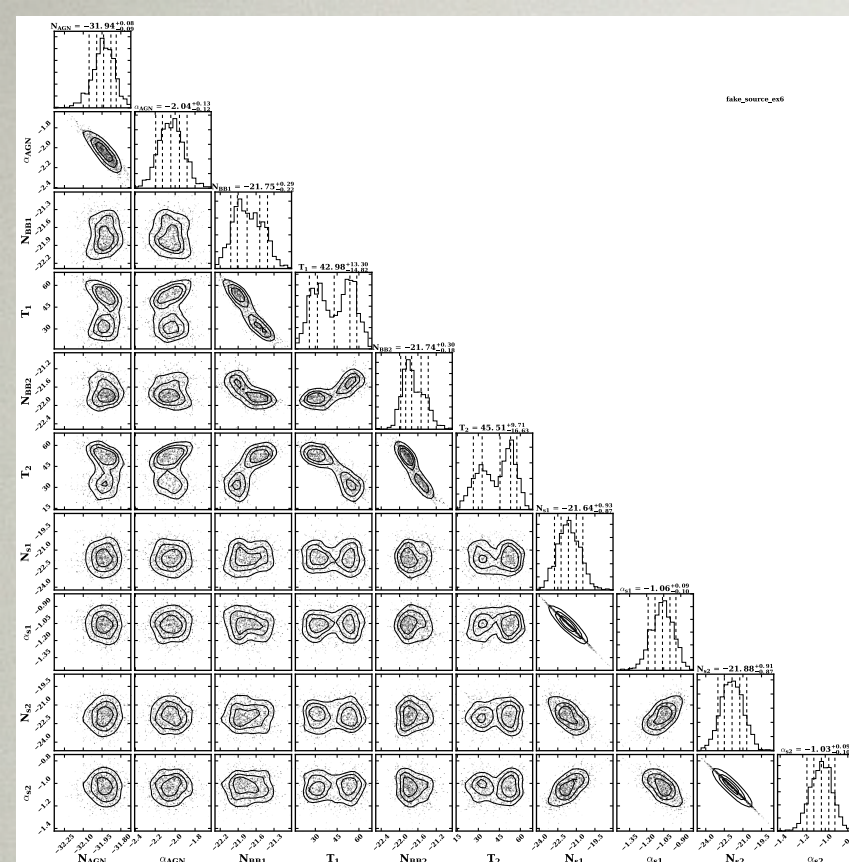
MRMOOSE

(ANOTHER) FITTING TOOL

- Bayesian framework
- handle upper limits properly
- handle blended source
- user-managed model/filter database
- User-friendly not user-opaque
- some limitations for v1.0 (public release, next week)
- Python 2.7 (hopefully 3.0 in close future)



MRMOOSE - A REALISTIC CASE



CONCLUSIONS

- Low Frequency radio astronomy to open a new window for AGN and star forming galaxy physics / demographics
- Synergy essential with the high frequency side to obtain the full picture
- SMBH in HzRG: similar output energy in total radio and IR but over different timescale! Is the radio phase the prelude to the quasar phase?
- MrMoose: a great tool to the multi-wavelength astronomer!