How does the host galaxy affect the BH virial mass estimates?

Ludovica Varisco

10 ottobre 2018

VIRIAL MASS ESTIMATES

Proxy of BLR velocities

Proxy of BLR size

$$M_{BH} = \alpha \frac{FWHM^2 \, L_{cont}^{\beta}}{G}$$

VIRIAL MASS ESTIMATES

Proxy of BLR velocities

Proxy of BLR size

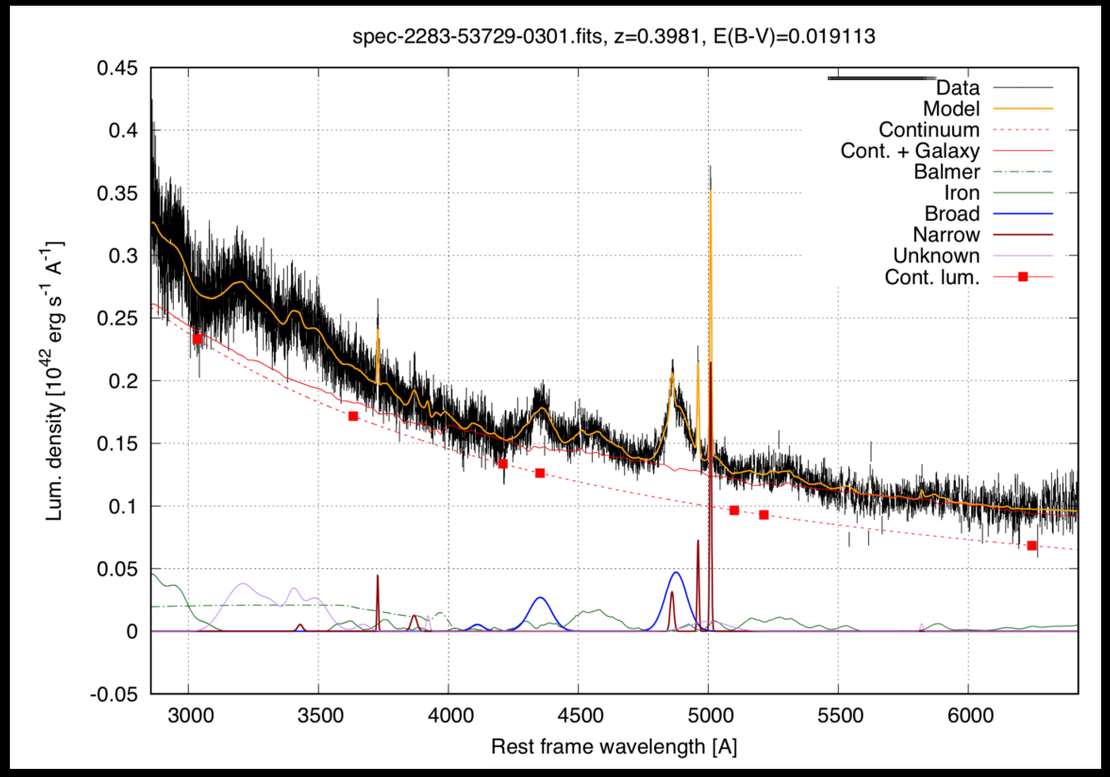
$$M_{BH} = \alpha \frac{FWHM^2 \, L_{cont}^{\beta}}{G}$$

VIRIAL MASS ESTIMATES

Proxy of BLR velocities

Proxy of BLR size

$$M_{BH} = \alpha \frac{FWHM^2 \; L_{cont}^{\beta}}{G}$$



$$M = 0.813 \times 10^8 \left(\frac{FWHM_{H\beta}}{1000\,km/s} \right)^2 \left(\frac{L_{5100}}{10^{46}\,erg/s} \right)^{0.5} M_{\odot}$$

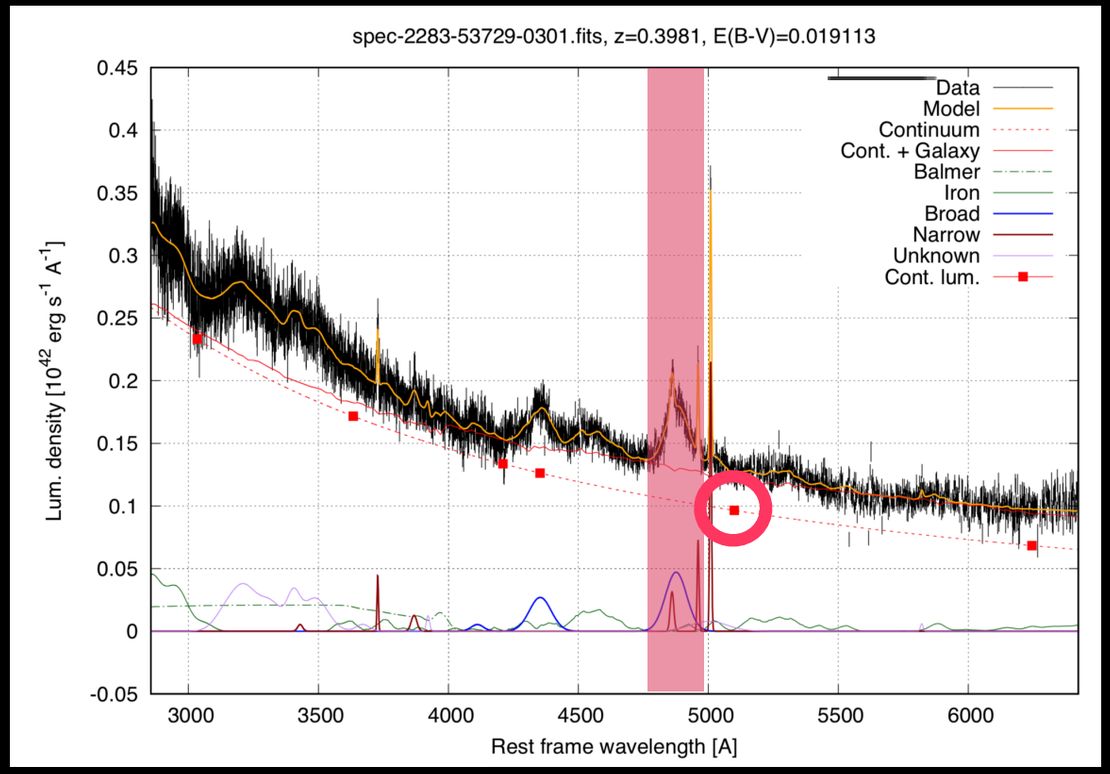
Vestergaard & Peterson (2006).

VIRIAL MASS ESTIMATES

Proxy of BLR velocities

Proxy of BLR size

$$M_{BH} = \alpha \frac{FWHM^2 \; L_{cont}^{\beta}}{G}$$



$$M = 0.813 \times 10^8 \left(\frac{FWHM_{H\beta}}{1000\,km/s} \right)^2 \left(\frac{L_{5100}}{10^{46}\,erg/s} \right)^{0.5} M_{\odot}$$

Vestergaard & Peterson (2006).

SAMPLE SELECTION

Shen's catalog

Shen et al. 2011

$$z \lesssim 0.7$$

SAMPLE SELECTION

Shen's catalog

Shen et al. 2011

$z \lesssim 0.7$

10 578 sources

SAMPLE SELECTION

Shen's catalog

Shen et al. 2011

$z \lesssim 0.7$

10 578 sources

Calderone et al. 2017

SAMPLE SELECTION

Shen's catalog

Shen et al. 2011

$z \lesssim 0.7$

10 578 sources

Calderone et al. 2017

Reliable fit

9107 sources

SAMPLE SELECTION

Shen's catalog

Shen et al. 2011

$z \lesssim 0.7$

10 578 sources

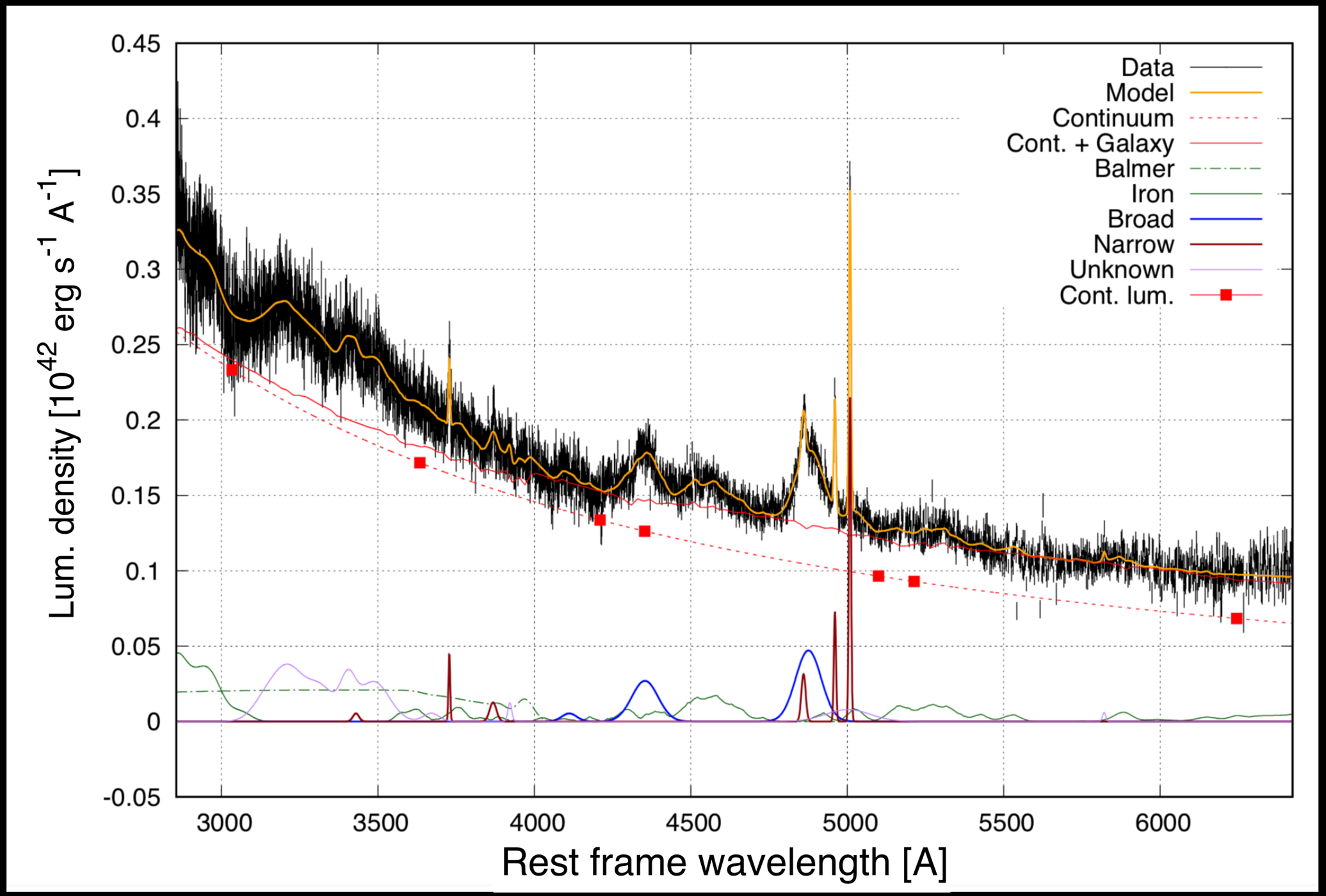
Calderone et al. 2017

Reliable fit

9107 sources

Final sample

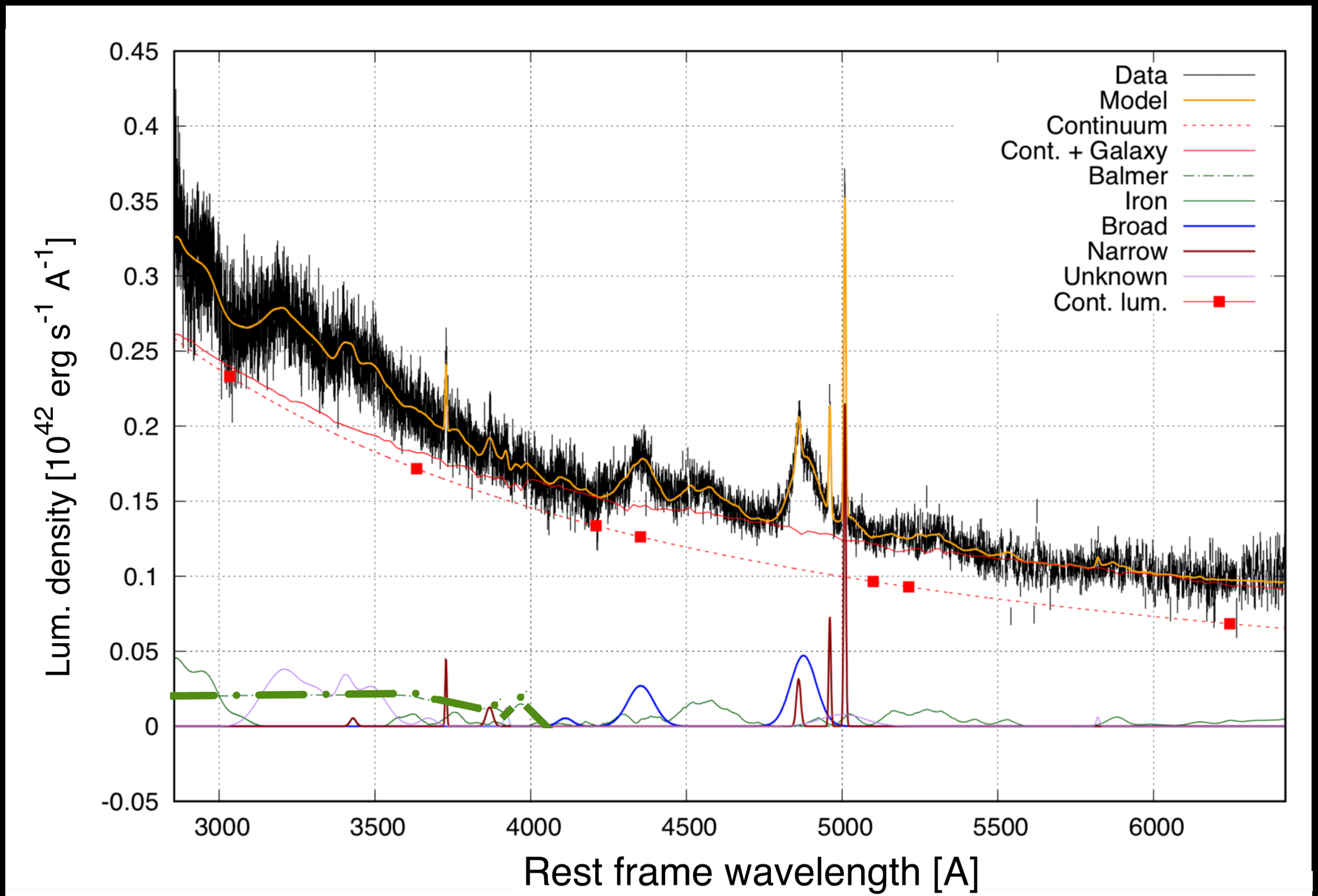
QSFIT SPECTRA ANALYSIS



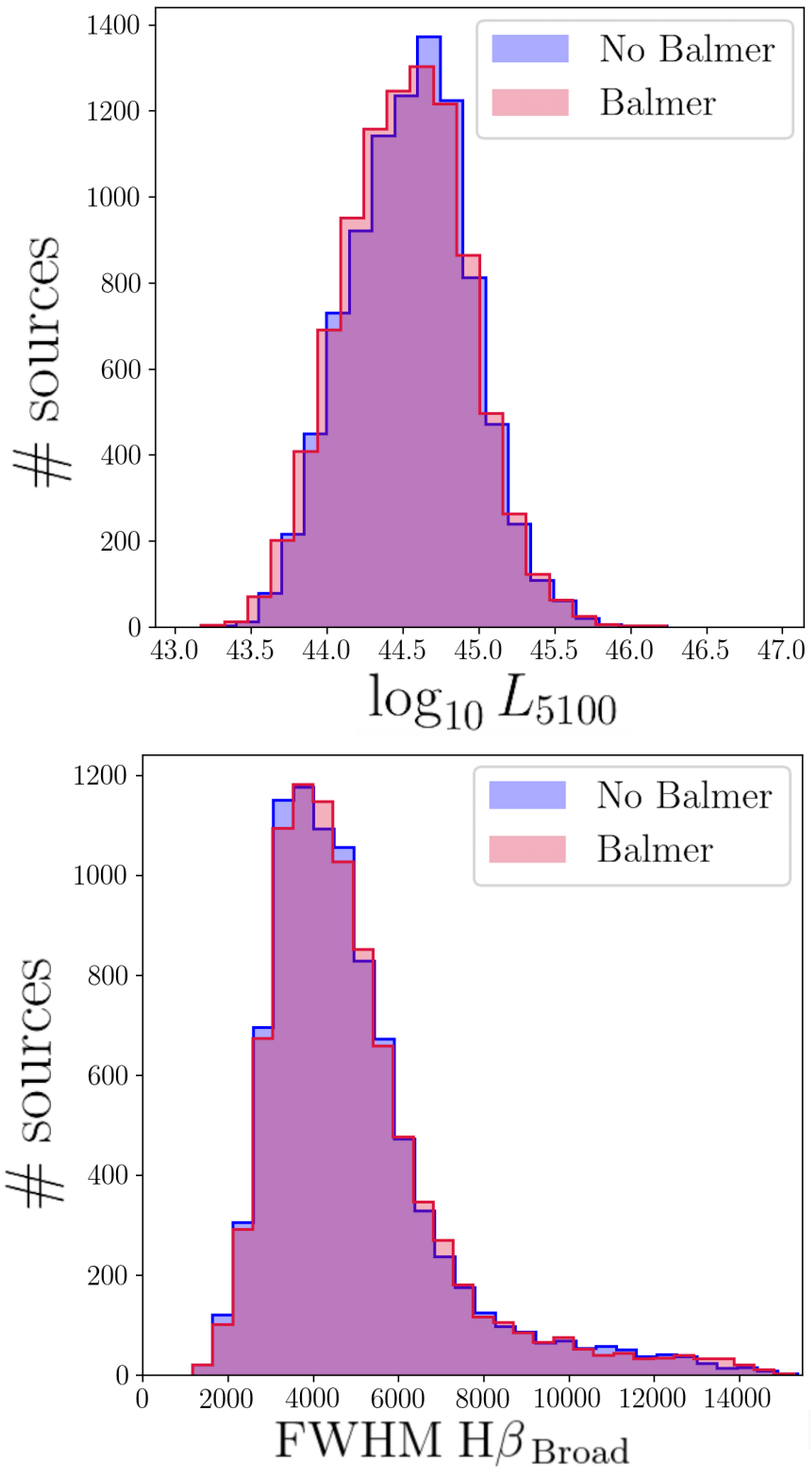
balmer continuum component

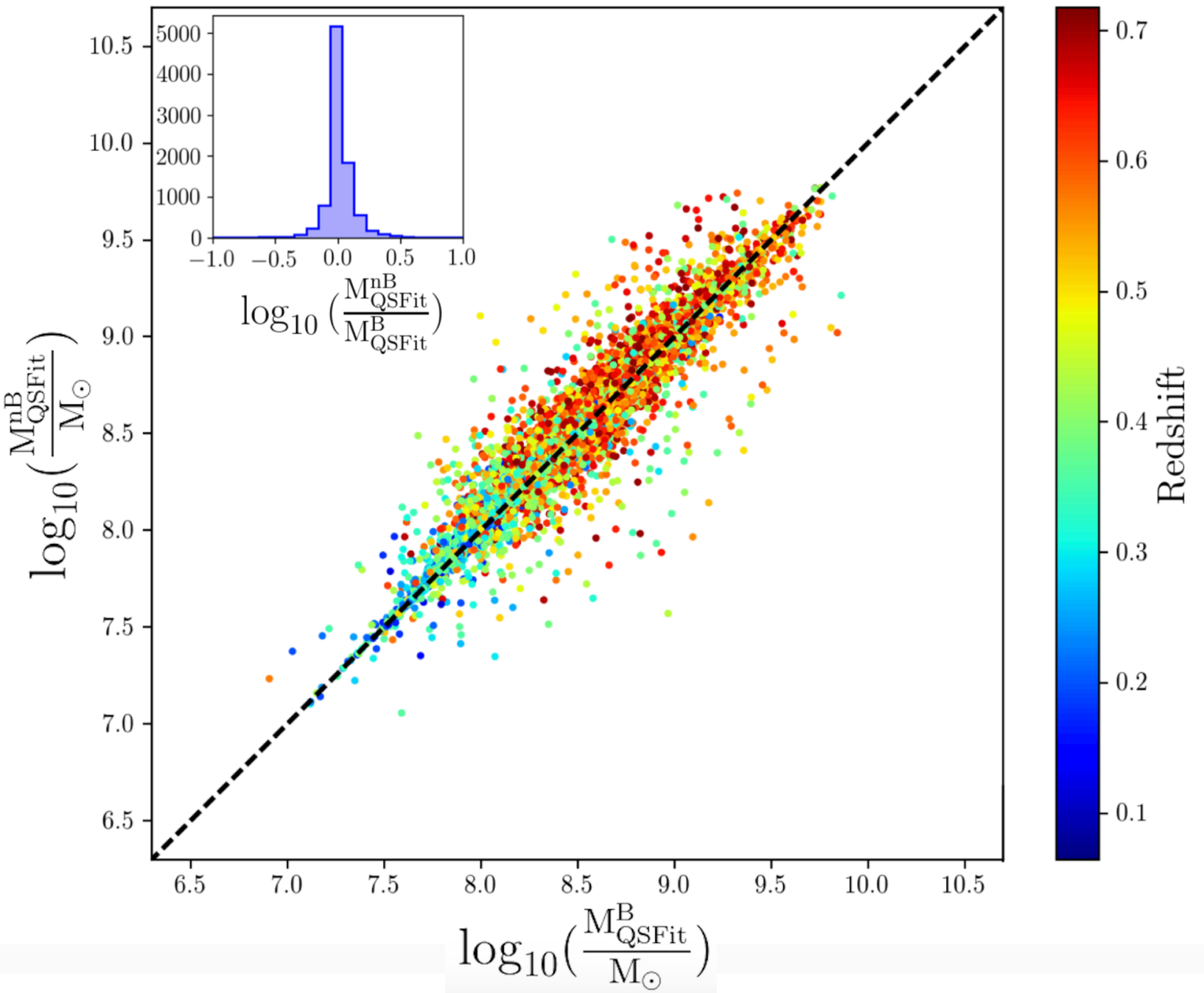
host galaxy component

BALMER COMPONENT



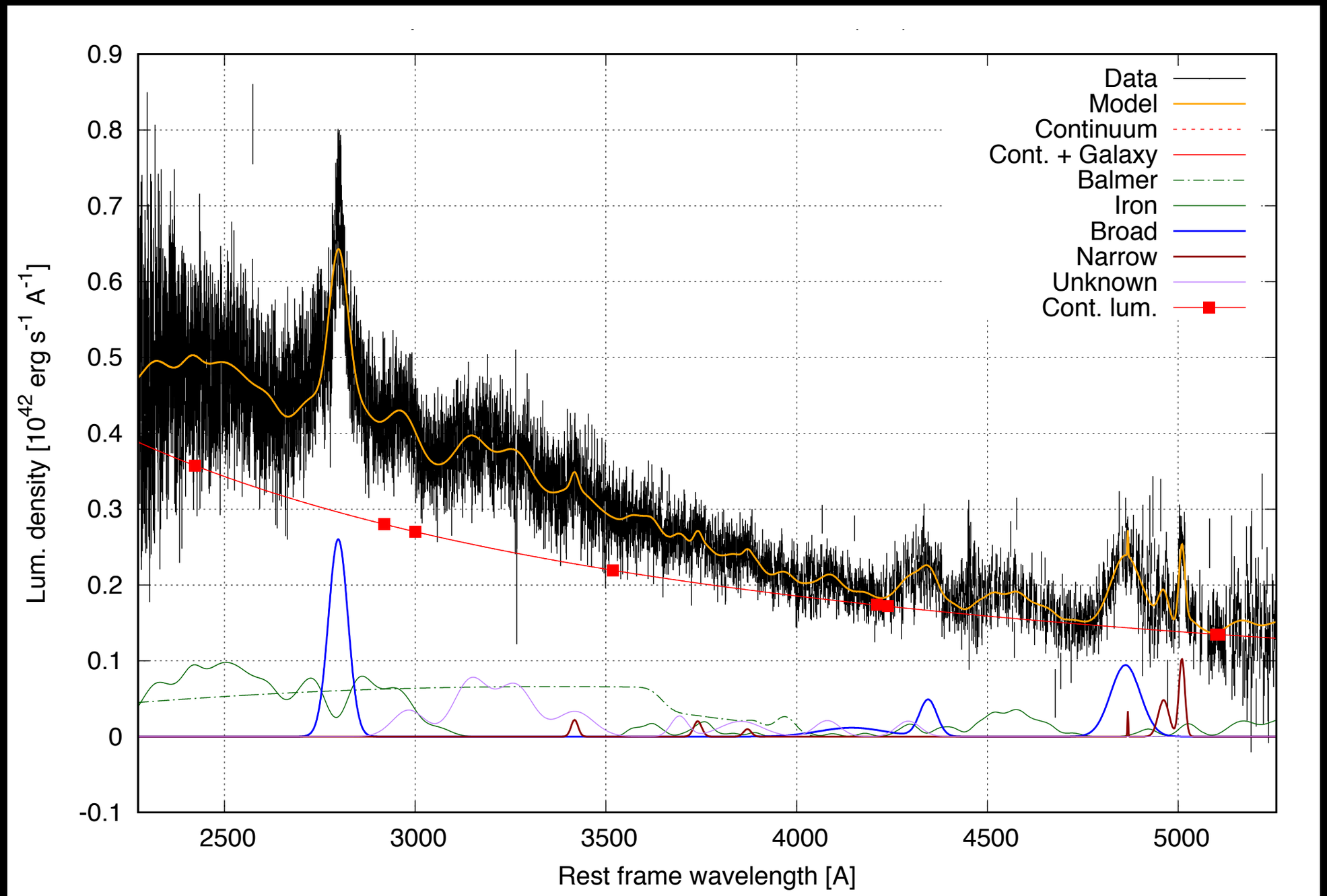
BALMER COMPONENT





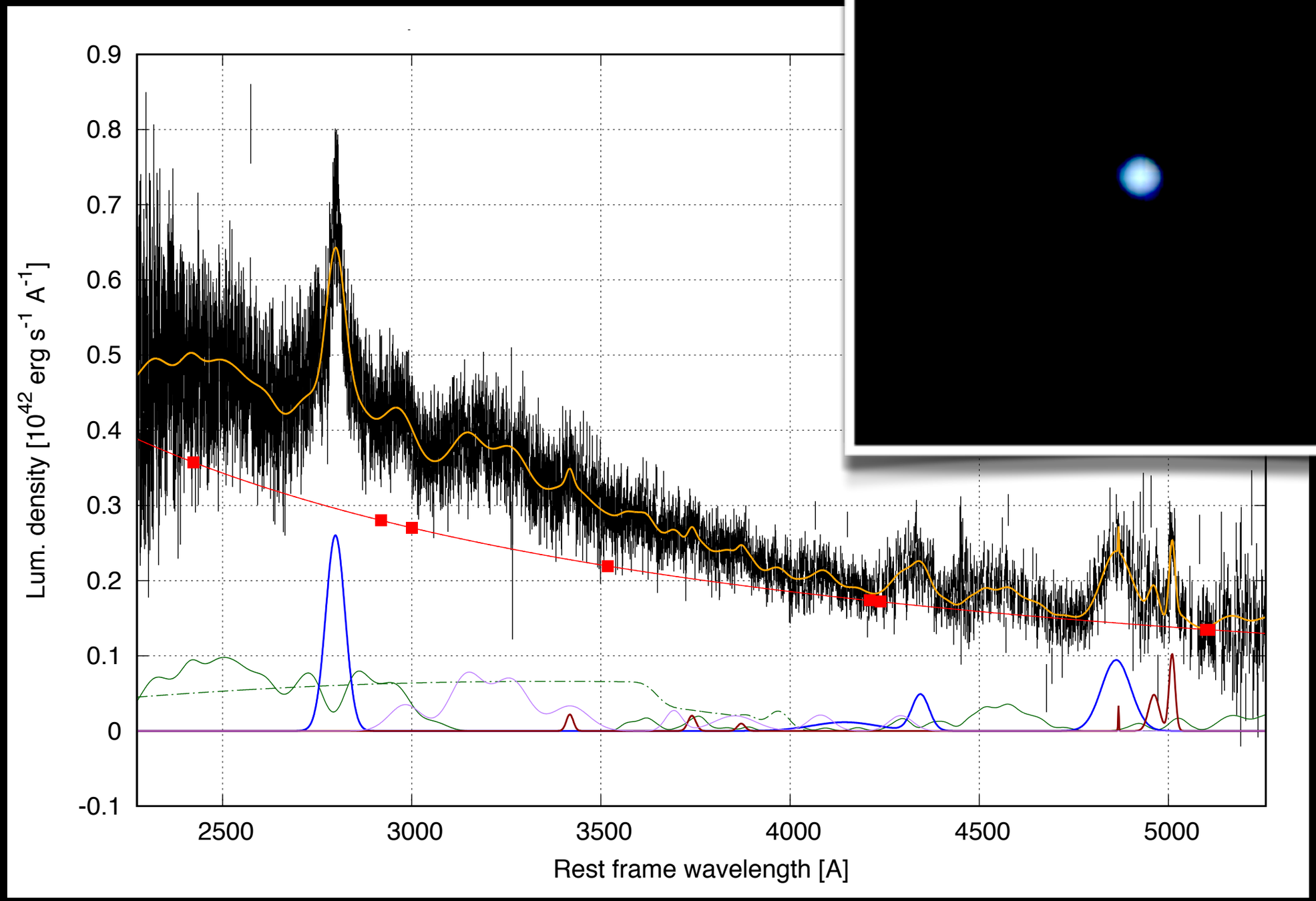
HOST GALAXY COMPONENT

Z ~ 0.7



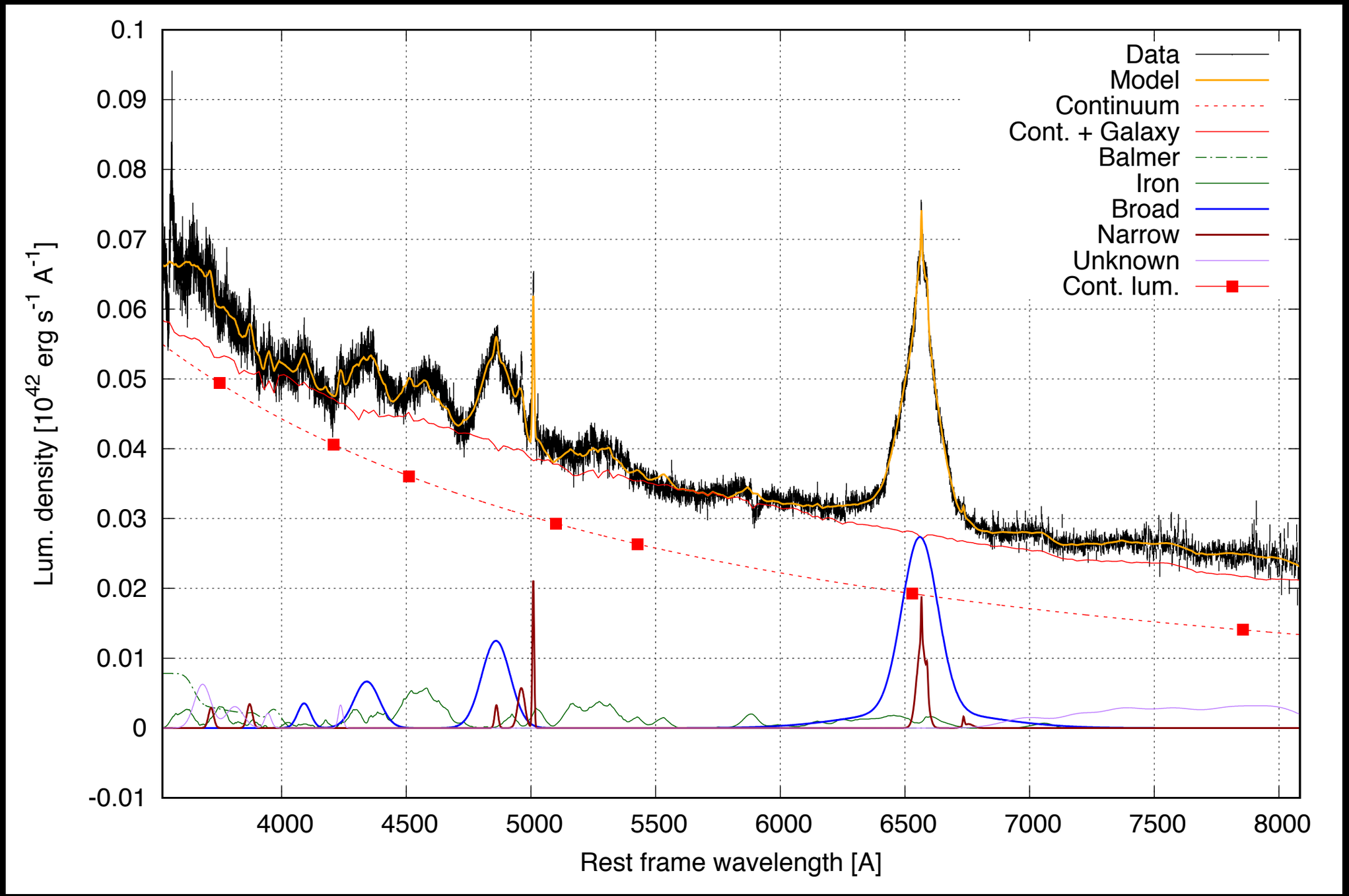
HOST GALAXY COMPONENT

Z ~ 0.7



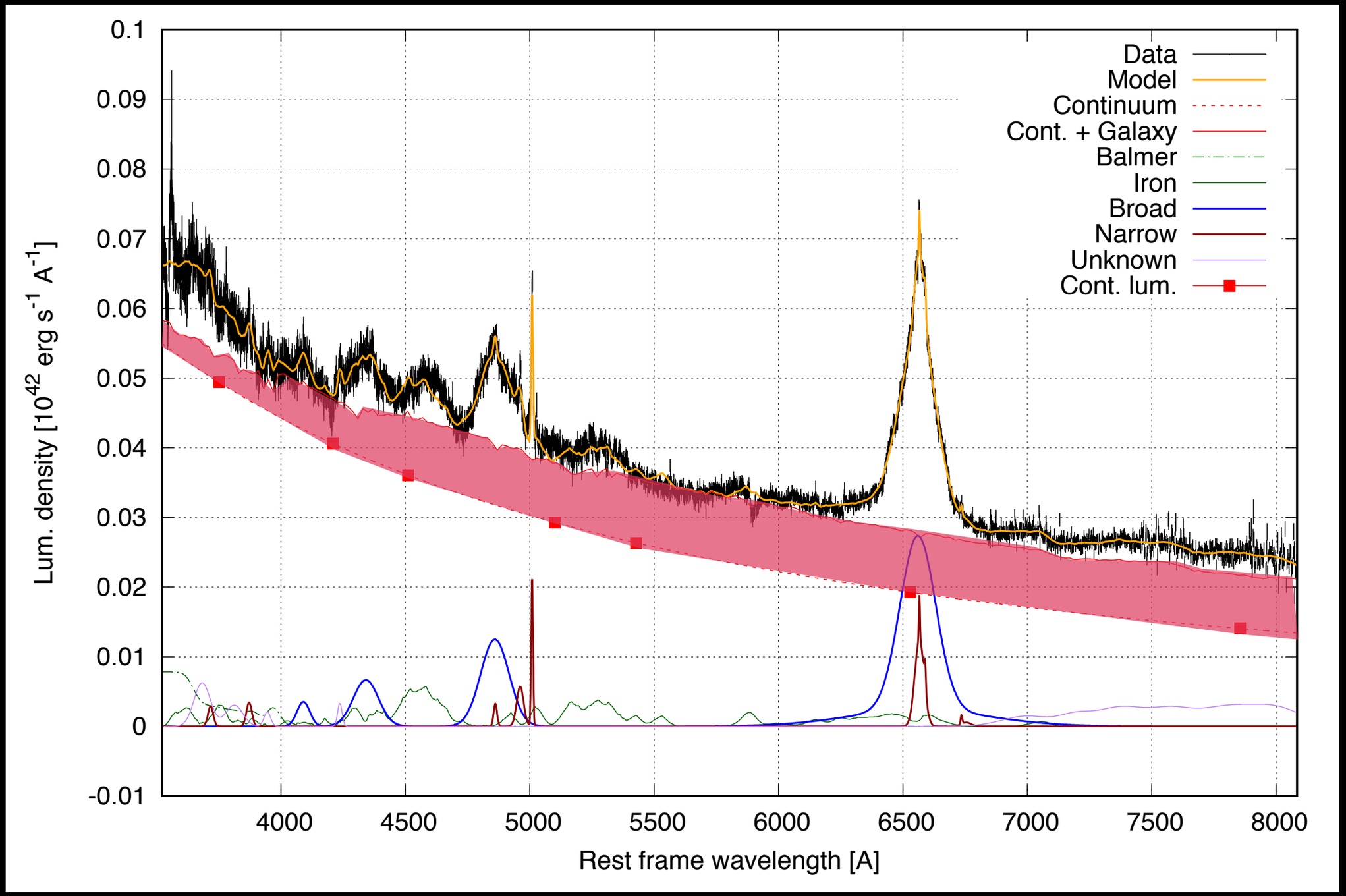
HOST GALAXY COMPONENT

Z ~ 0.1



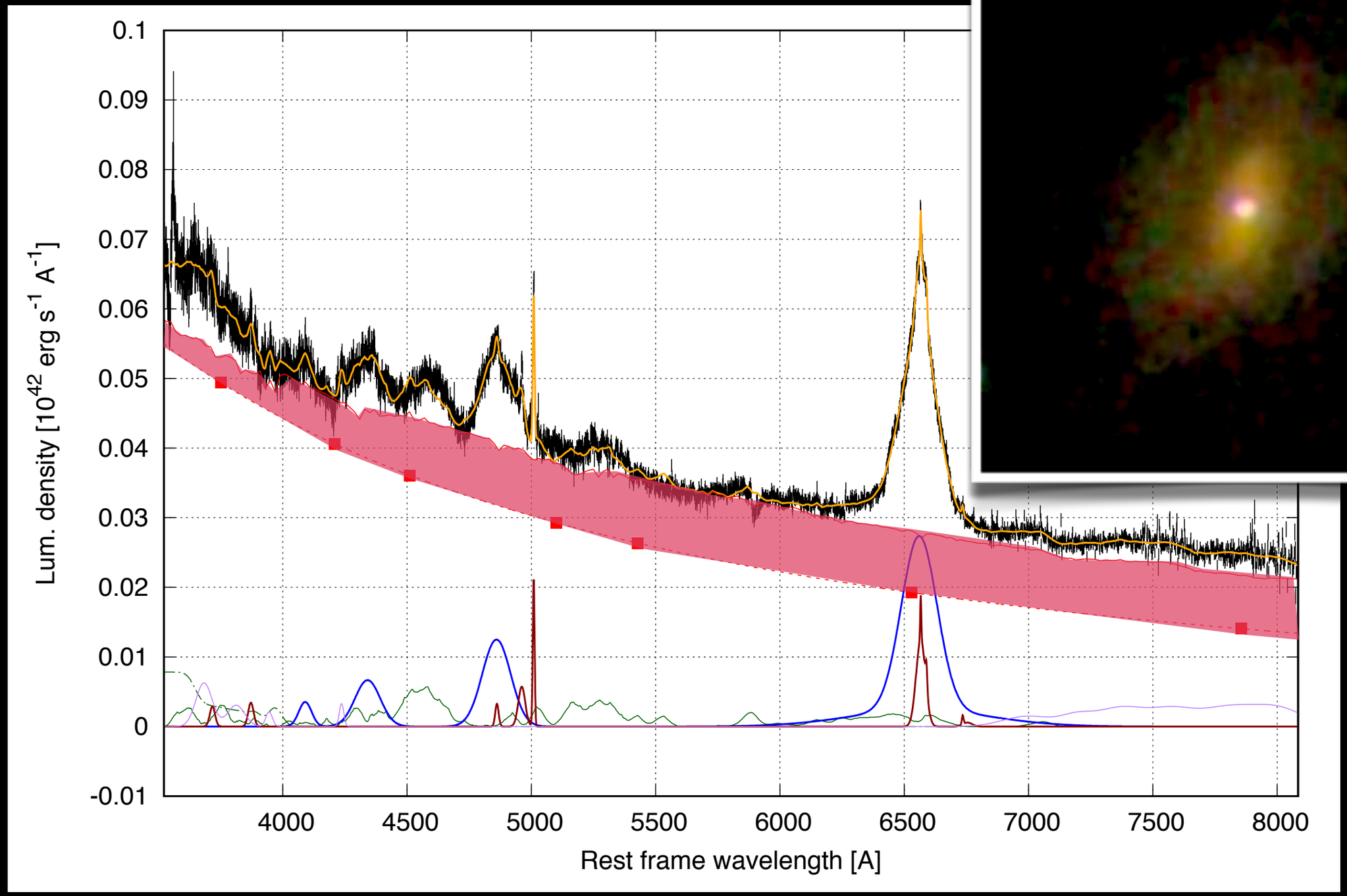
HOST GALAXY COMPONENT

Z ~ 0.1



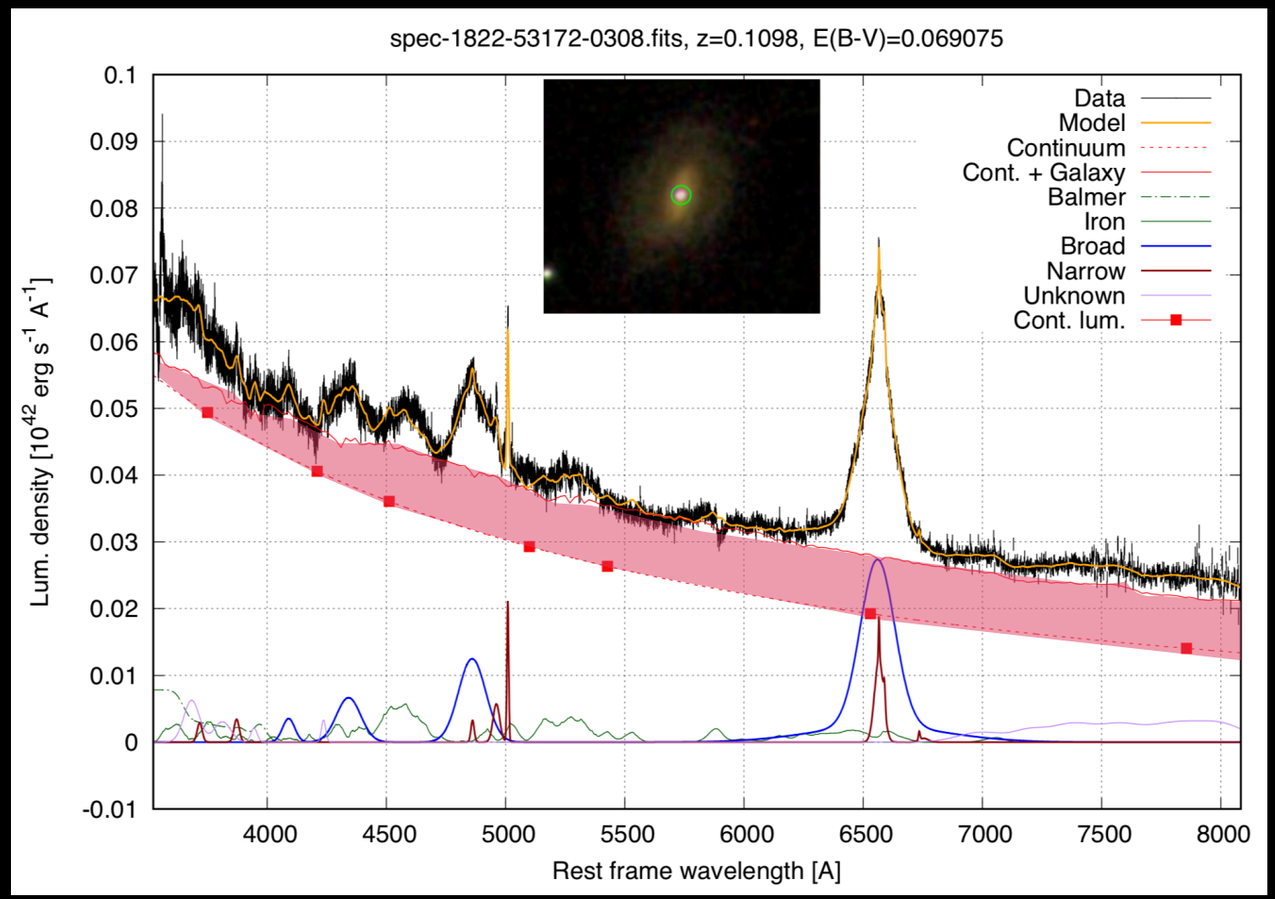
HOST GALAXY COMPONENT

Z ~ 0.1

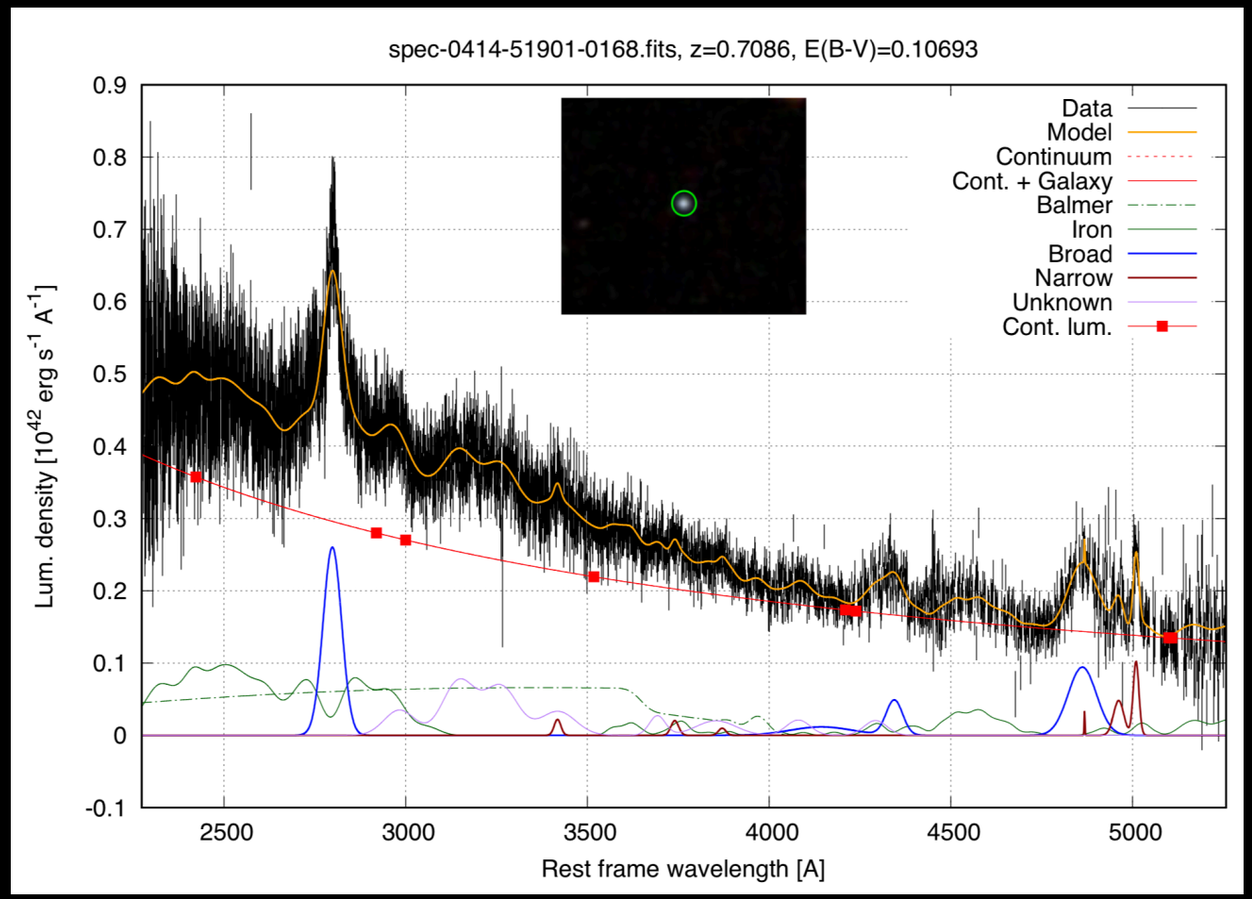


HOST GALAXY COMPONENT

Z ~ 0.1



Z ~ 0.7

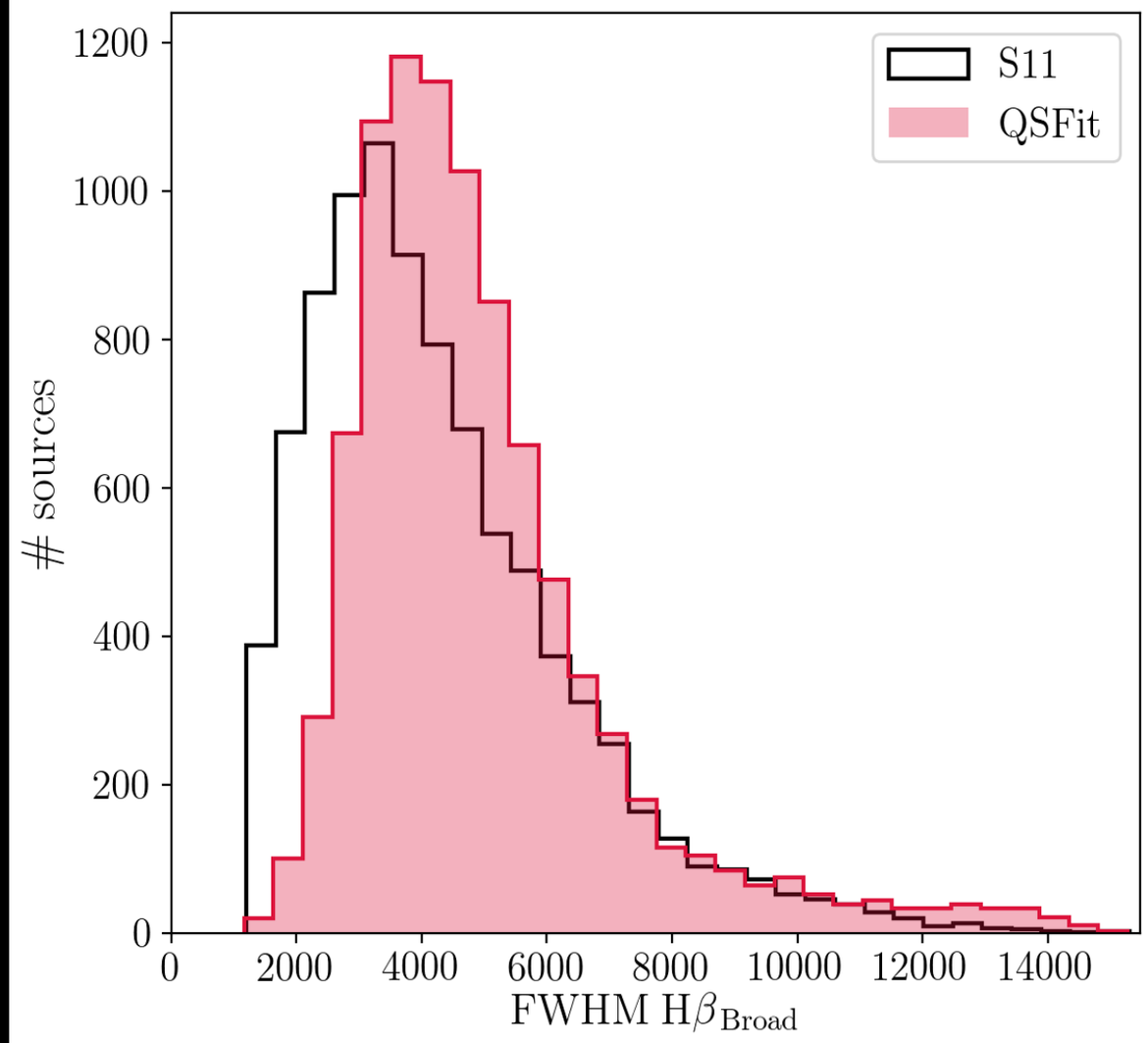


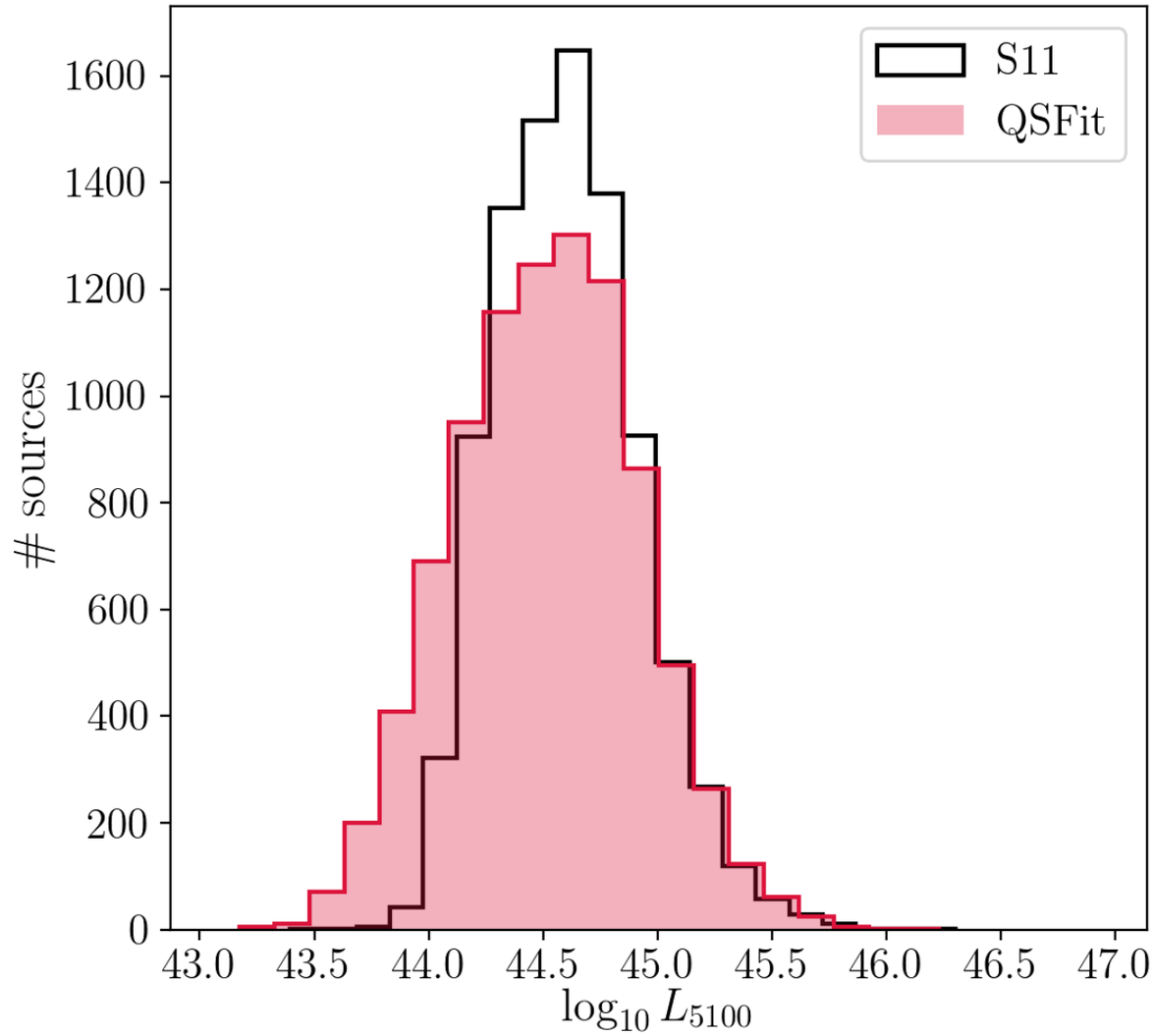
Affects

1. Continuum luminosity
2. FWHM of the BEL

$\Rightarrow$ M_{BH}

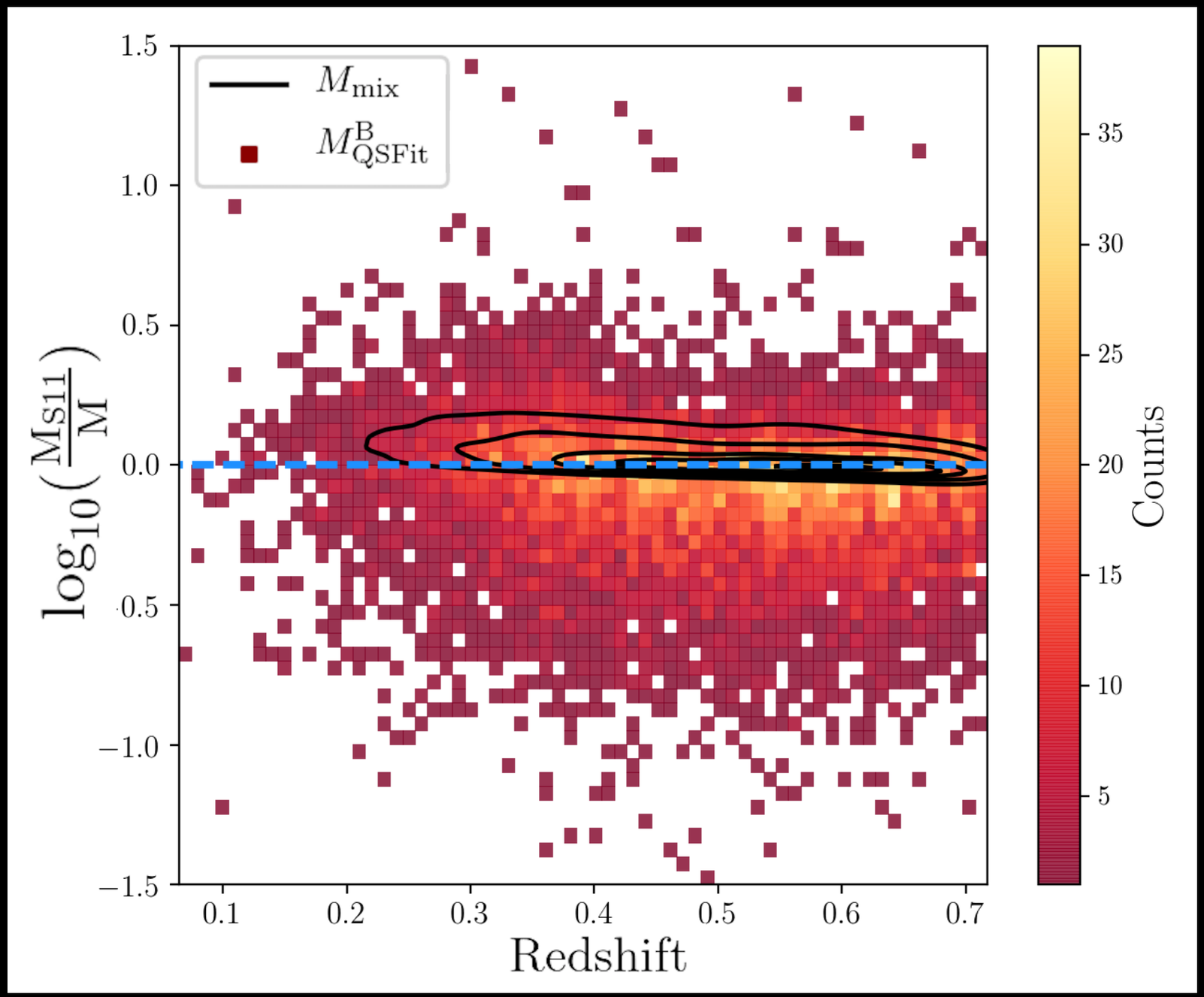
HOST GALAXY COMPONENT





$$M = 0.813 \times 10^8 \left(\frac{FWHM_{H\beta}}{1000\,km/s} \right)^2 \left(\frac{L_{5100}}{10^{46} erg/s} \right)^{0.5} M_\odot$$

HOST GALAXY COMPONENT



M_{mix} — **L_{cont}(QSFit)**, **FWHM(Shen11)**

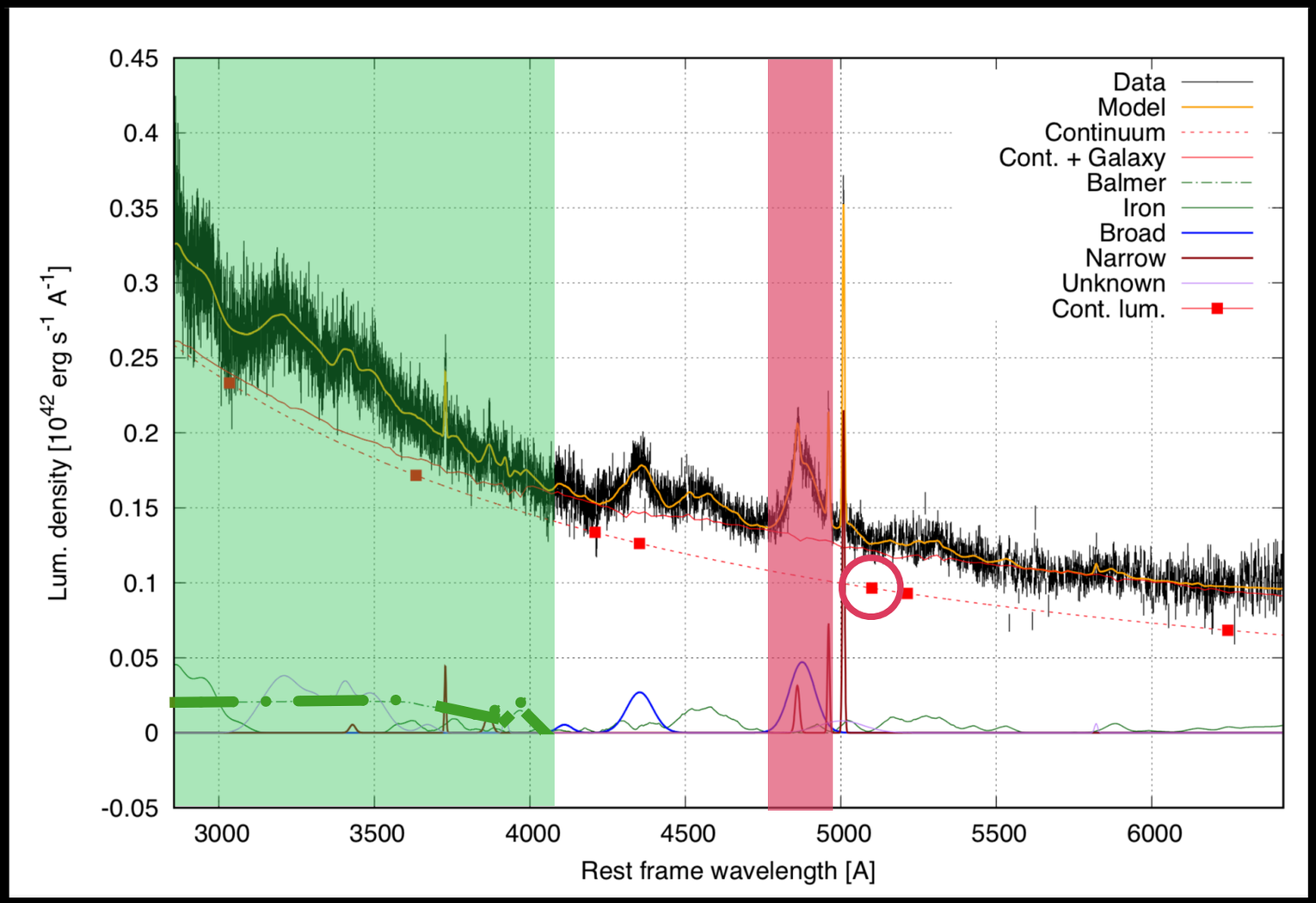
M_{QSFit} — **L_{cont}(QSFit)**, **FWHM(QSFit)**

CONCLUSIONS

1. *For our sample* the Balmer continuum component does not affect significantly the BH mass estimate

CONCLUSIONS

1. *For our sample* the Balmer continuum component does not affect significantly the BH mass estimate



CONCLUSIONS

1. *For our sample* the Balmer continuum component does not affect significantly the BH mass estimate

2. A detailed decomposition of the AGN spectrum is fundamental to minimize mass estimates uncertainties

CONCLUSIONS

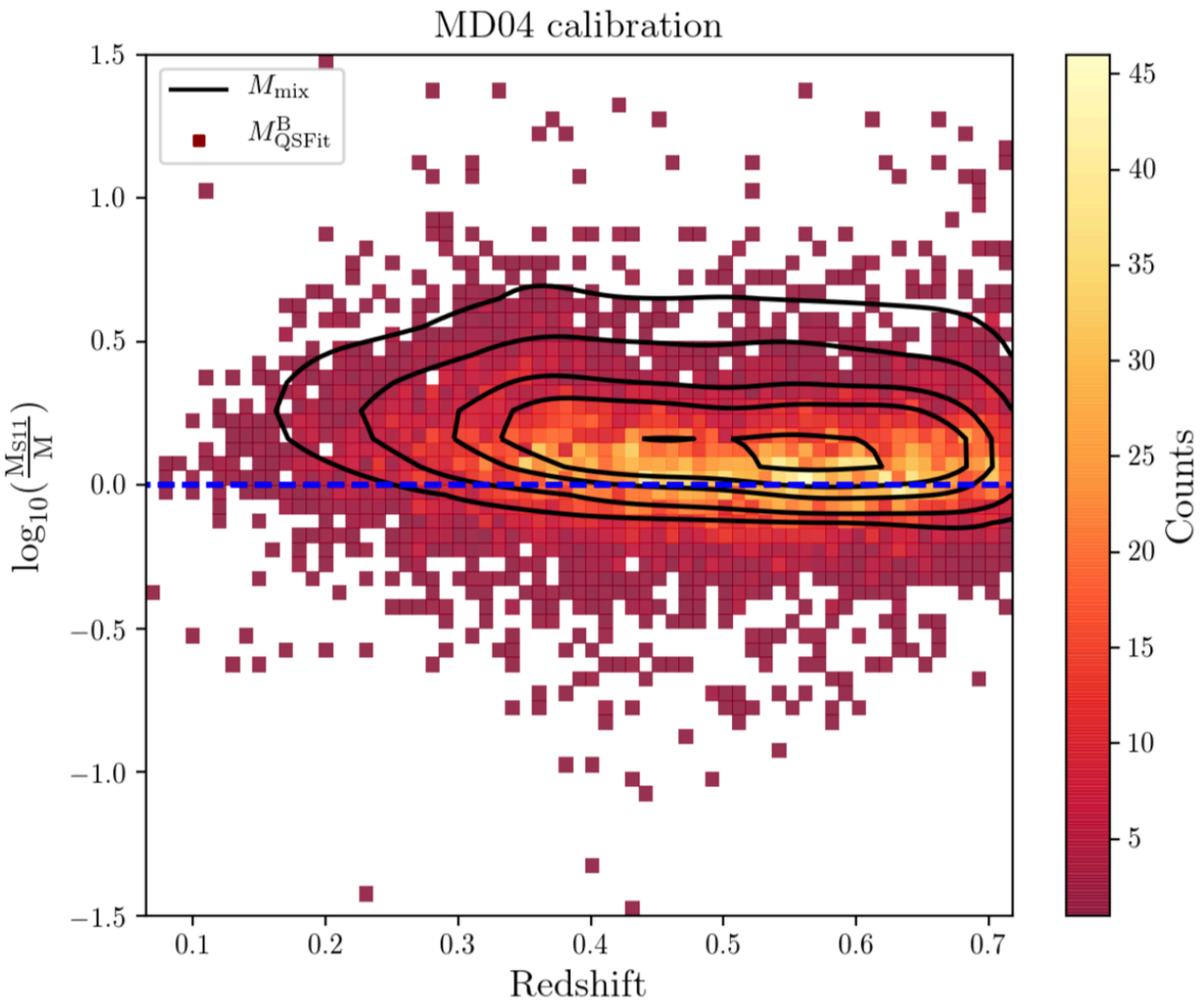
1. *For our sample* the Balmer continuum component does not affect significantly the BH mass estimate

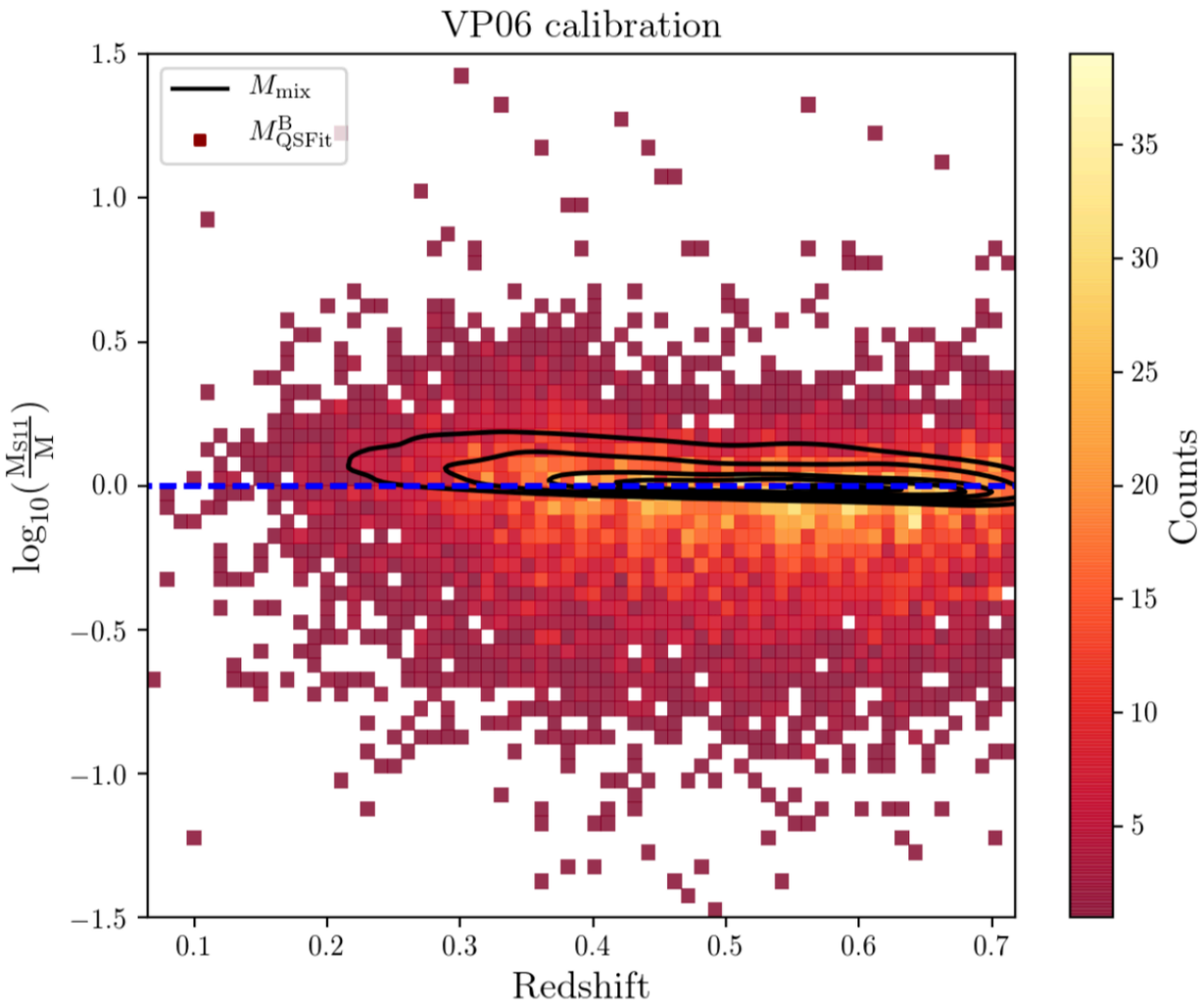
2. A detailed decomposition of the AGN spectrum is fundamental to minimize mass estimates uncertainties

Varisco L. et al., 2018, A&A
[https://arxiv.org/abs/1803.08504]

Thank you!

HOST GALAXY COMPONENT





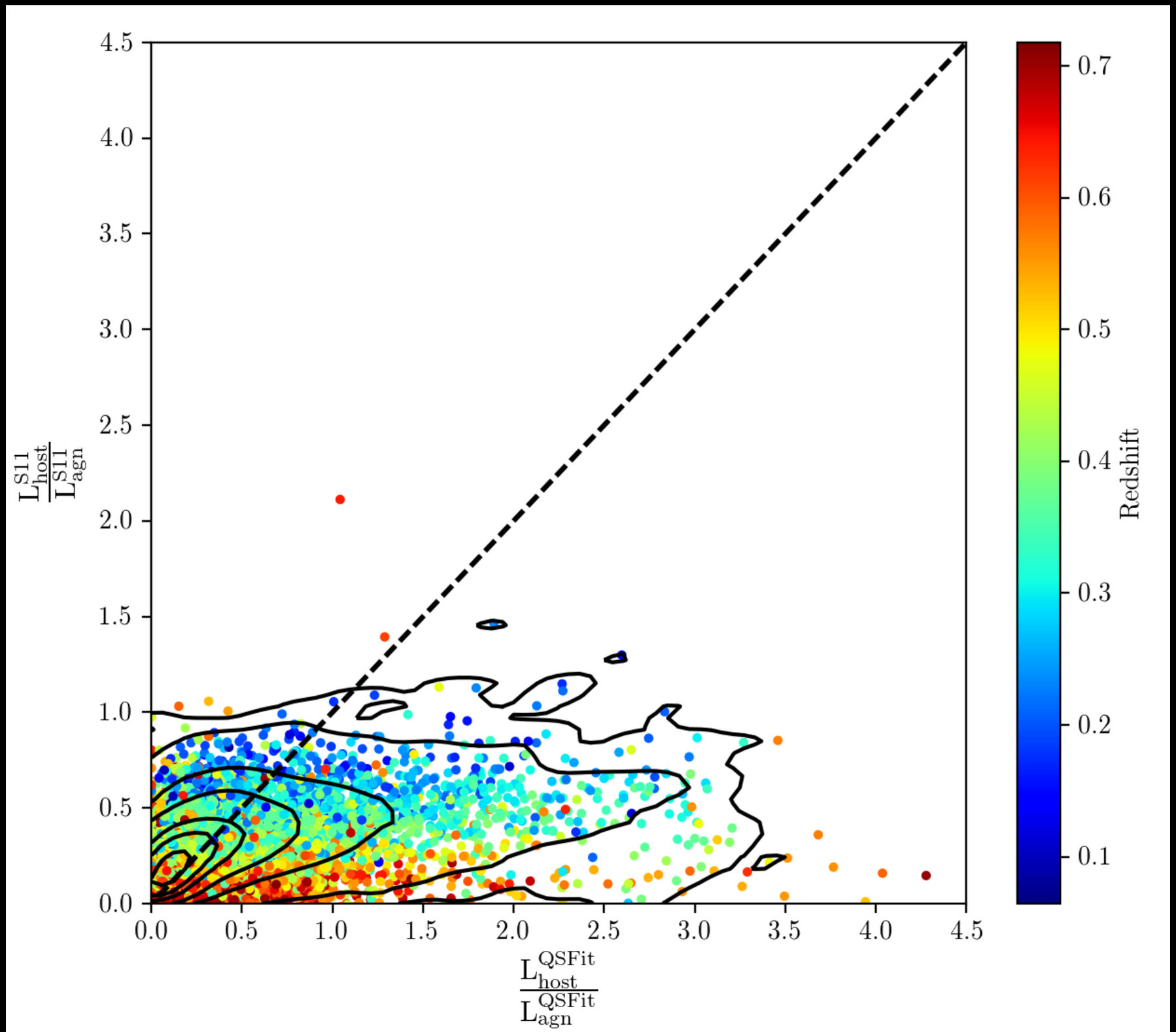
McLure & Dunlop 2004

$$\mathrm{M} = 0.78 \times 10^{8} \left(\frac{\mathrm{L_{5100}}}{10^{46} \mathrm{erg/s}} \right)^{0.61} \left(\frac{\mathrm{FWHM_{H\beta}}}{1000\,\mathrm{km/s}} \right)^{2} \mathrm{M_{\odot}}$$

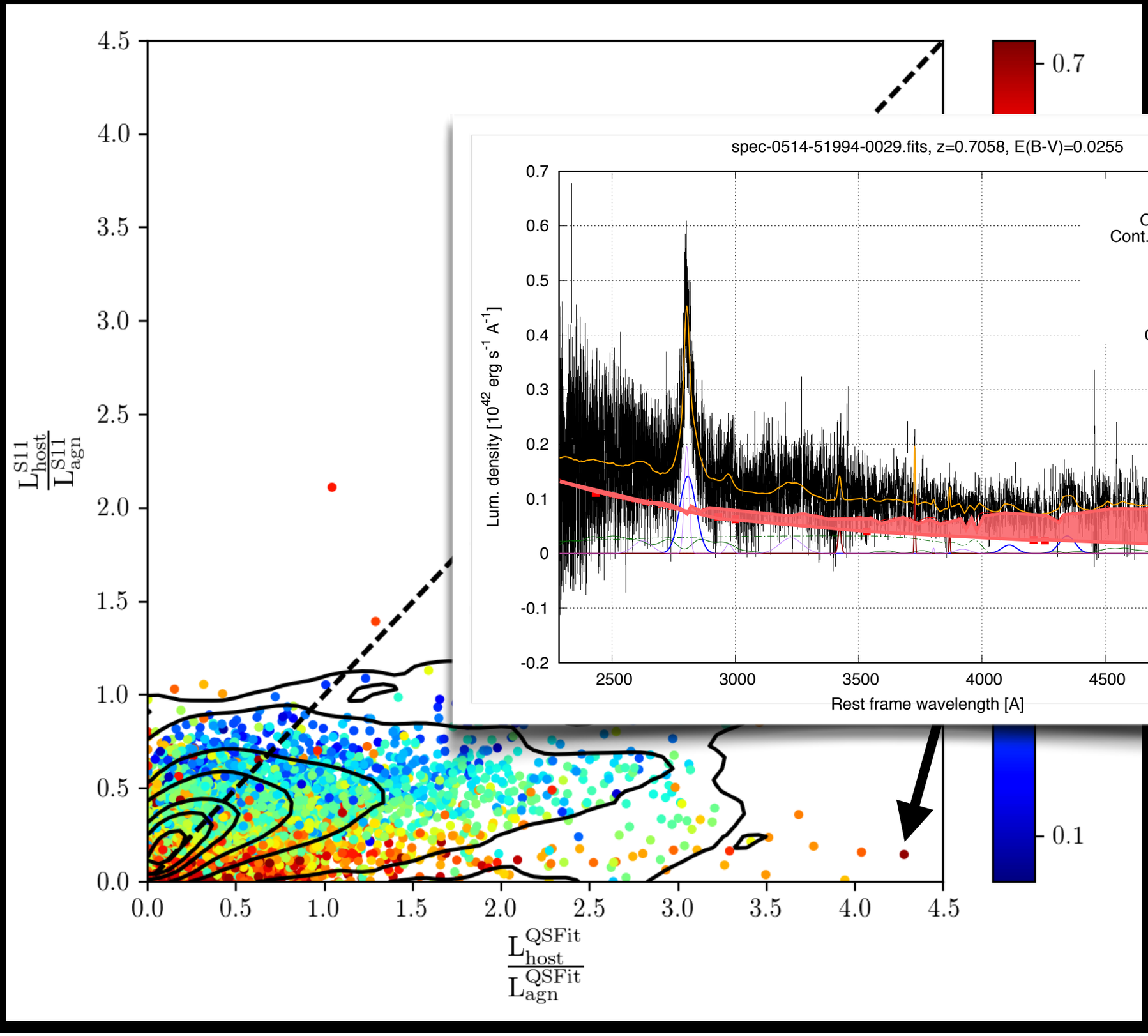
Vestergaard & Peterson (2006).

$$\mathrm{M} = 0.813 \times 10^{8} \left(\frac{\mathrm{L_{5100}}}{10^{46} \mathrm{erg/s}} \right)^{0.5} \left(\frac{\mathrm{FWHM_{H\beta}}}{1000\,\mathrm{km/s}} \right)^{2} \mathrm{M_{\odot}}$$

GALAXY CORRECTION



GALAXY CORRECTION



GALAXY CORRECTION