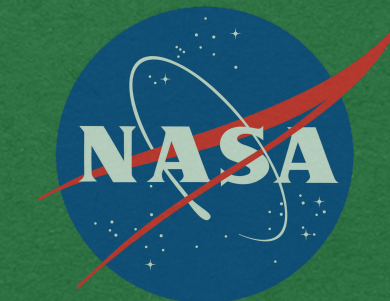


Does a universal mode of AGN accretion suggest AGN are not special?

Mackenzie Jones

Dartmouth College ★ NASA Harriett Jenkins Fellow

In collaboration with Ryan Hickox, Simon Mutch, Darren Croton, Andrew Ptak, Michael DiPompeo



Are AGN Special?

What galaxies and halos host an AGN?

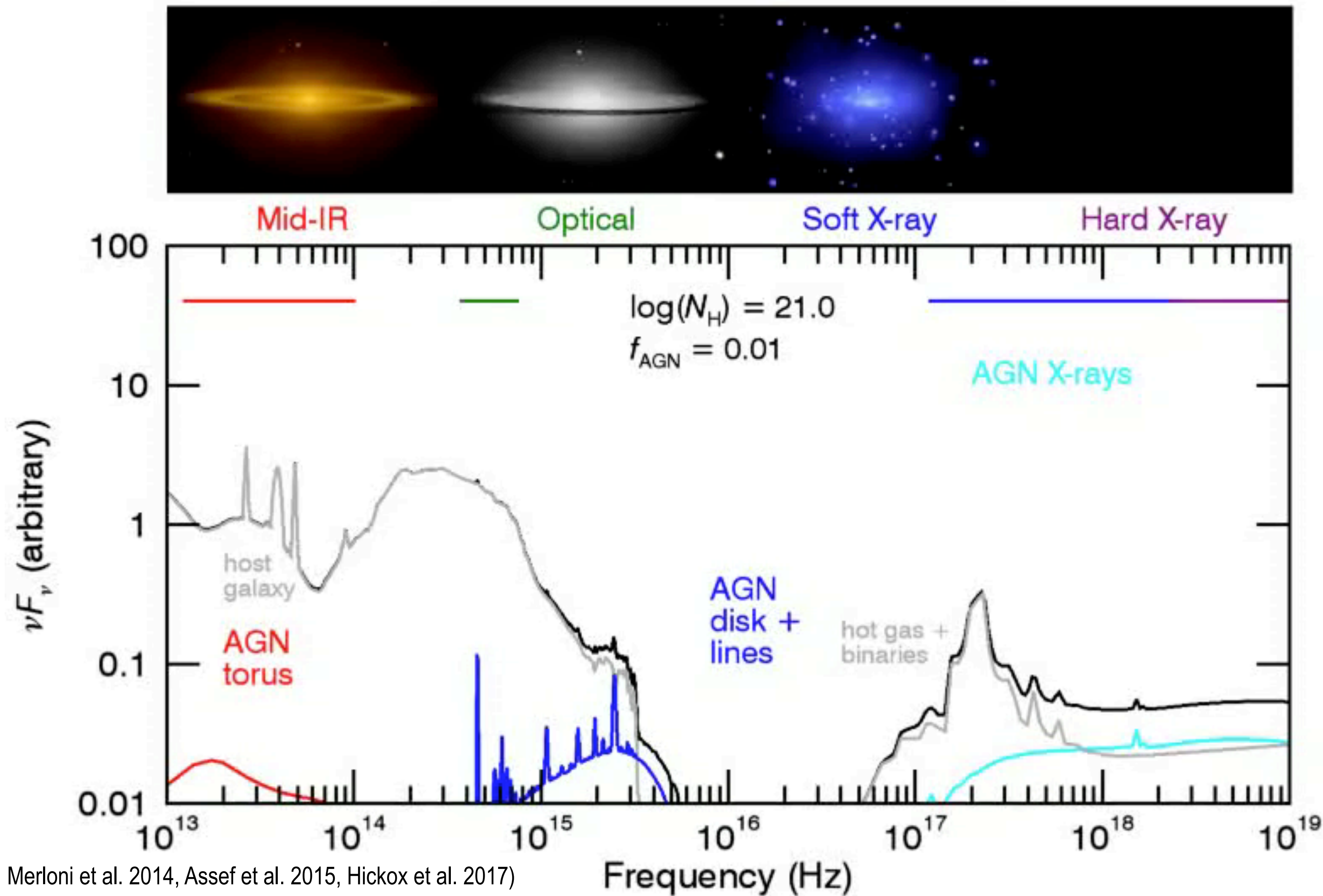
Do AGN and galaxies grow together?

What AGN contribute to the cosmic X-ray background?

Observational Biases: Dilution

Composite AGN and galaxy SEDs and images for varying AGN dominance and obscuration

Hickox & Alexander (2018)
"Obscured Active Galactic Nuclei"
ARA&A, Volume 56

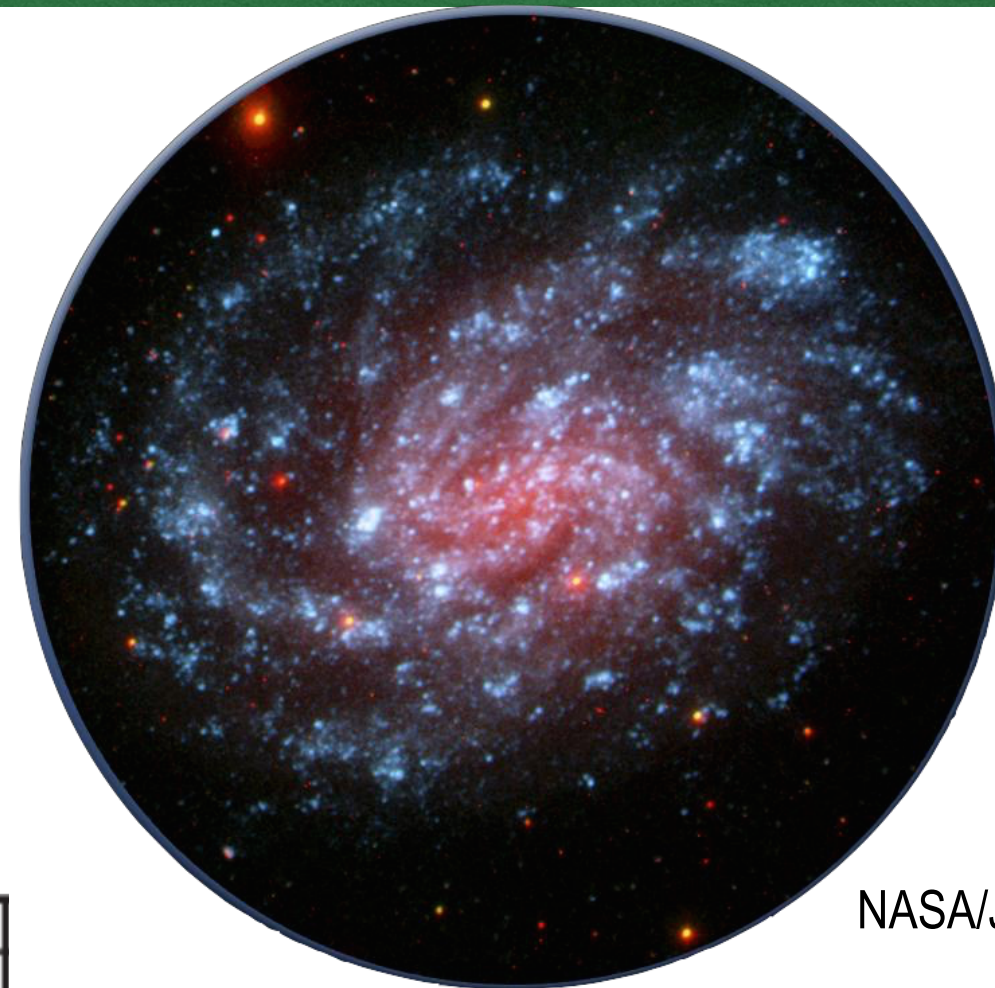


(e.g. Hickox et al. 2007, Treister et al. 2010, Merloni et al. 2014, Assef et al. 2015, Hickox et al. 2017)

(e.g. Hopkins et al. 2009, Trump et al. 2016, Jones et al. 2016)

Observed AGN Accretion in the Optical

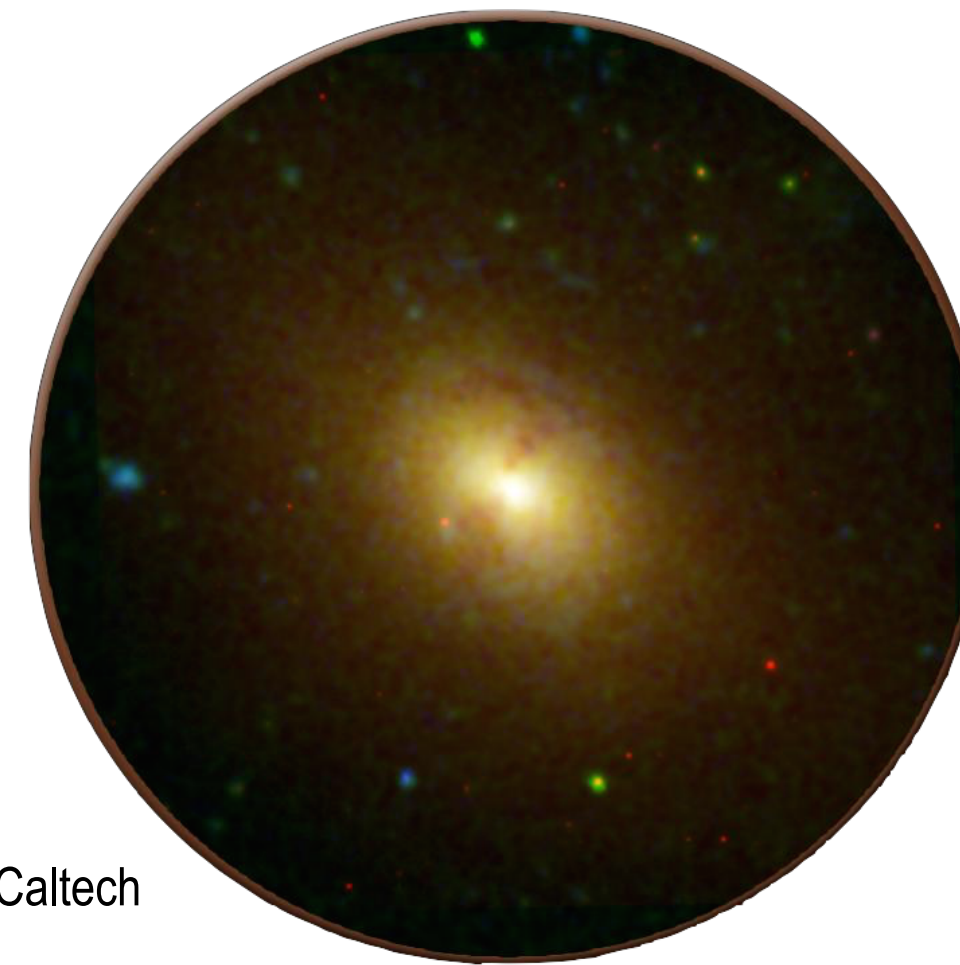
Young
Galaxies



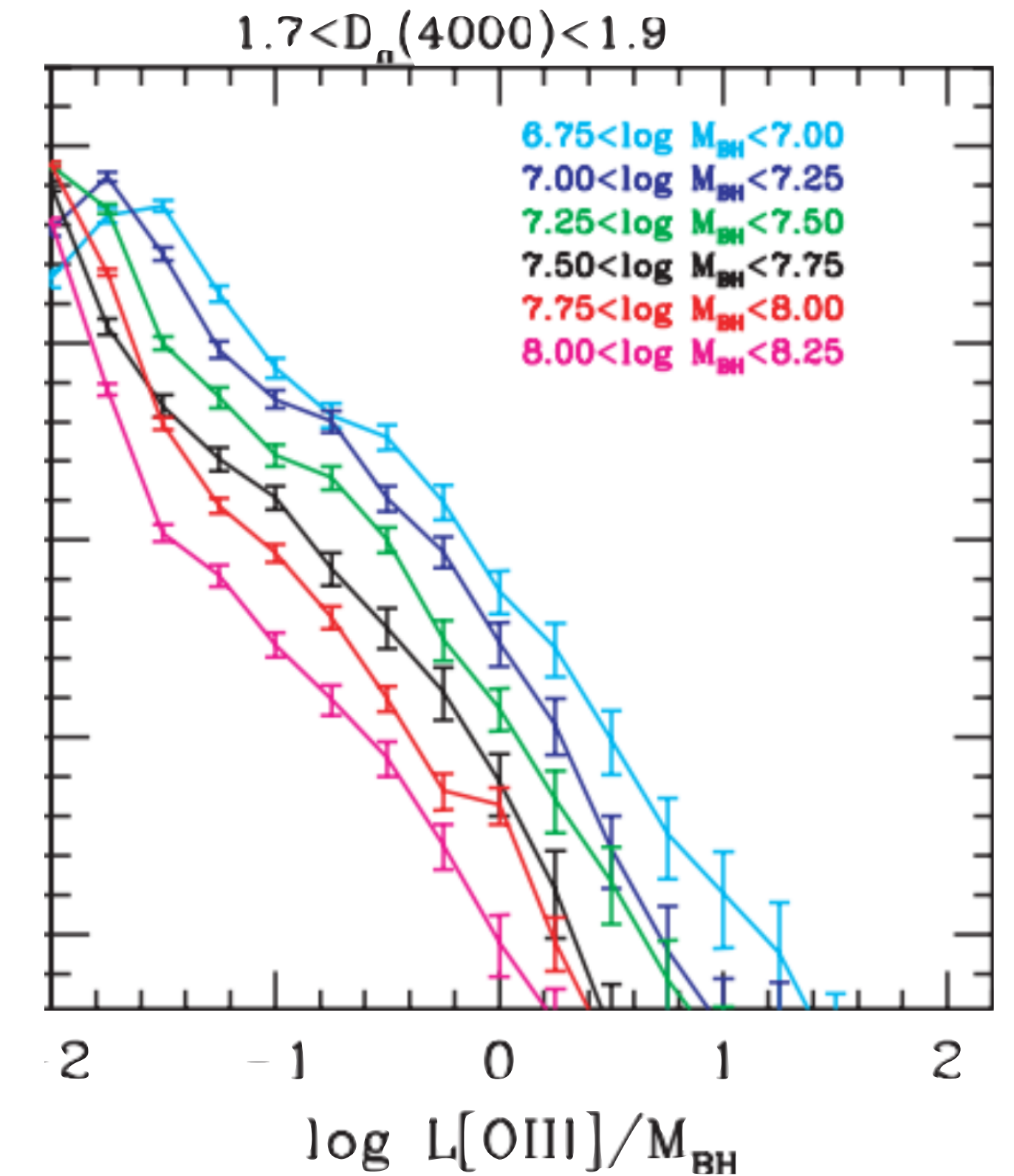
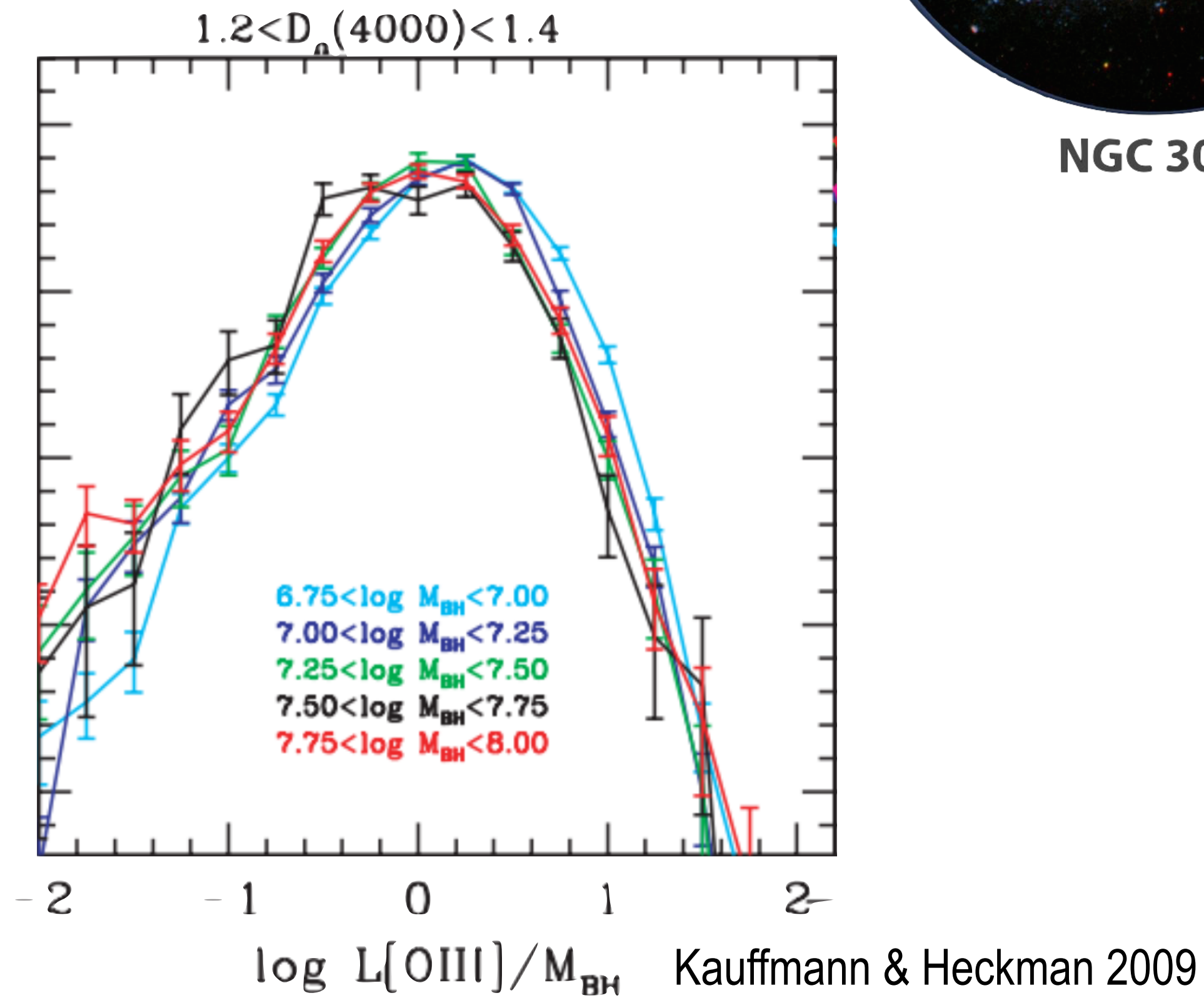
NGC 300

NASA/JPL-Caltech

Older
Galaxies

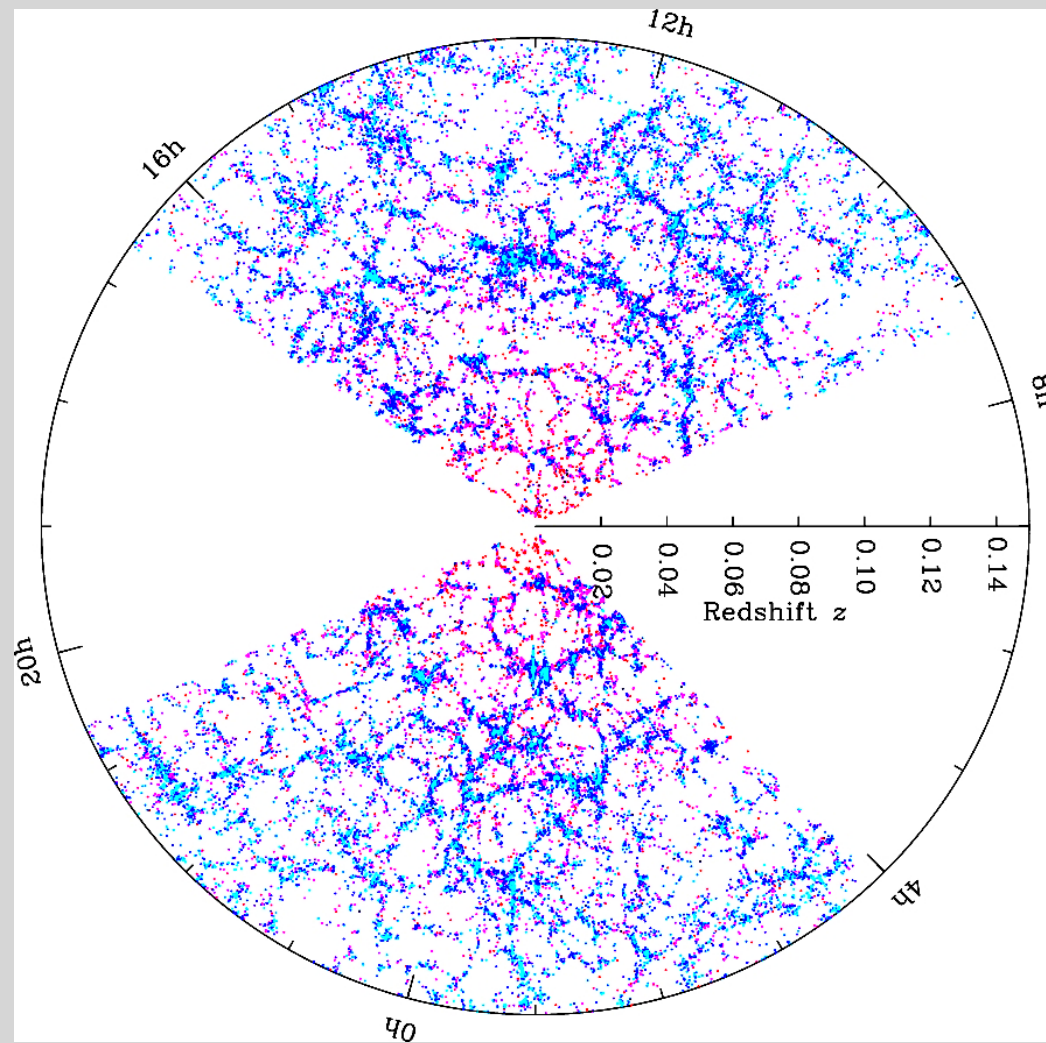


NGC 1316

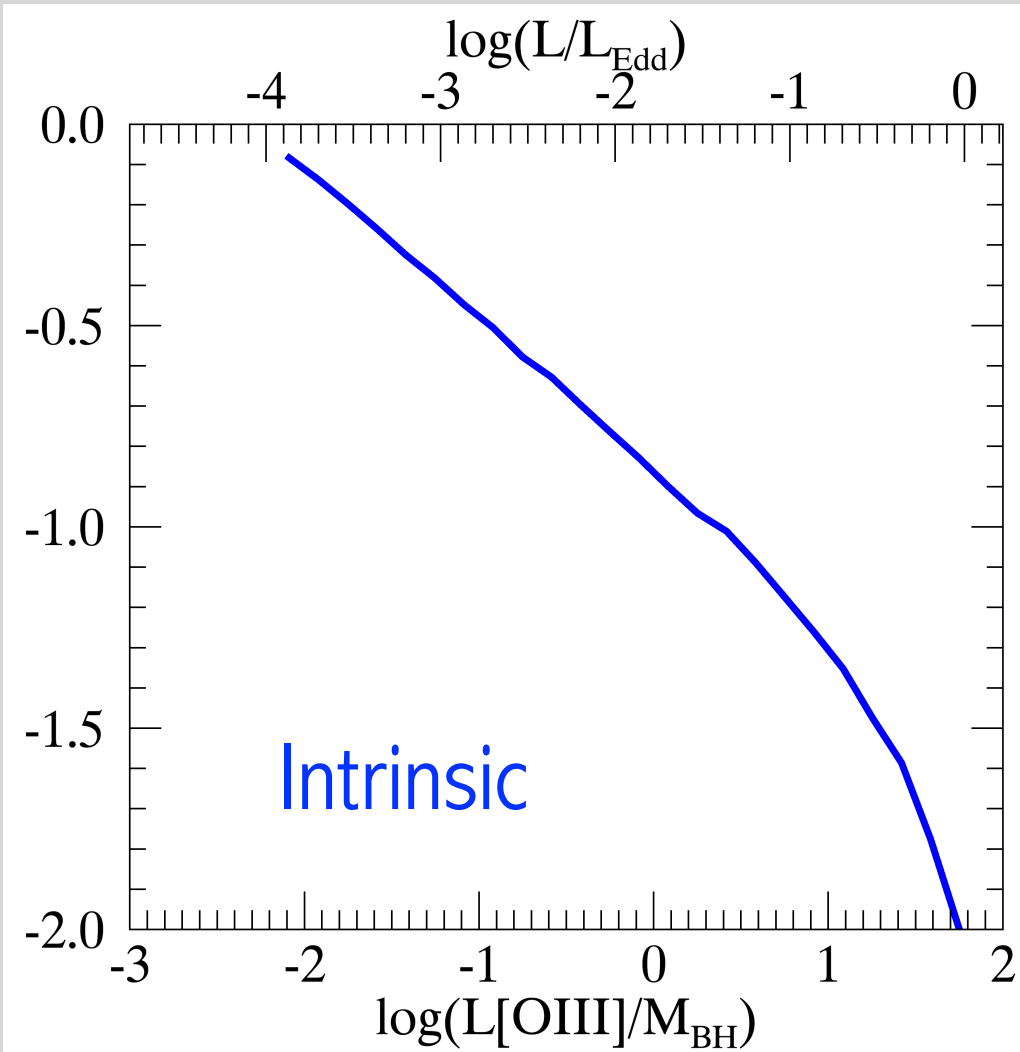


Building Simulated AGN in the Optical

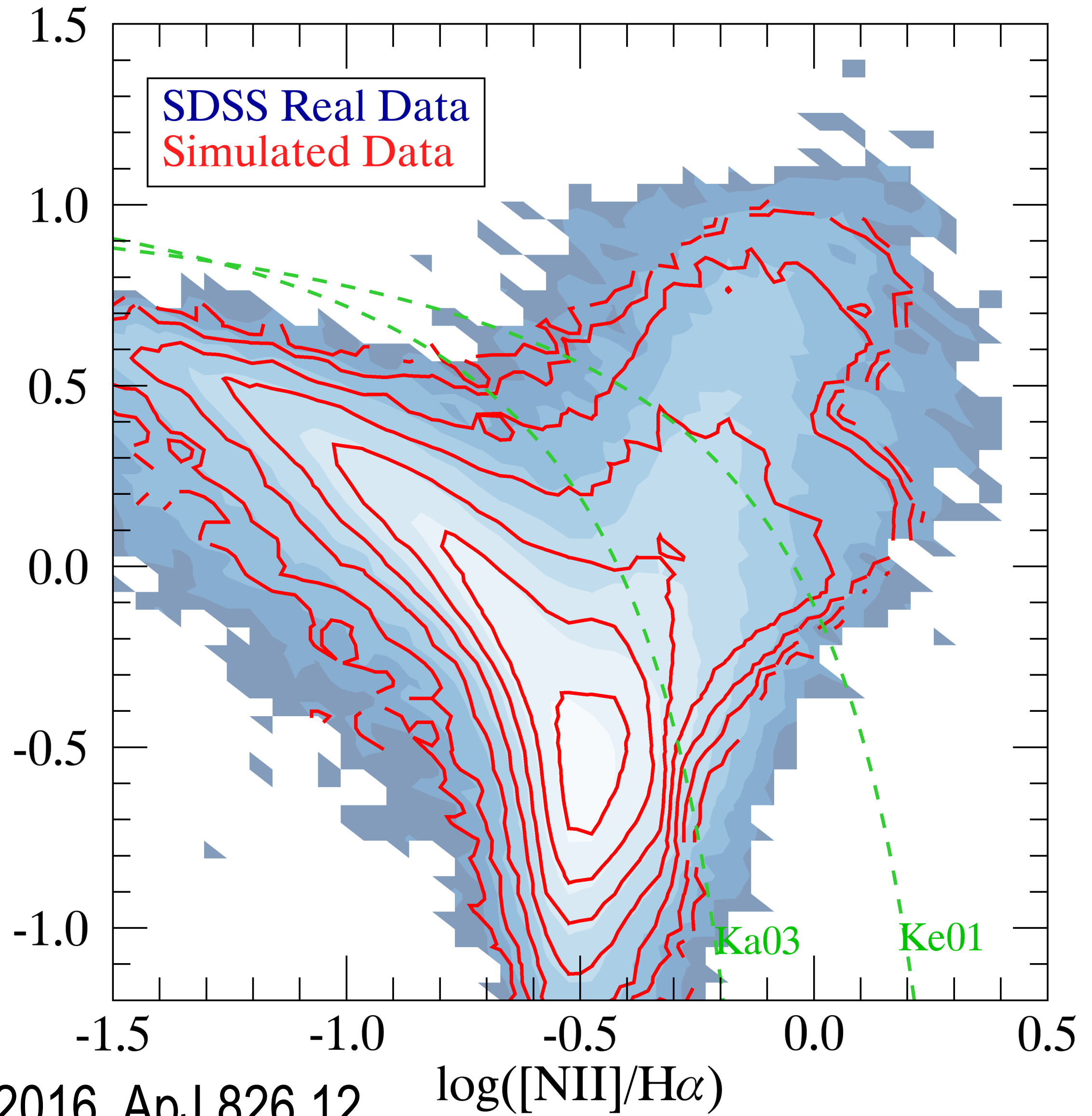
SDSS Star Forming Galaxies



AGN Accretion Rate



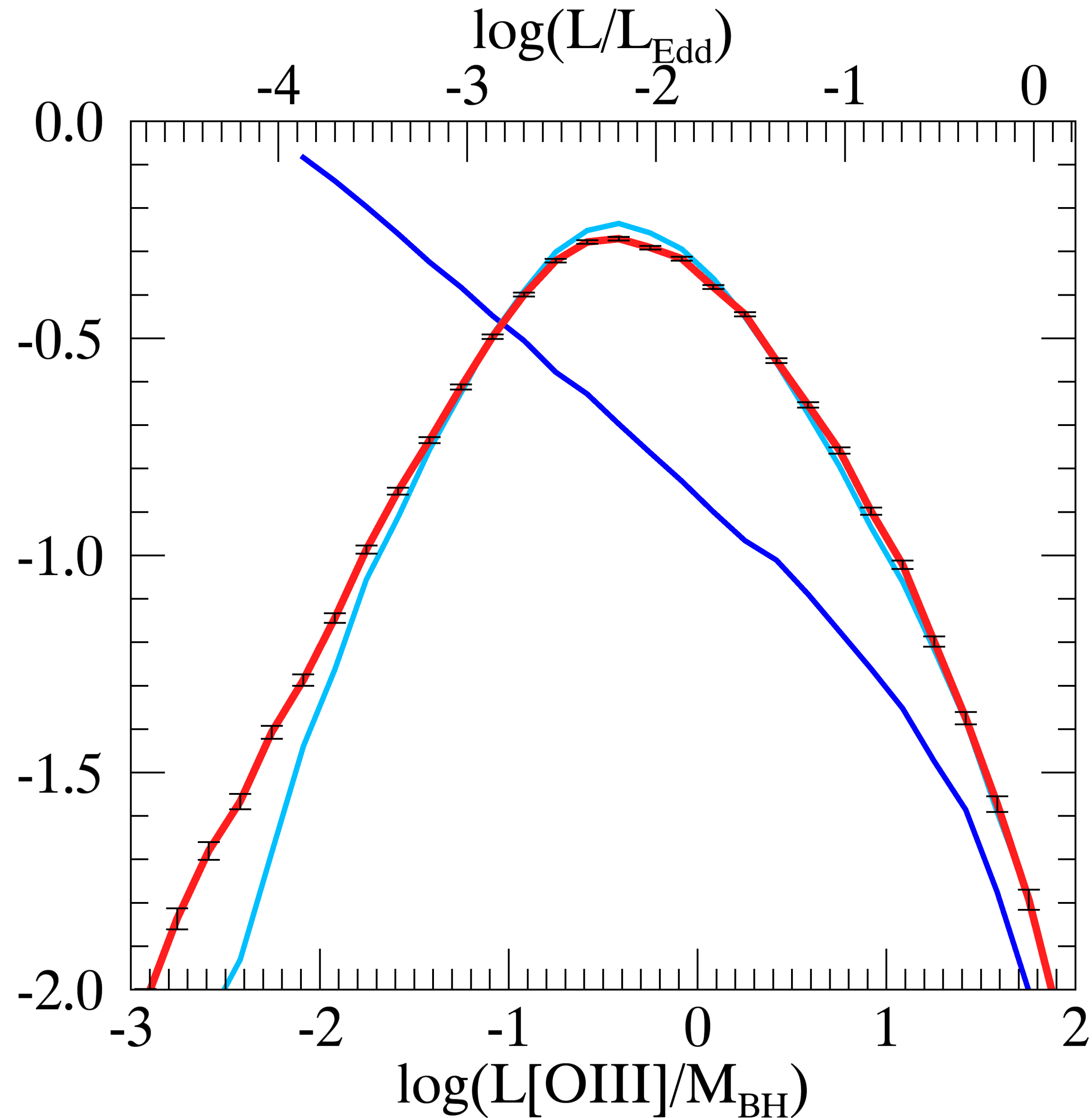
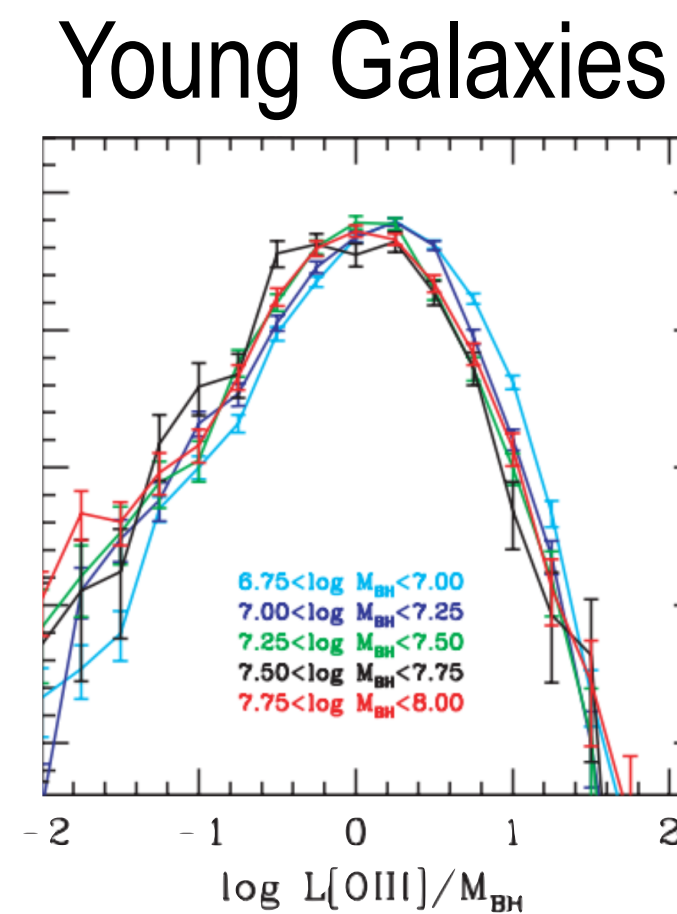
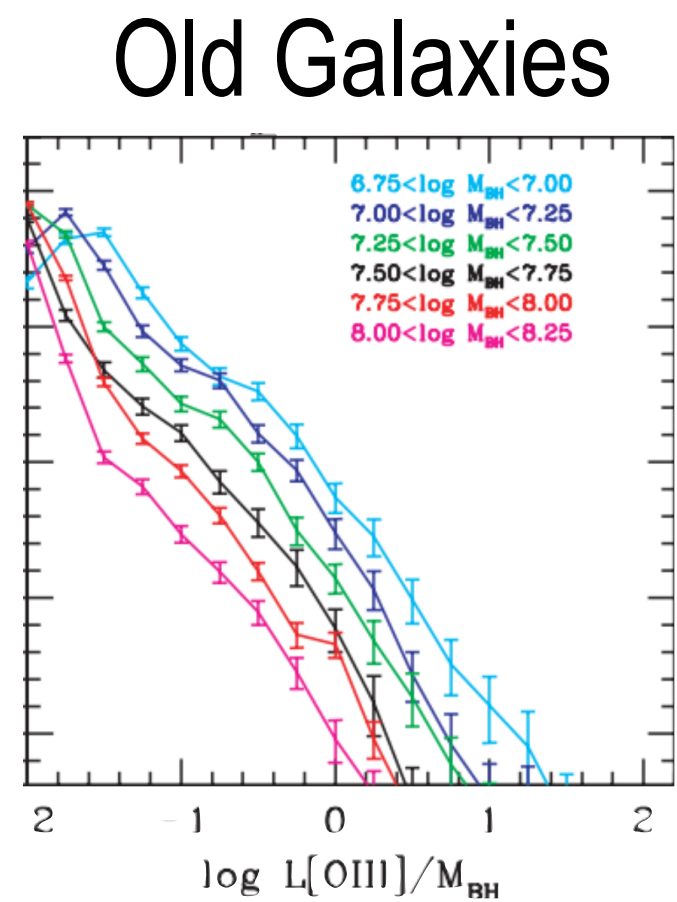
$\log([\text{OIII}]/\text{H}\beta)$



Jones et al 2016, ApJ 826, 12

Testing the Simulated Sample: What AGN Do We Observe?

Eddington Ratio Distribution

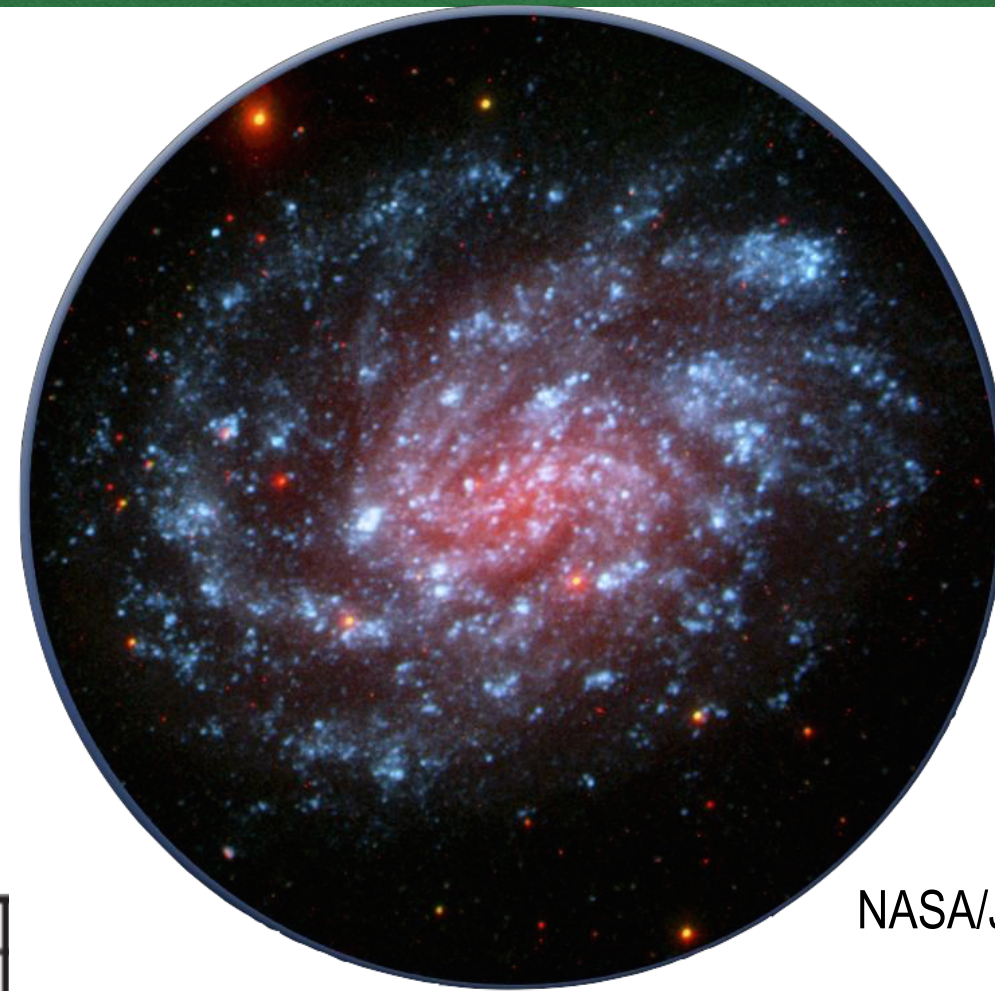


Intrinsic
 Simulated
 Observed

Jones et al 2016, ApJ 826,12

A Summary of AGN Accretion in the Optical

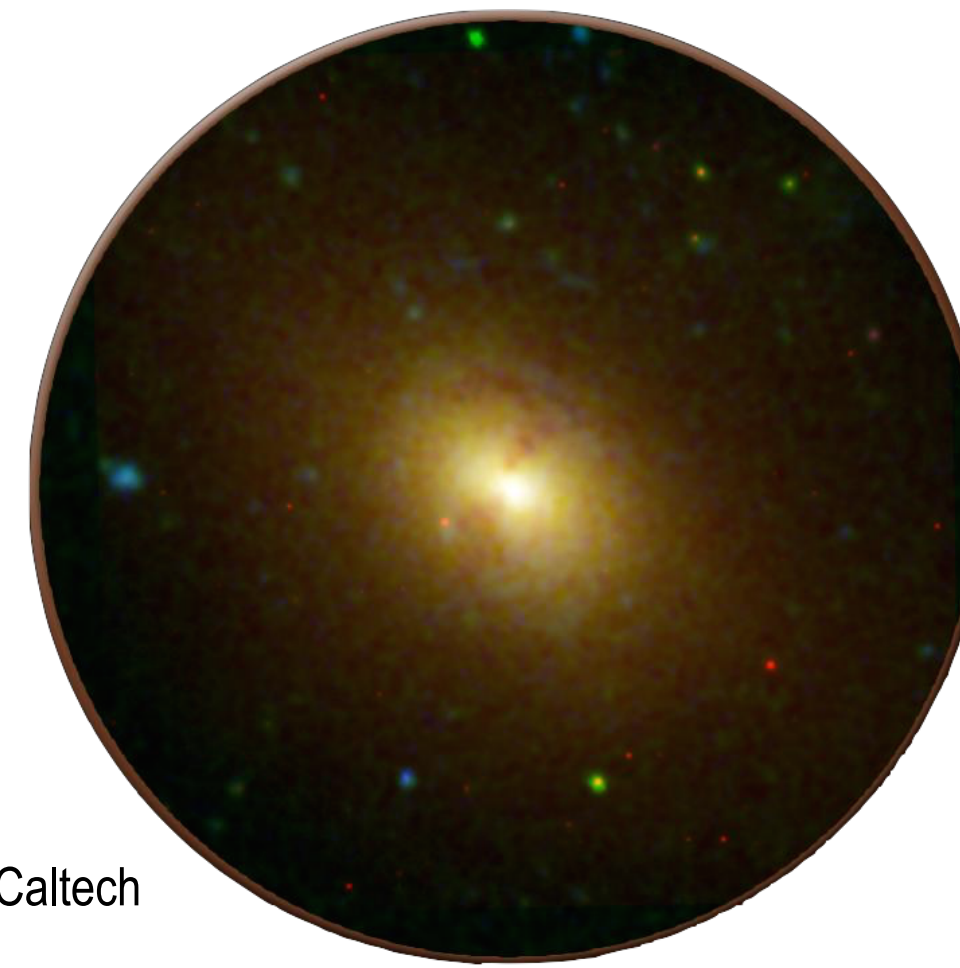
Young
Galaxies



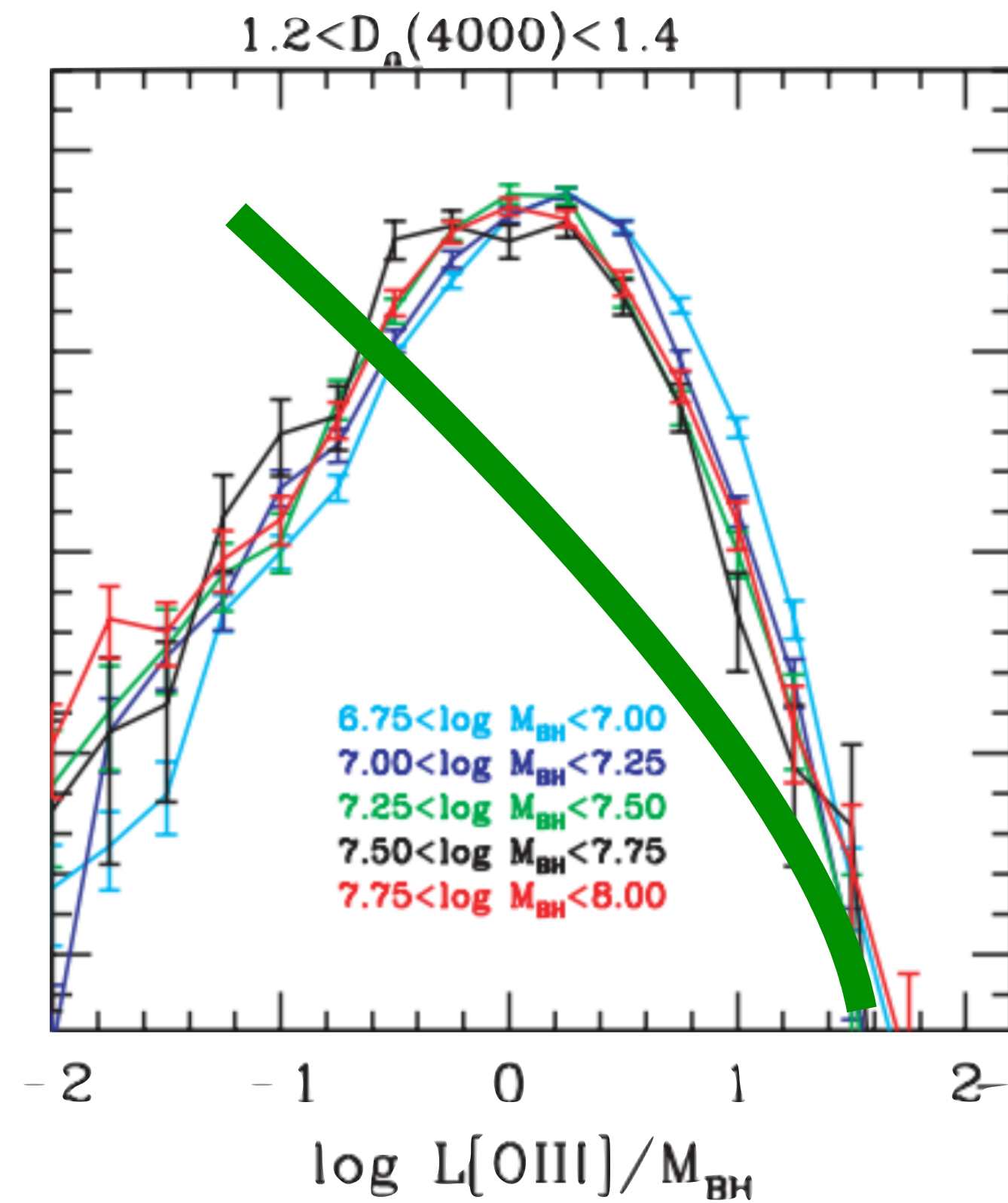
NGC 300

NASA/JPL-Caltech

Older
Galaxies

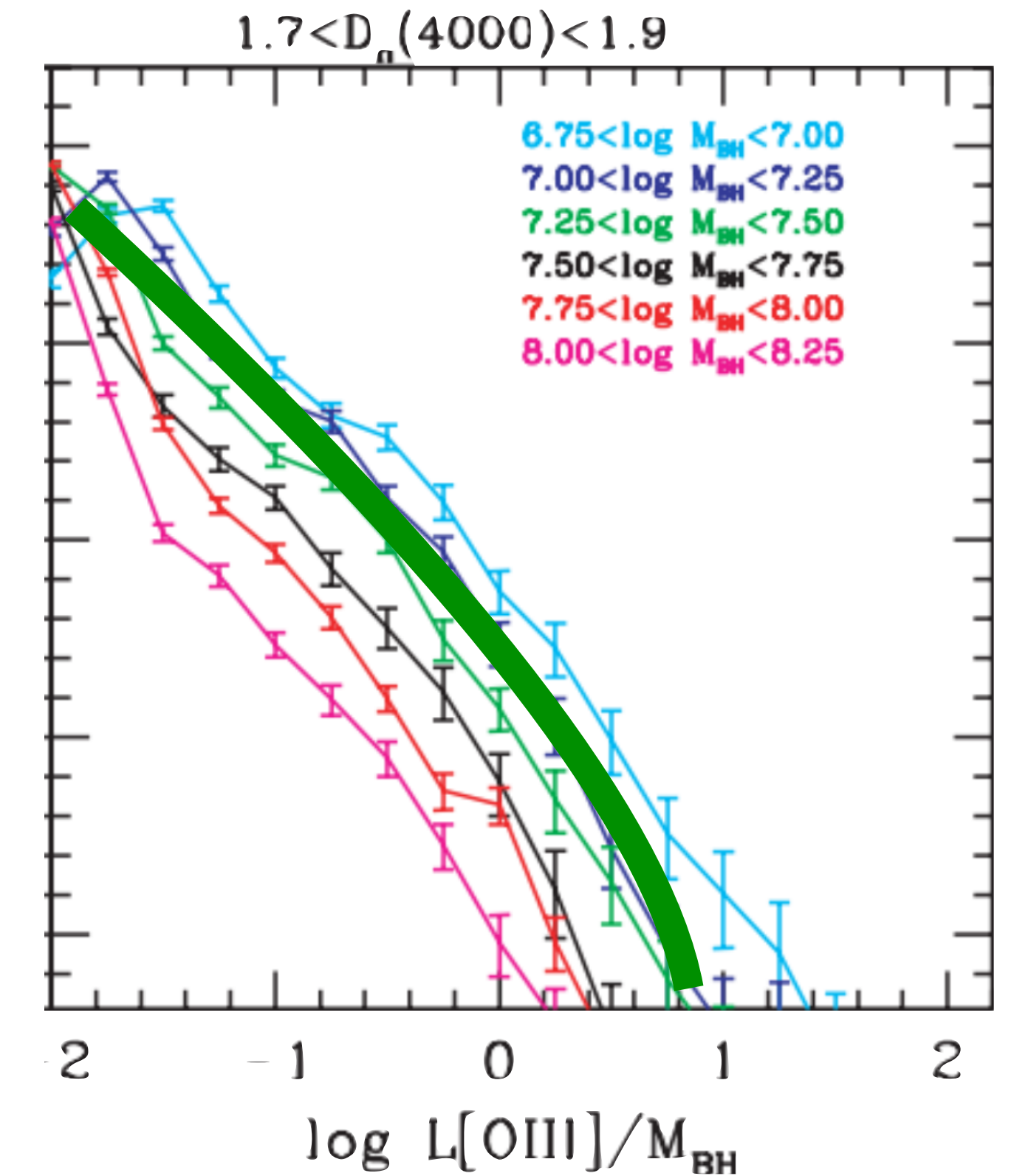


NGC 1316



Universal
Power Law

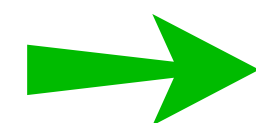
Jones et al 2016, ApJ 826, 12



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What galaxies and halos host an AGN?

universal broad Eddington ratio distribution is consistent with observations



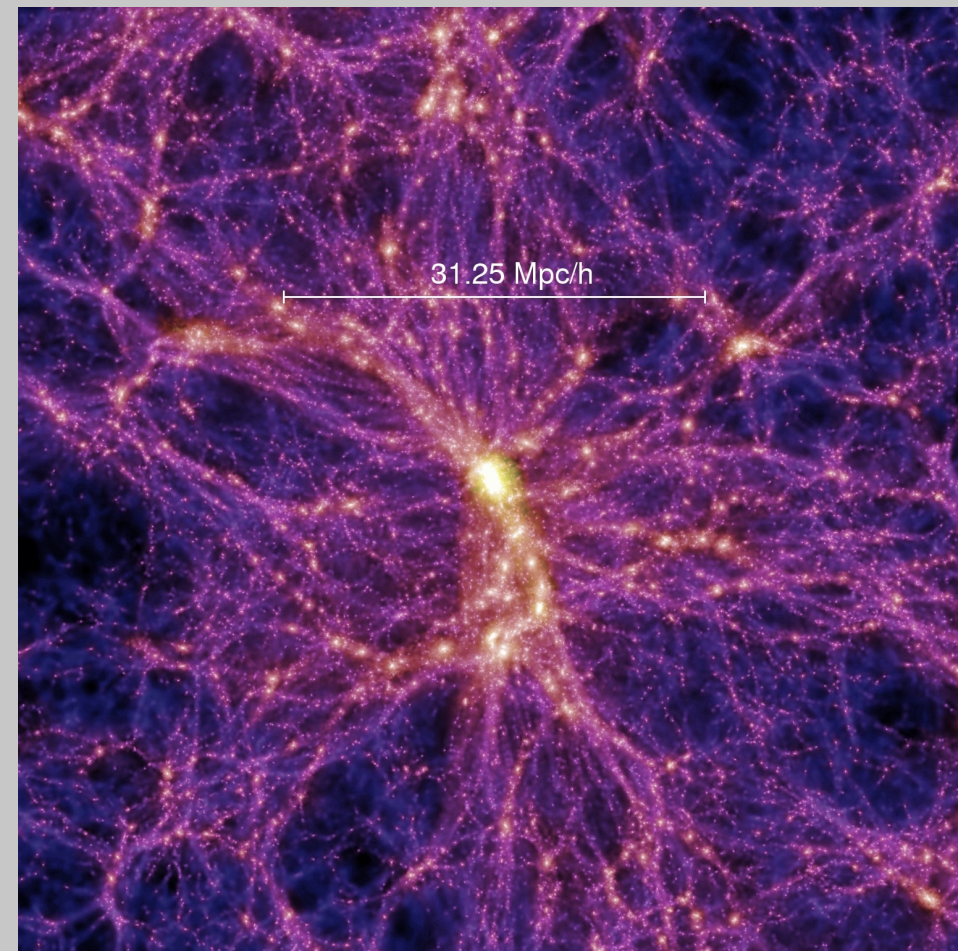
fueling mechanism between different galaxy populations may not be specific to host galaxy type or age

Do AGN and galaxies grow together?

What AGN contribute to the cosmic X-ray background?

A Simple Model of Galaxy Formation and AGN Accretion

Dark Matter + Galaxies



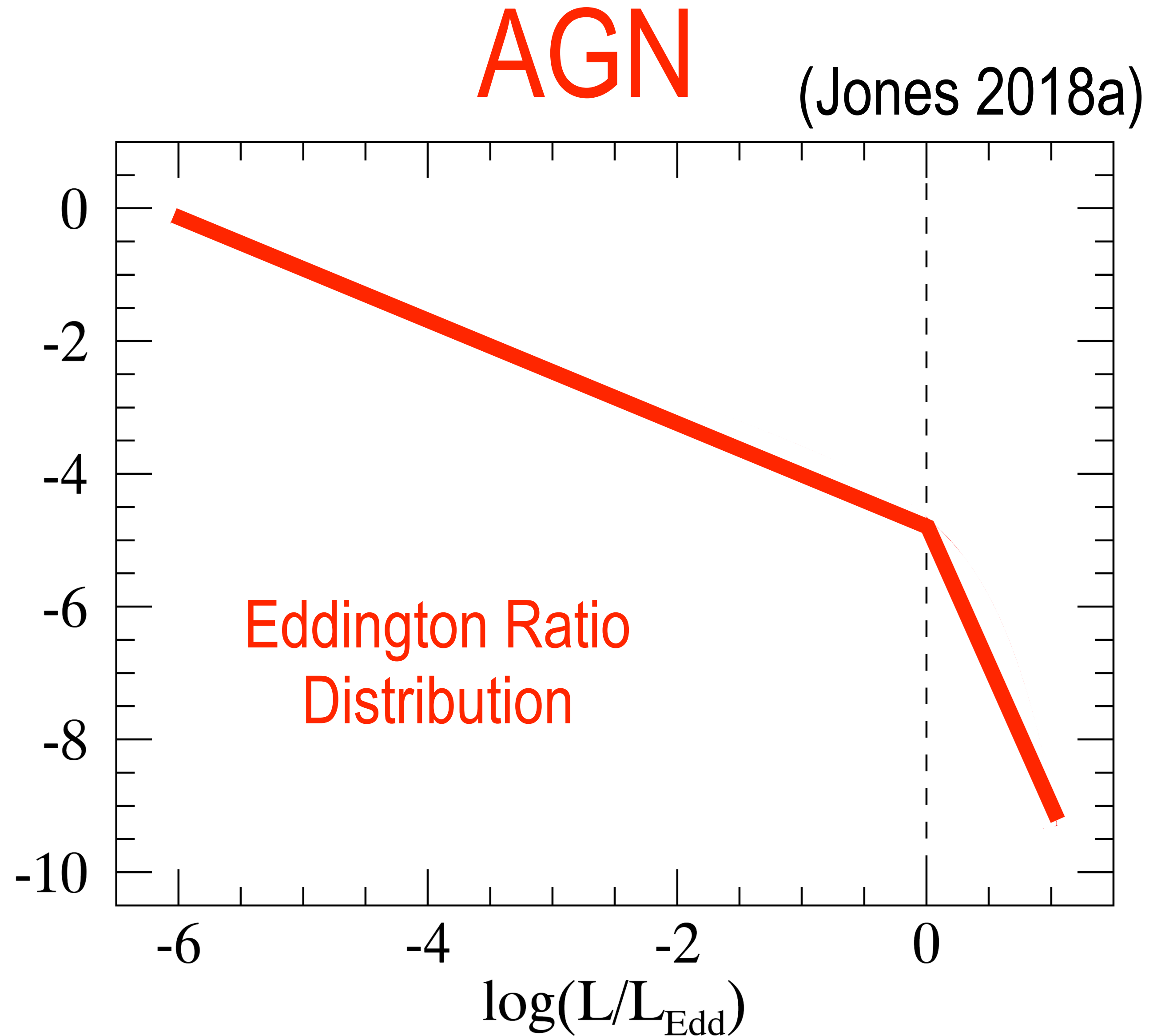
Springel et al. 2005



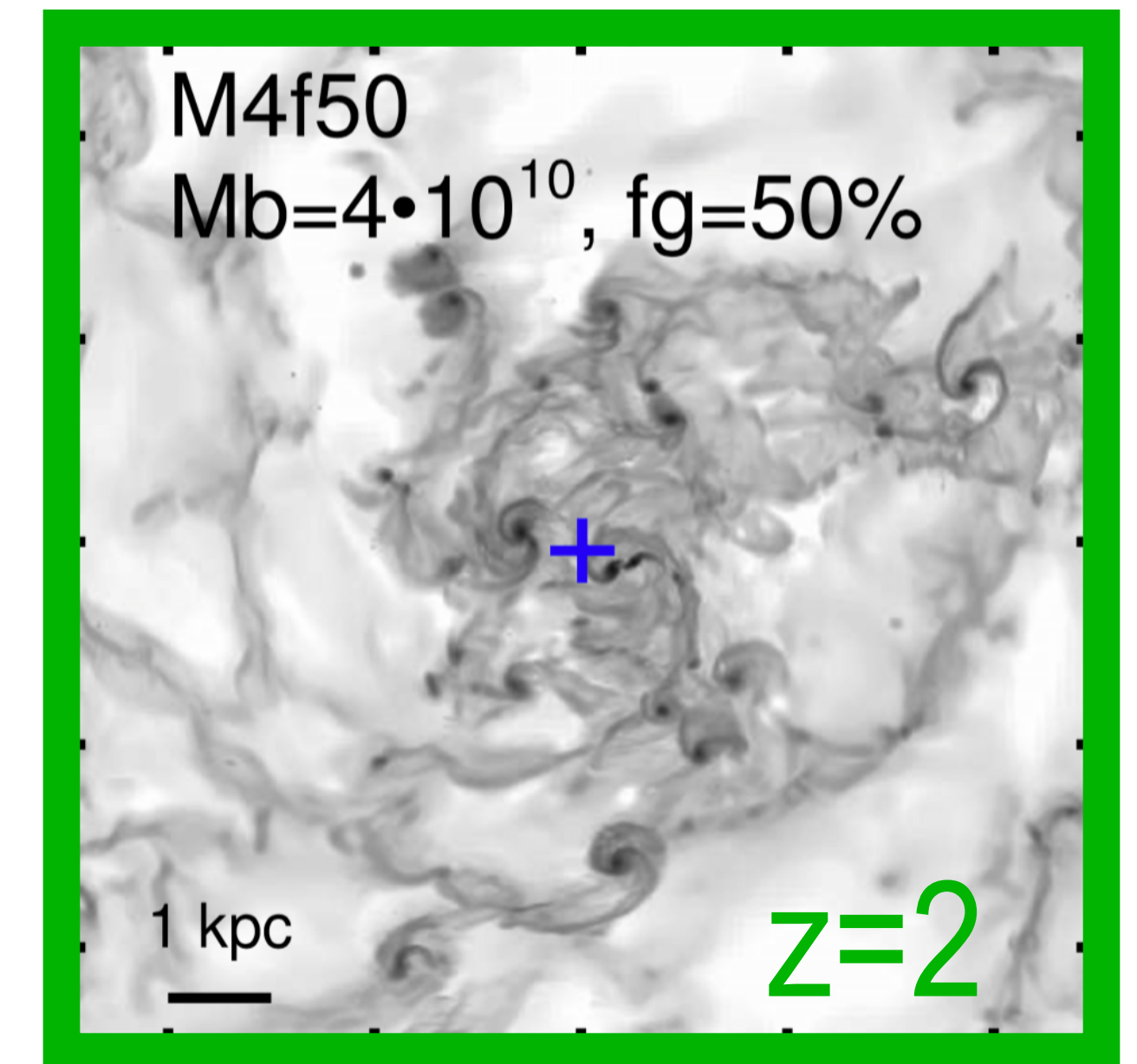
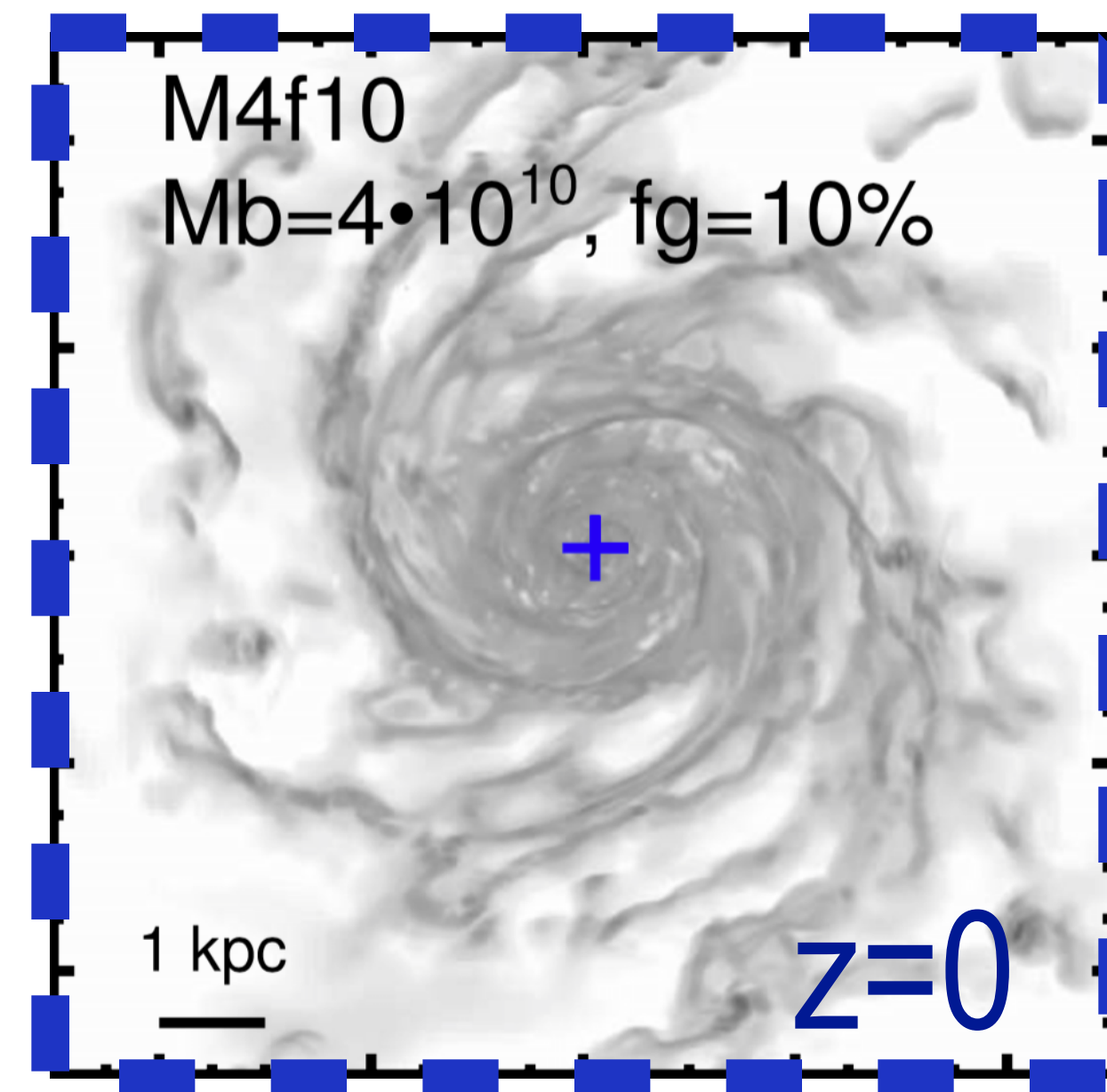
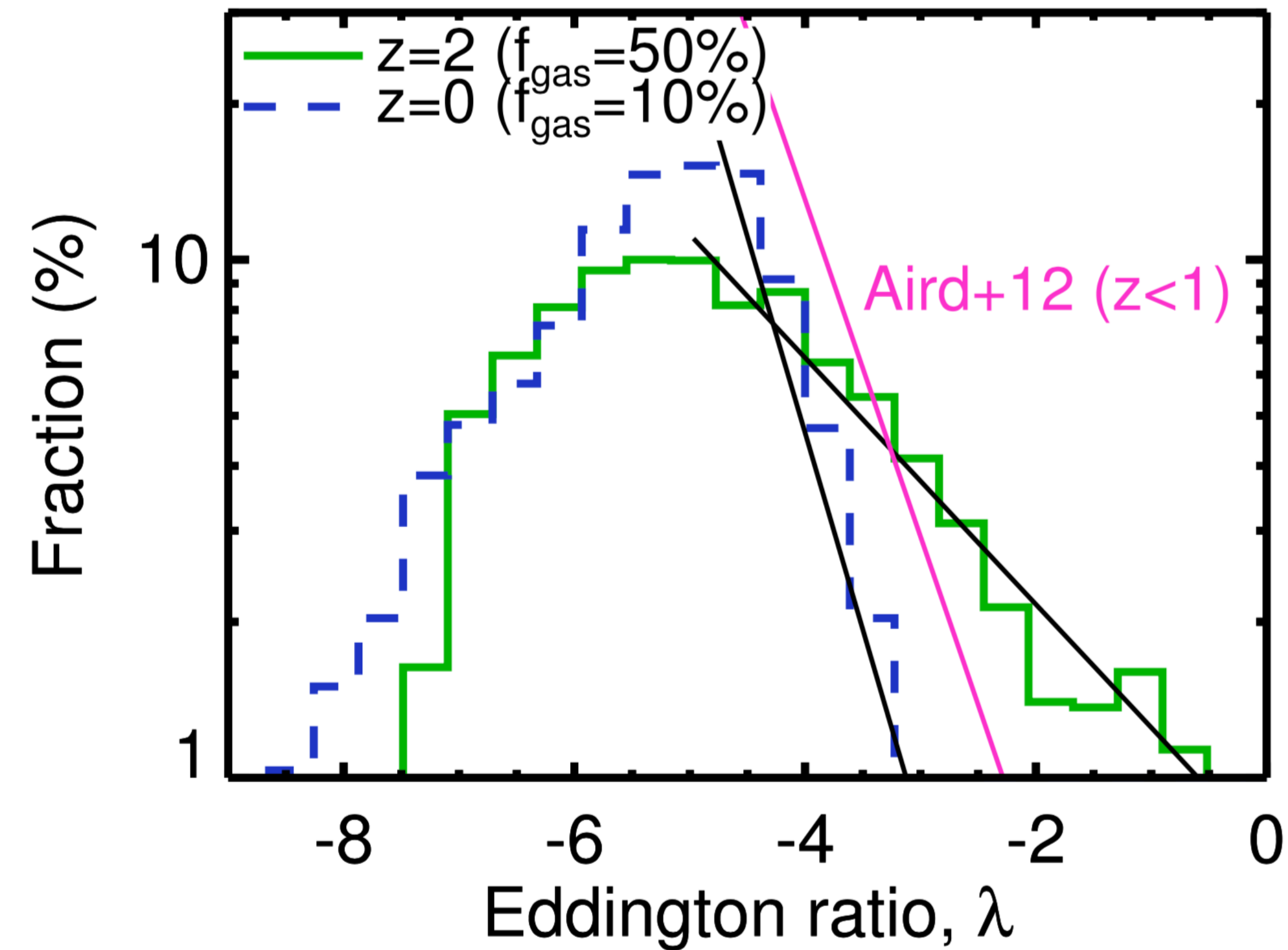
Mutch et al 2013, MNRAS 435, 2445



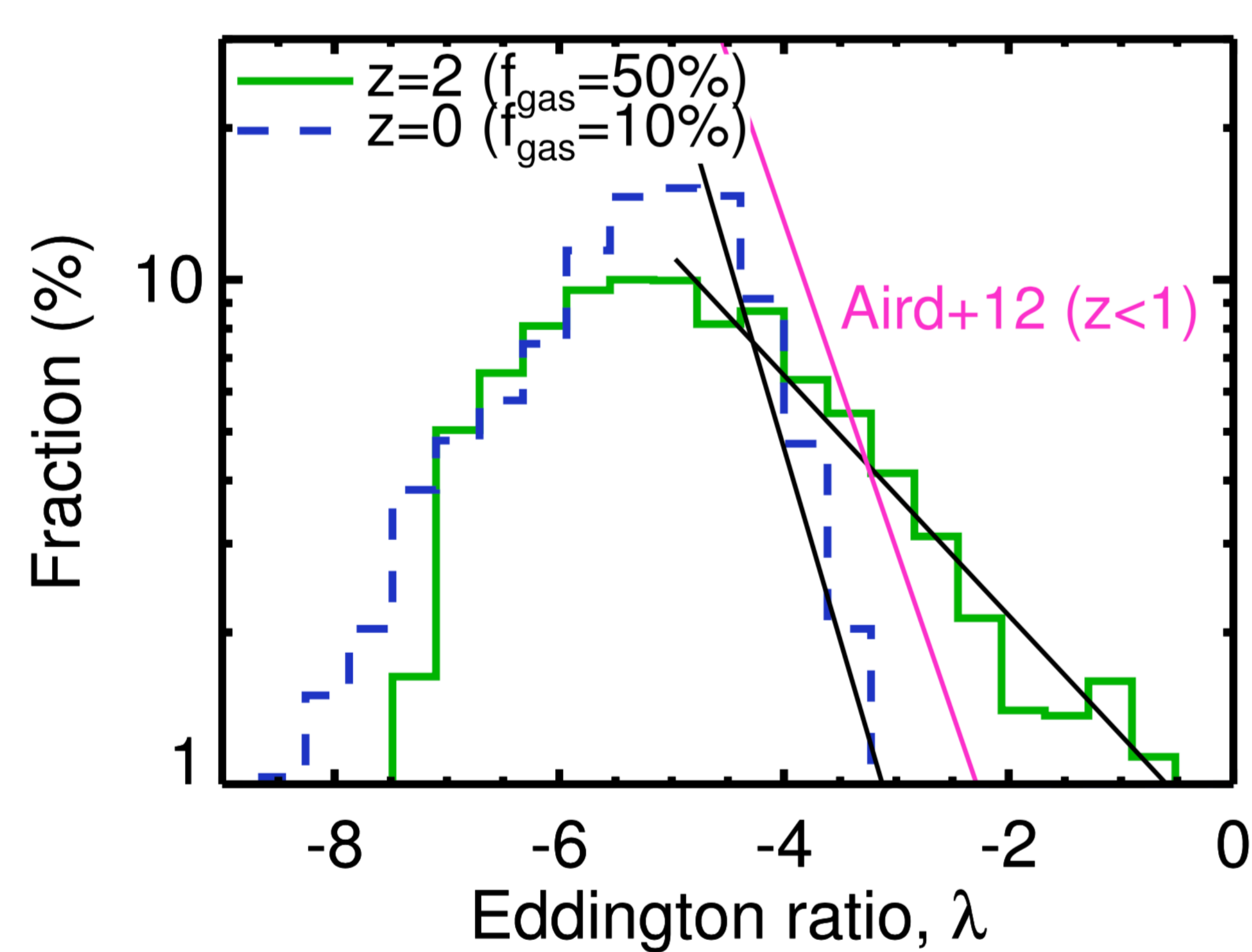
$\log \Phi(L/L_{\text{Edd}})$



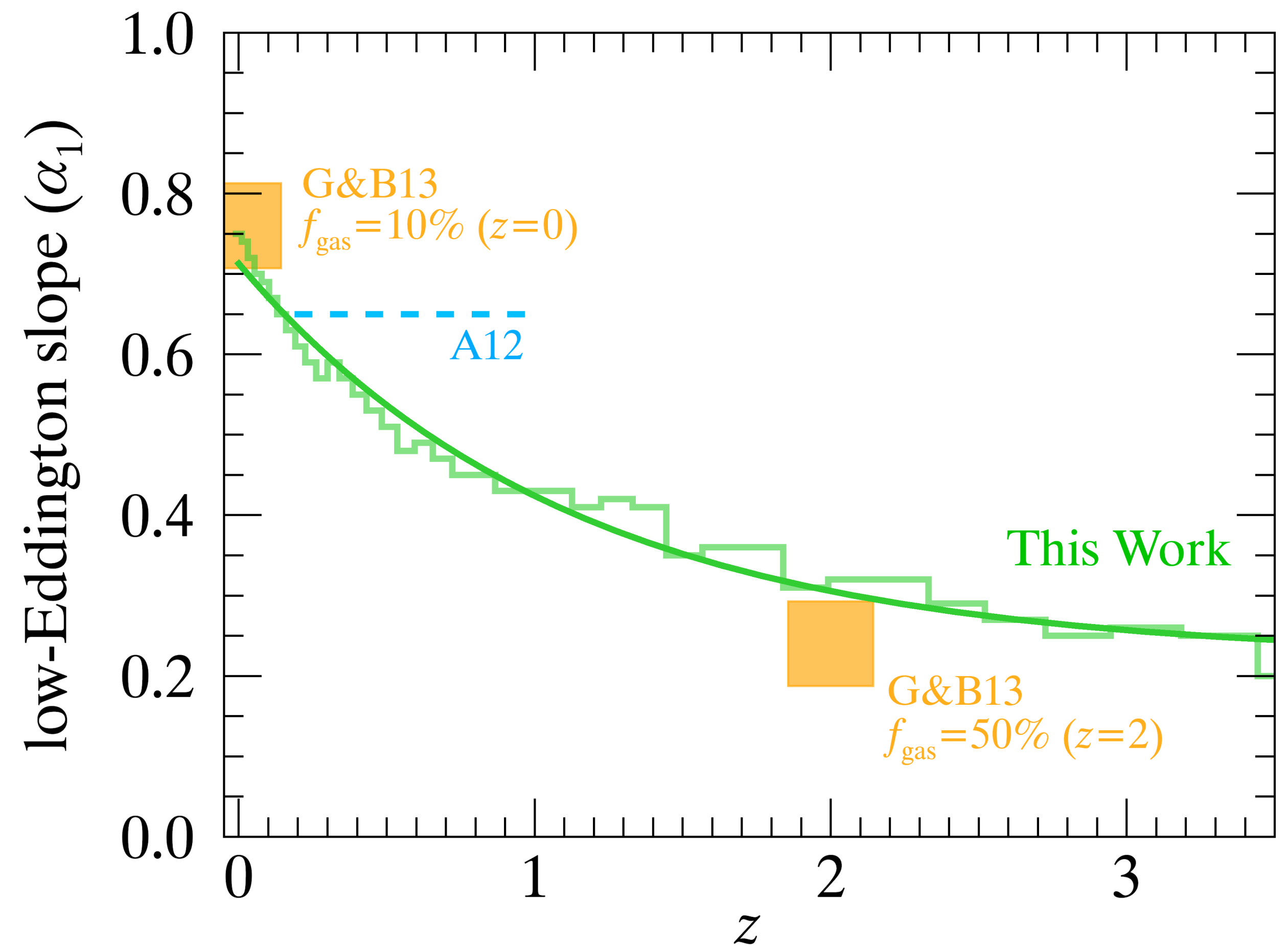
Eddington ratio slope decreases with increasing gas fraction



Eddington ratio slope decreases with increasing gas fraction



Gabor & Bournaud 2013

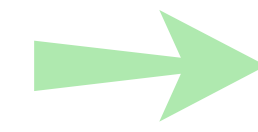


Jones et al 2018a, *in prep*

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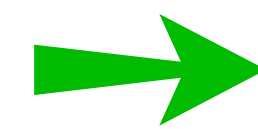
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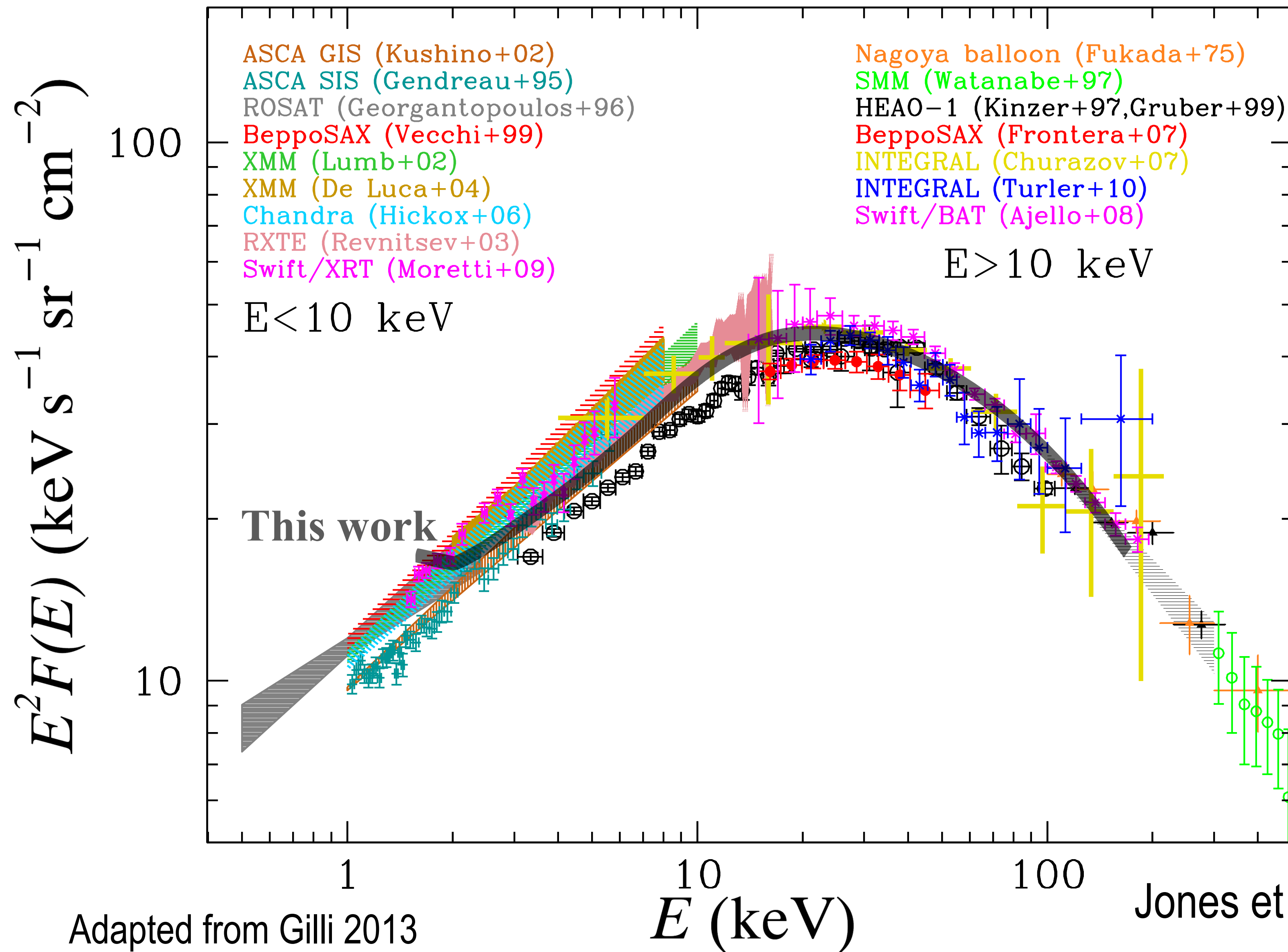
universal broad Eddington ratio distribution decreases as the gas fraction of the galaxy increases



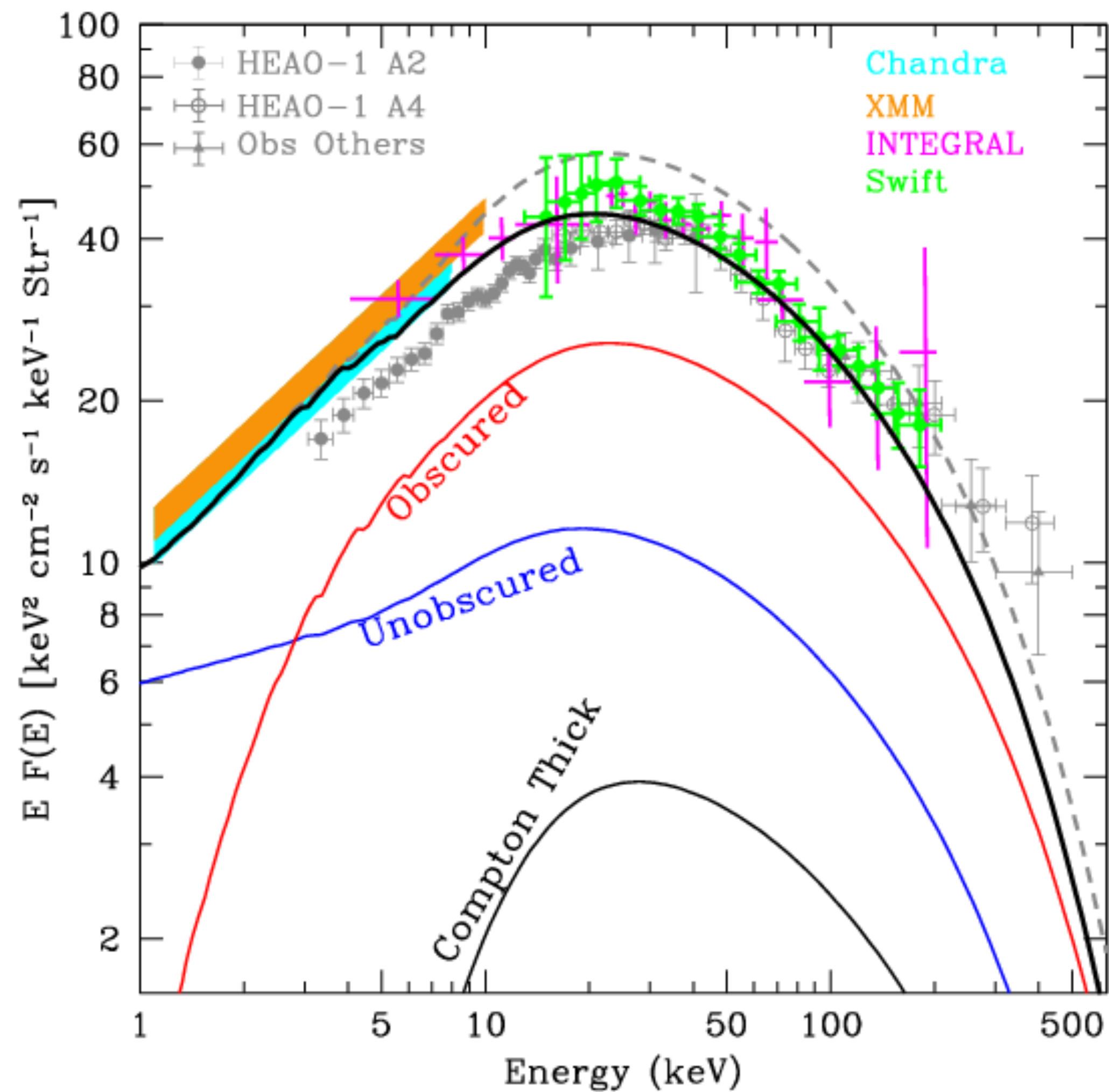
may indicate a connection between the black hole activity and galaxy properties due to a common supply of gas

What AGN contribute to the cosmic X-ray background?

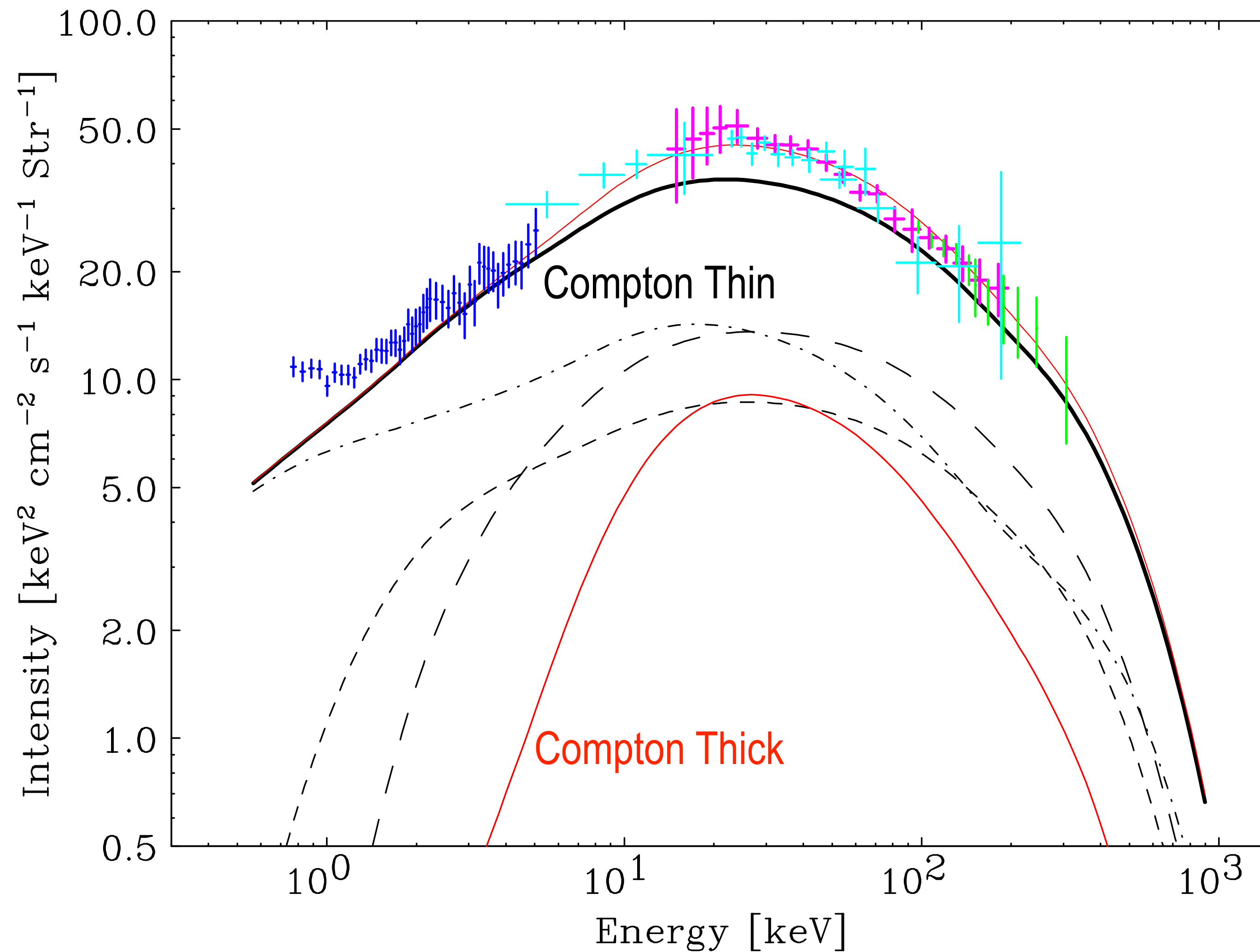
Modeling the Cosmic X-ray Background



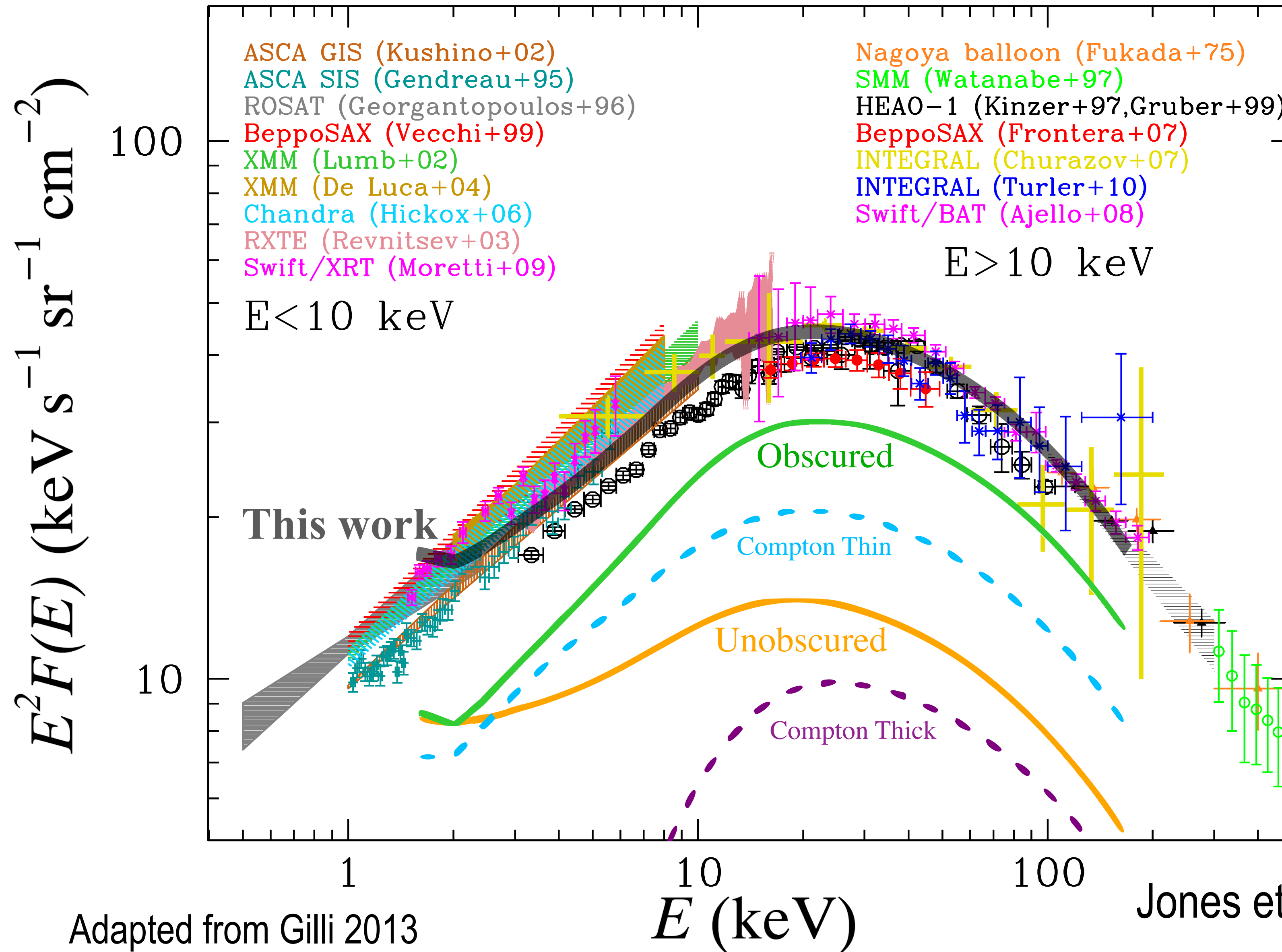
Treister et al. 2009



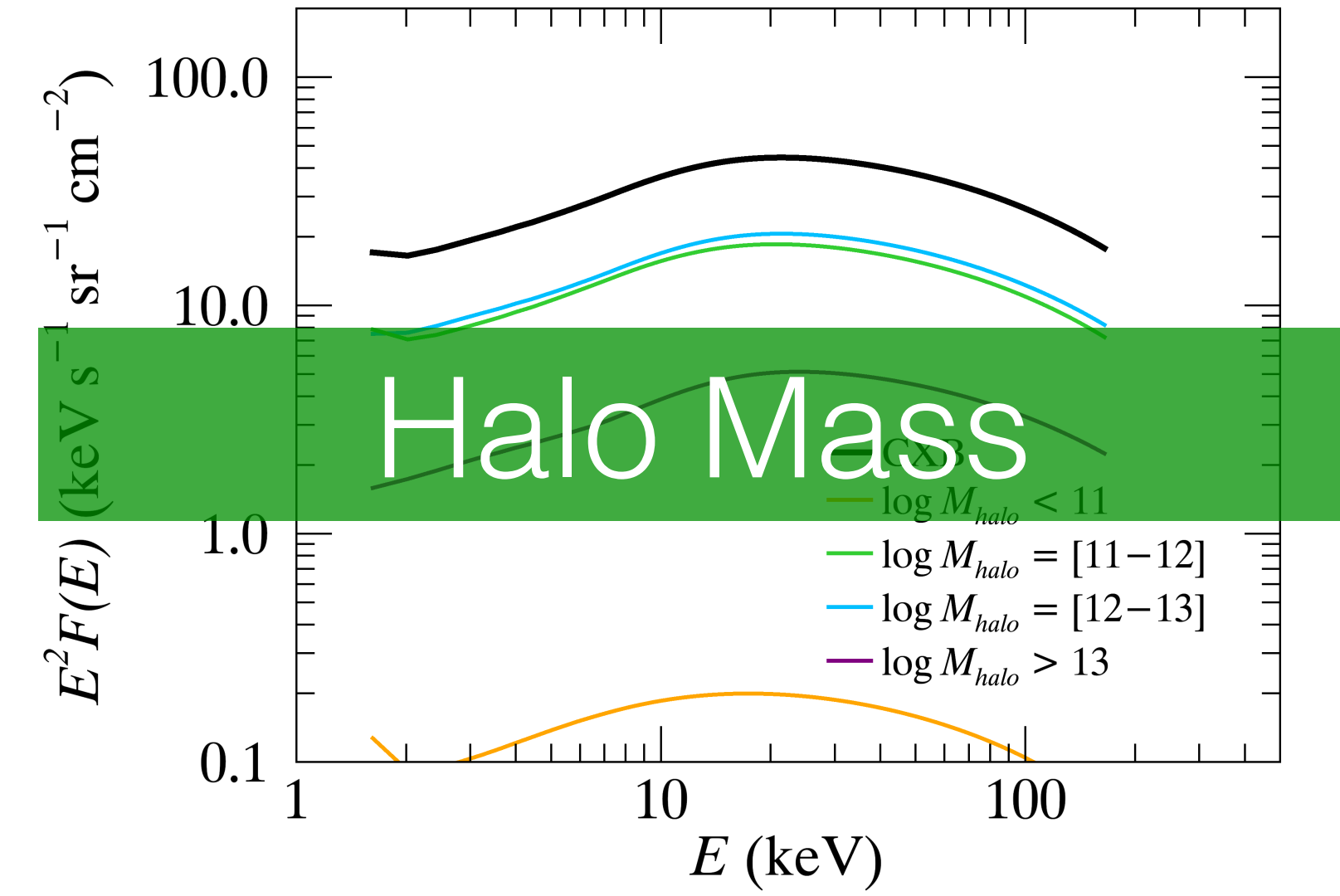
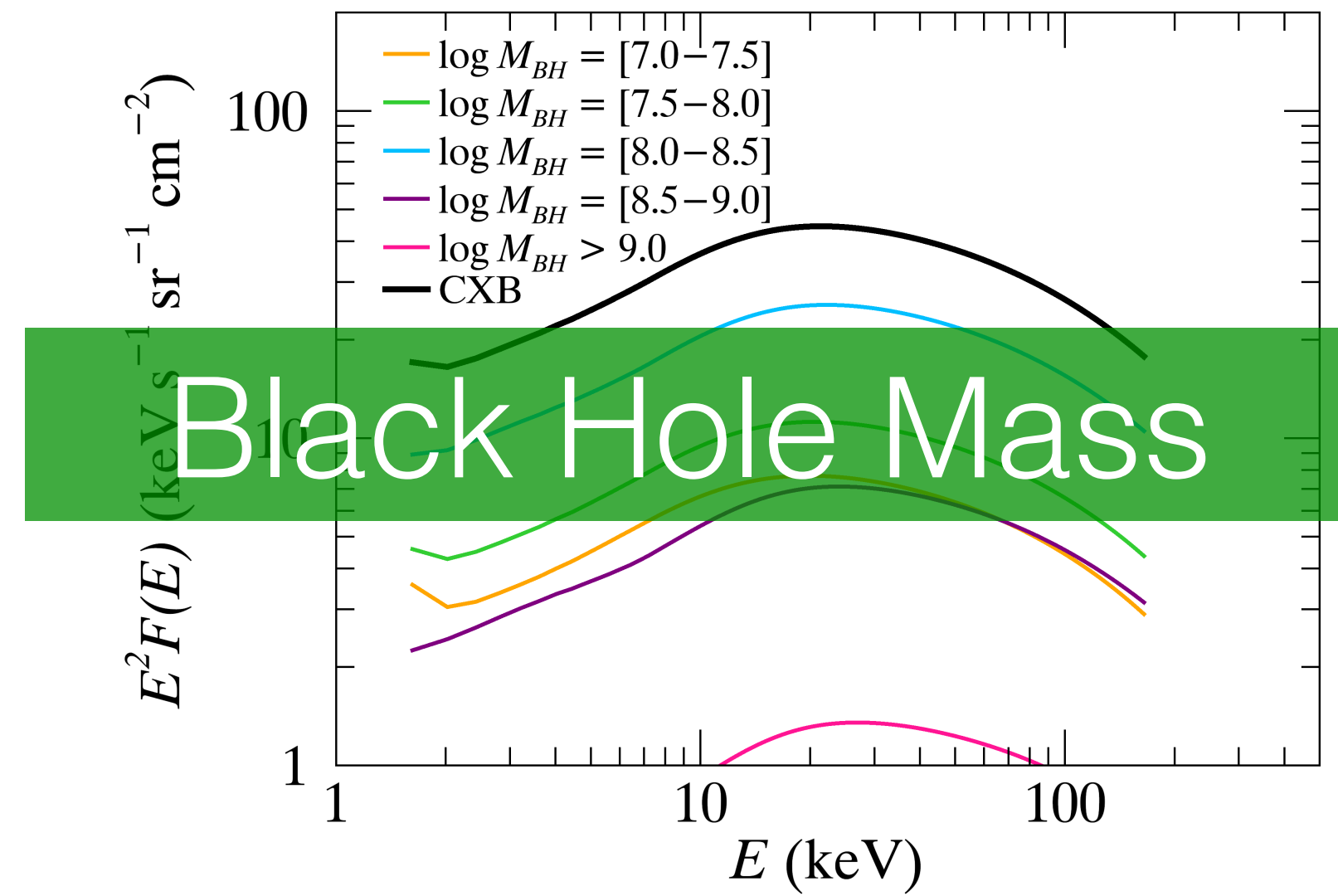
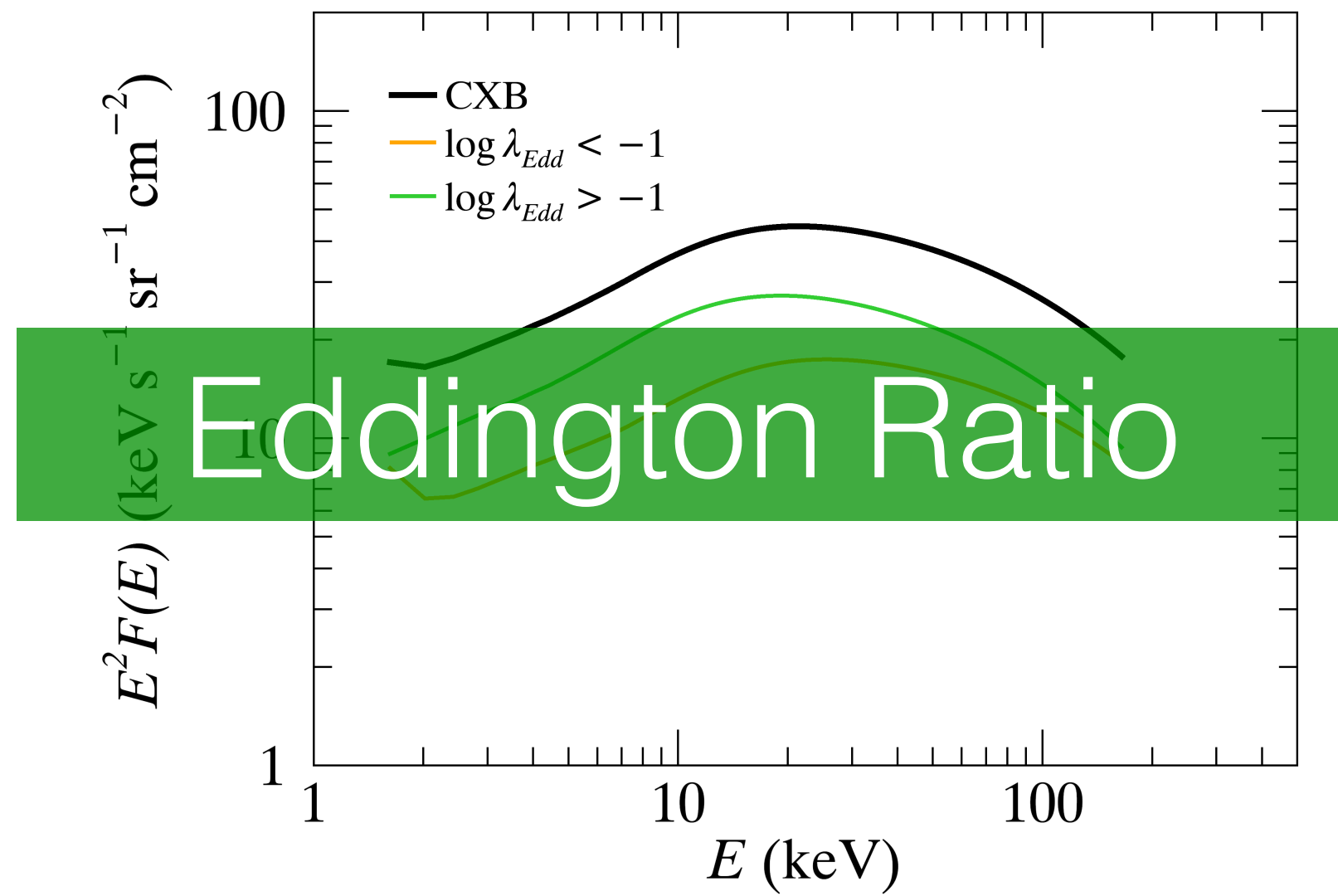
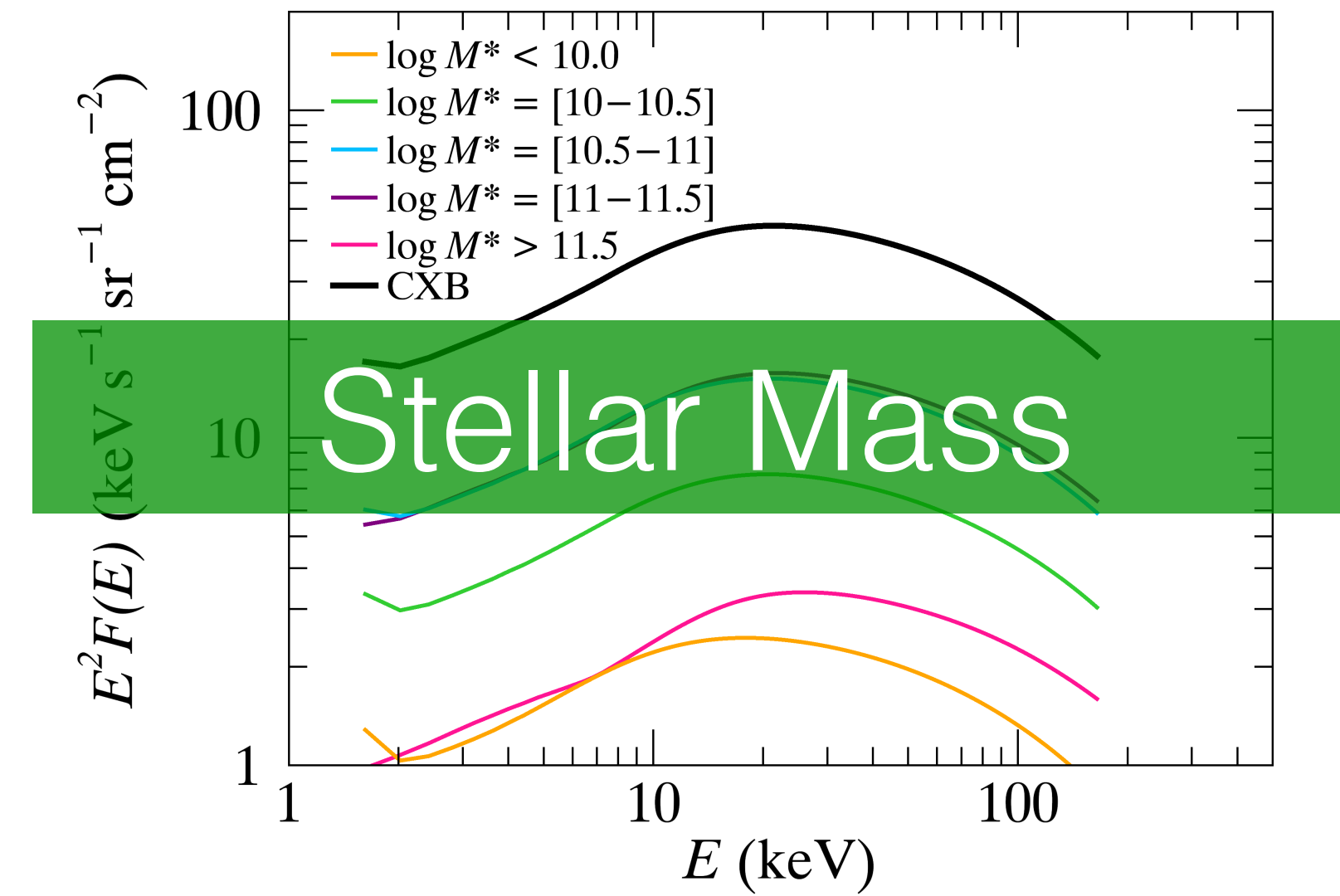
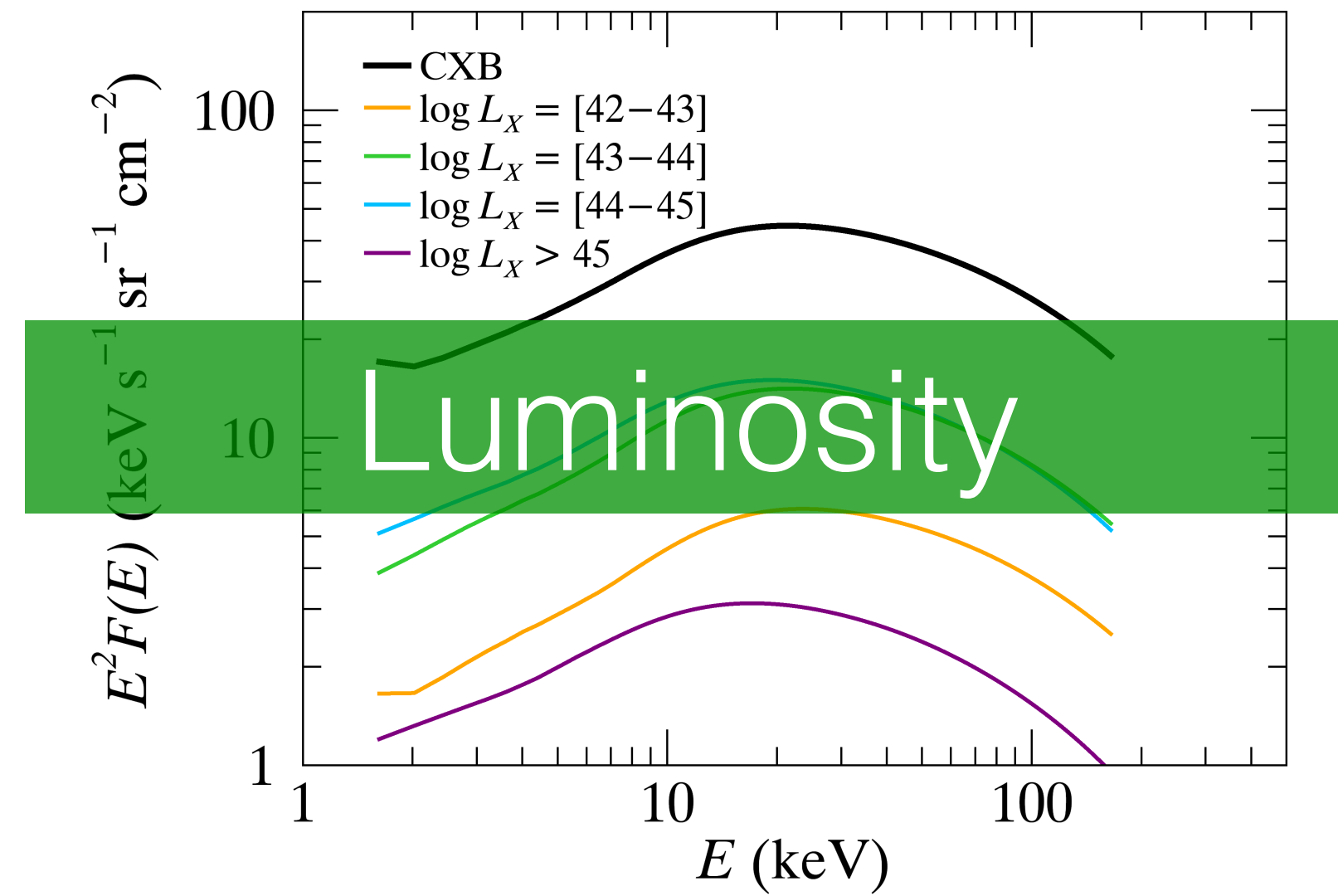
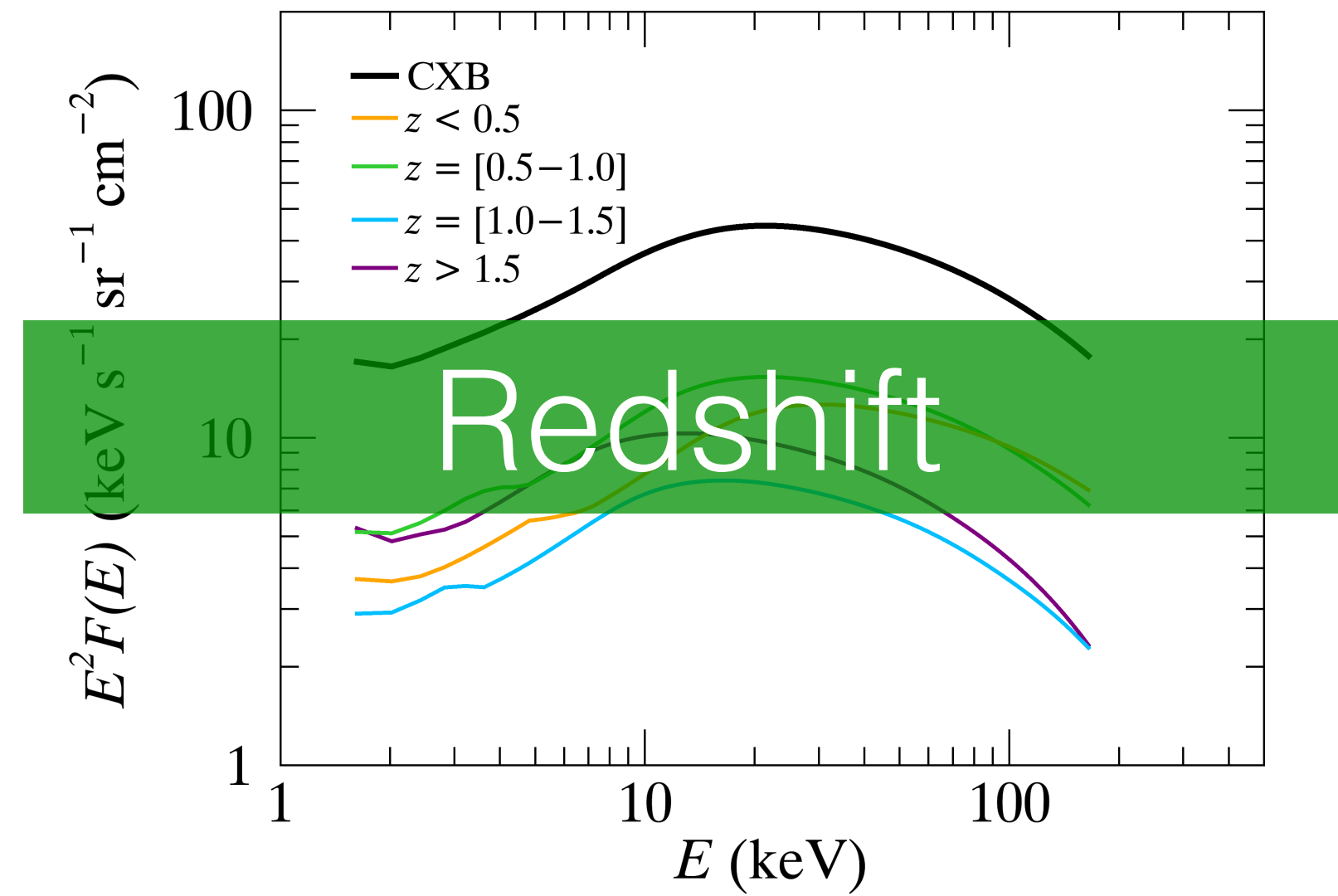
Ueda et al. 2014



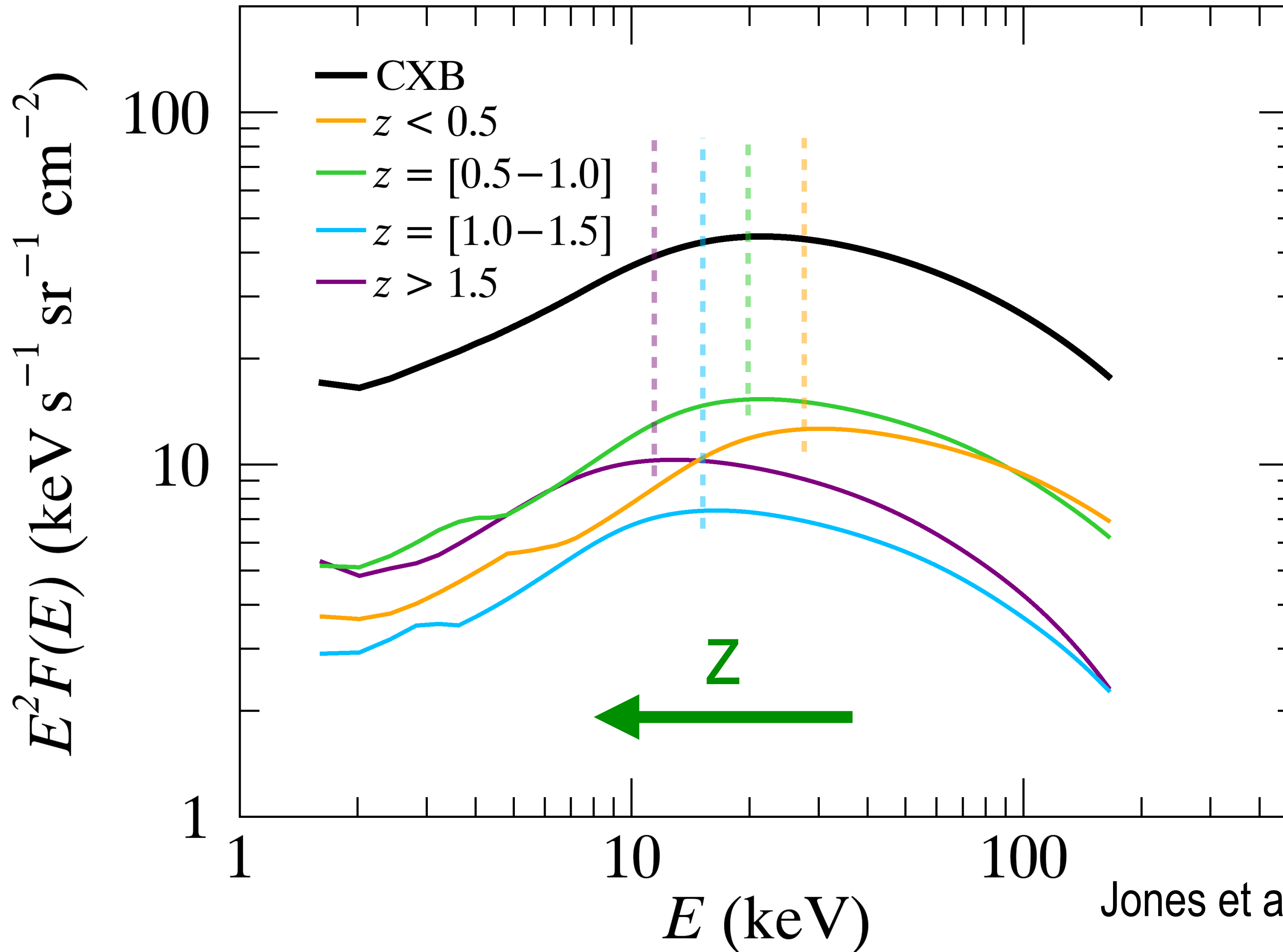
CXB as a Function of Column Density

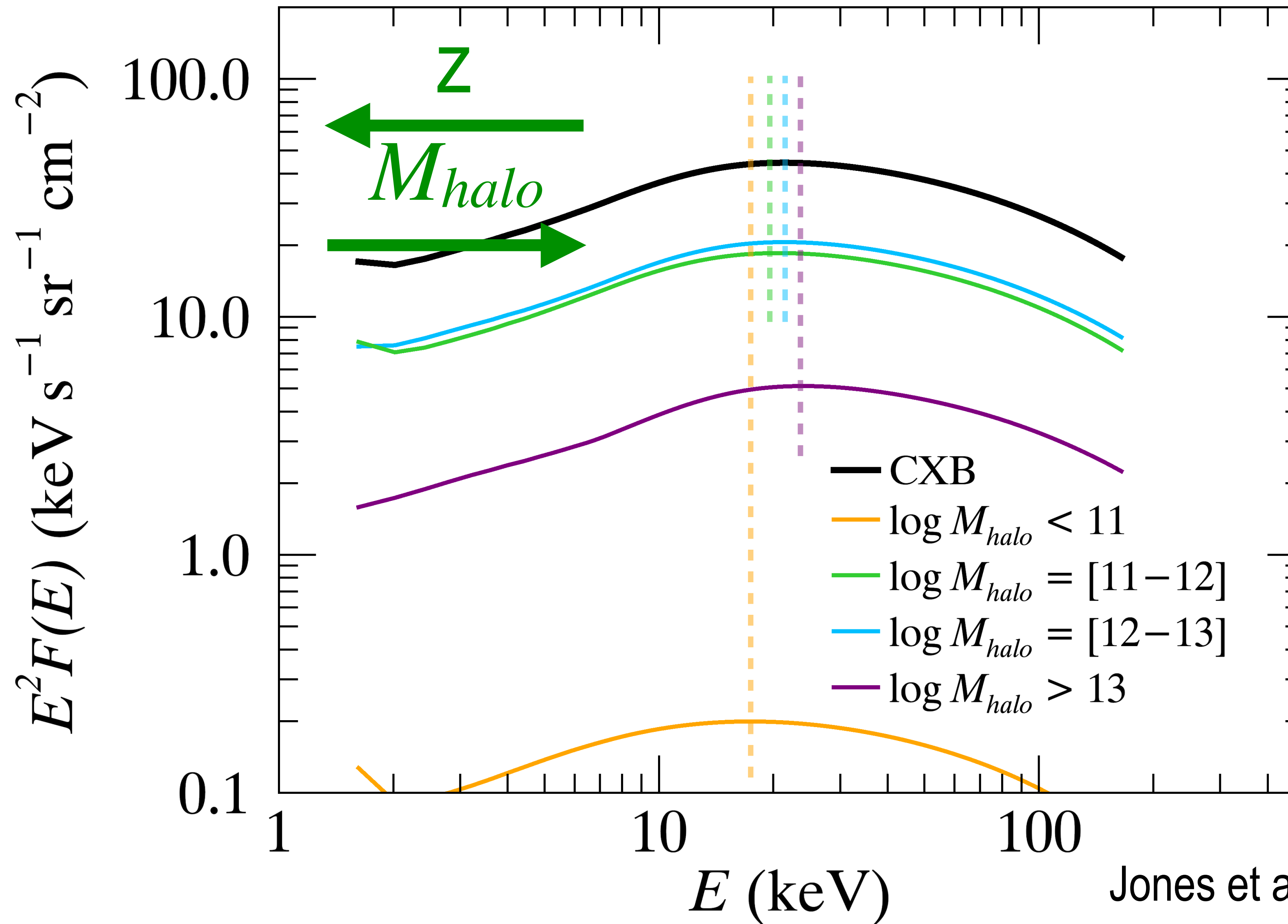


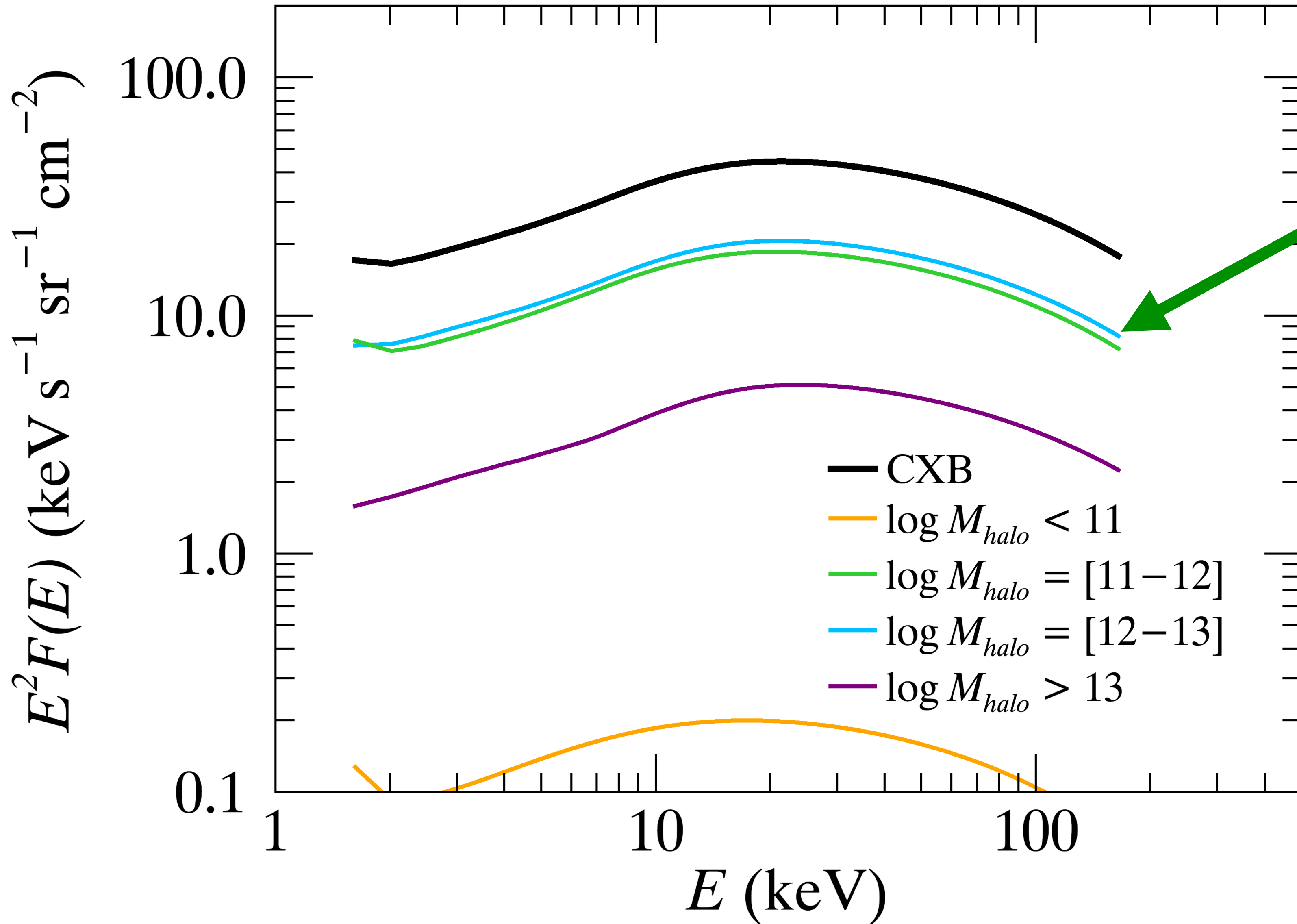
CXB as a Function of...



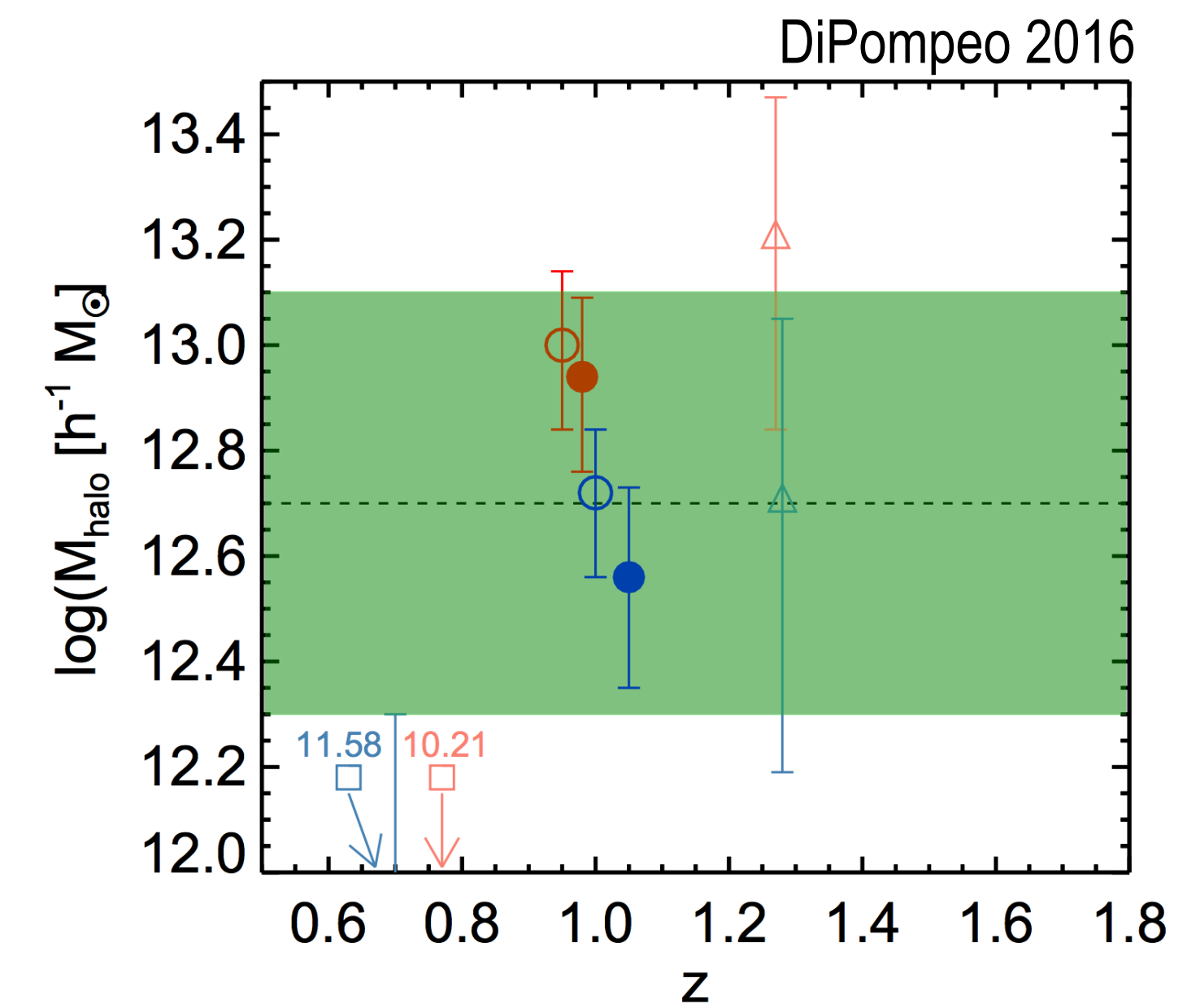
CXB as a Function of Redshift



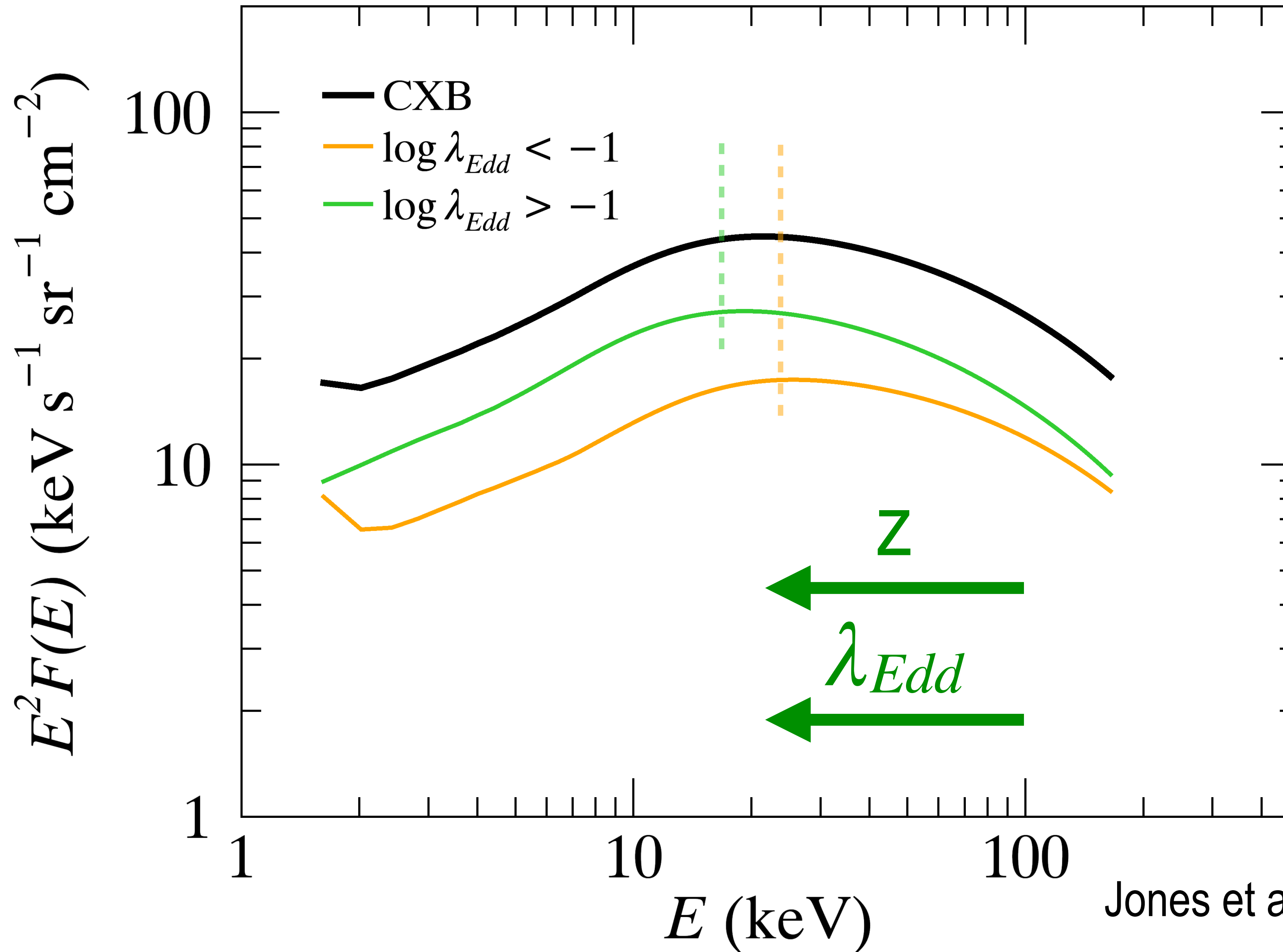




Corresponds to halos with the most quasar activity



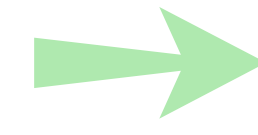
CXB as a Function of Eddington Ratio



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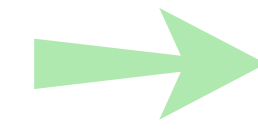
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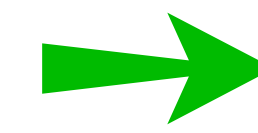
universal broad Eddington ratio distribution decreases as the gas fraction of the galaxy increases



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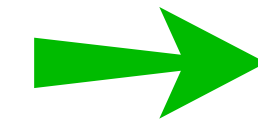


possible to probe the host galaxy and halo properties of AGN that contribute to the CXB

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What galaxies and halos host an AGN?

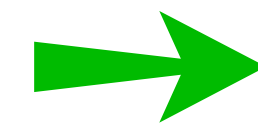
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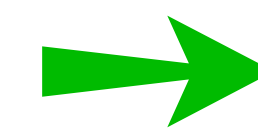
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