Title: Baryon feedback: How extreme is too extreme?

Speakers: Alexandra Amon

Collection/Series: Cosmic Ecosystems

Subject: Cosmology

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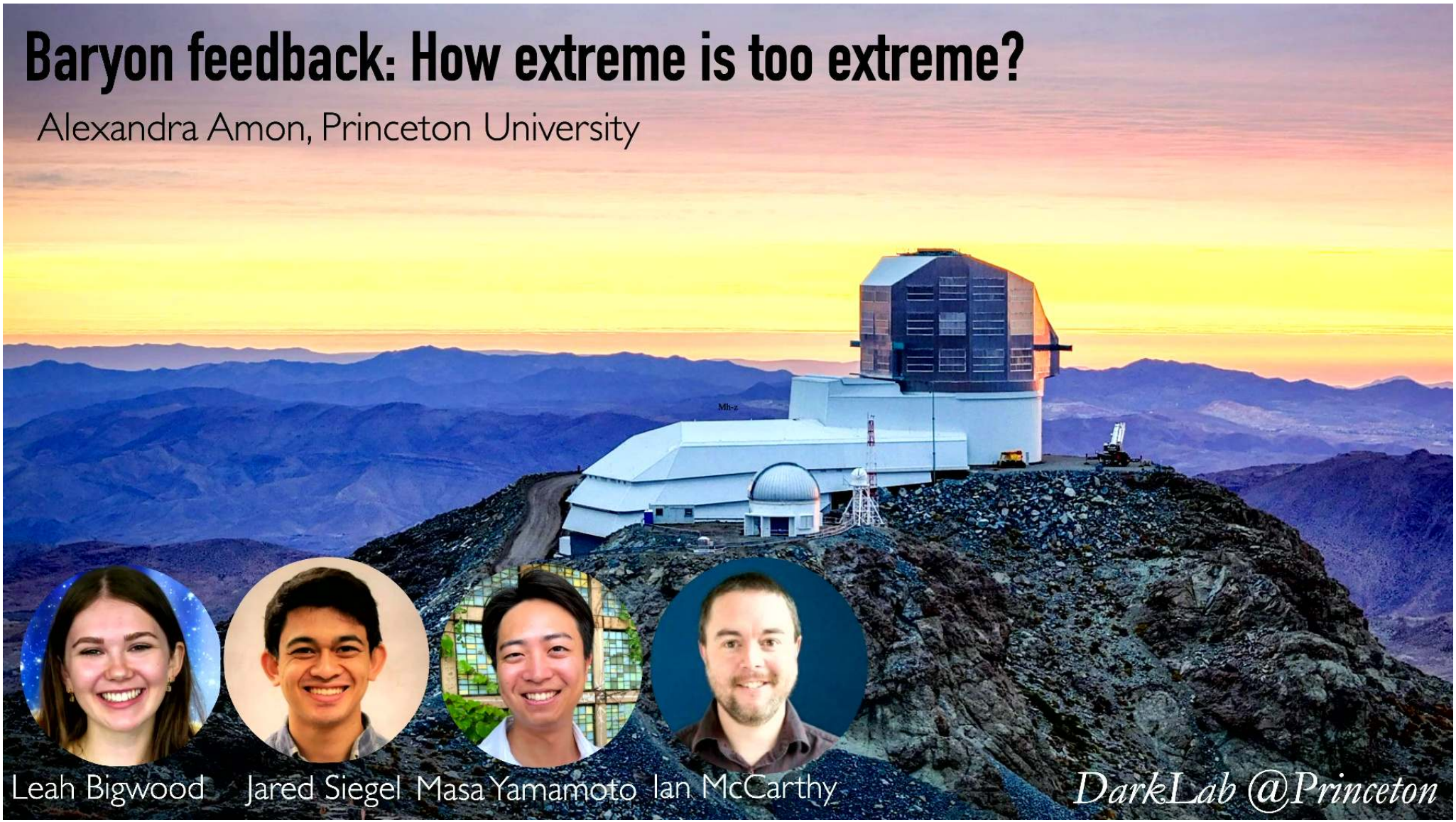
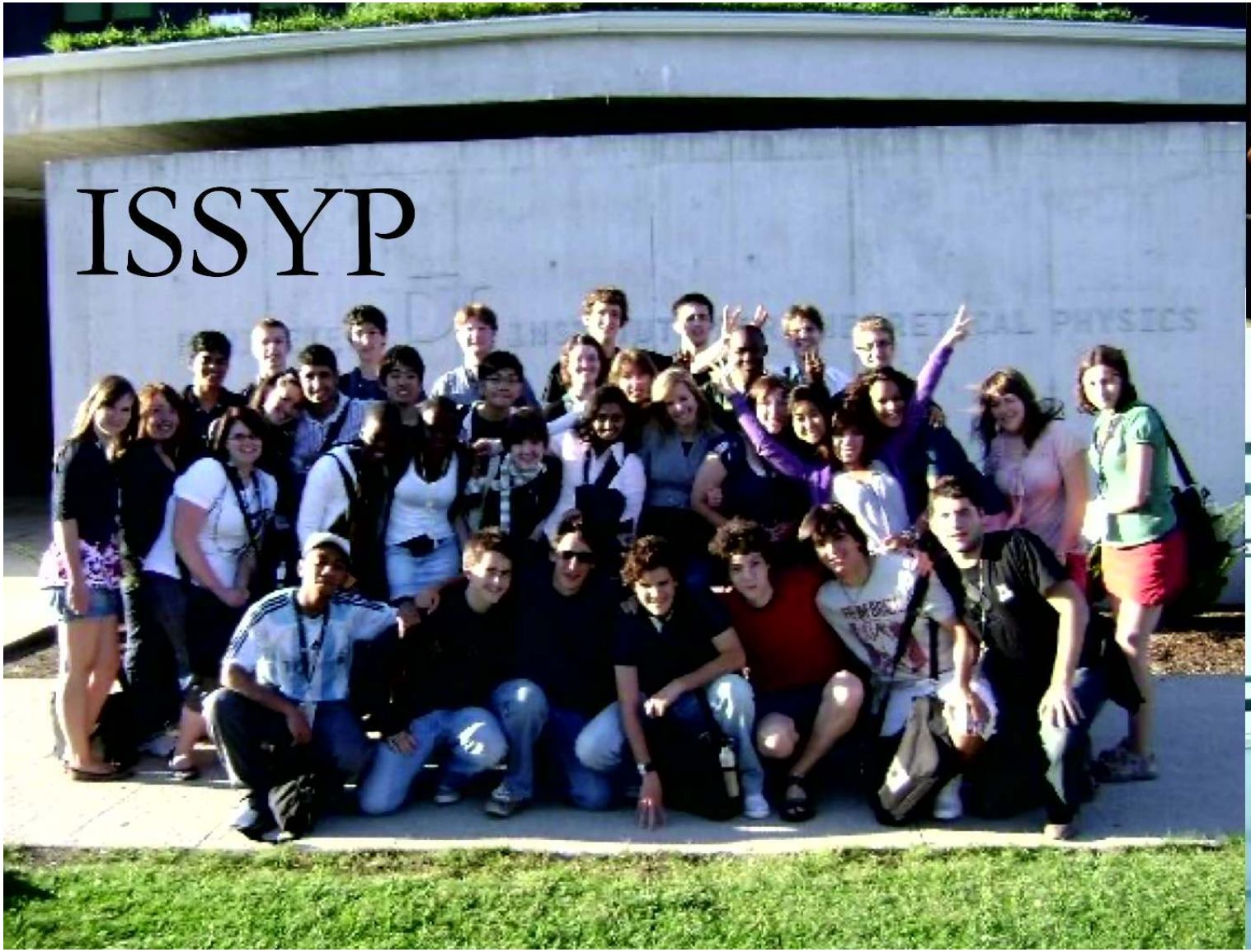
Baryon feedback: How extreme is too extreme?

Alexandra Amon, Princeton University

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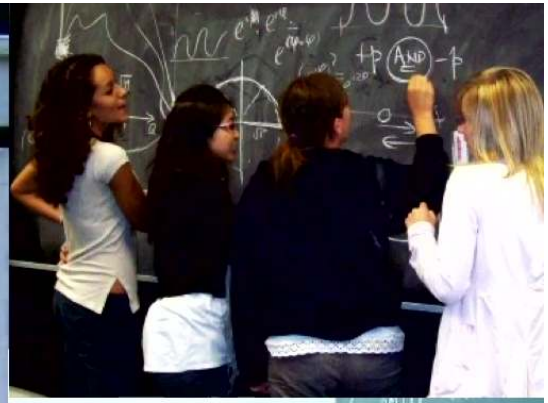
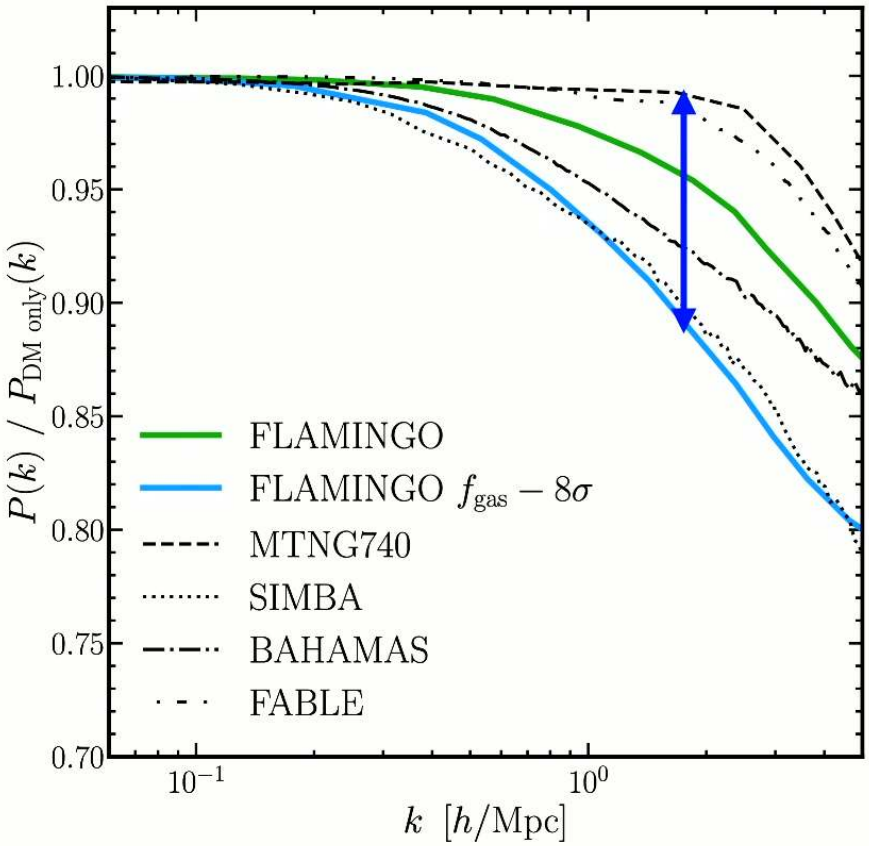
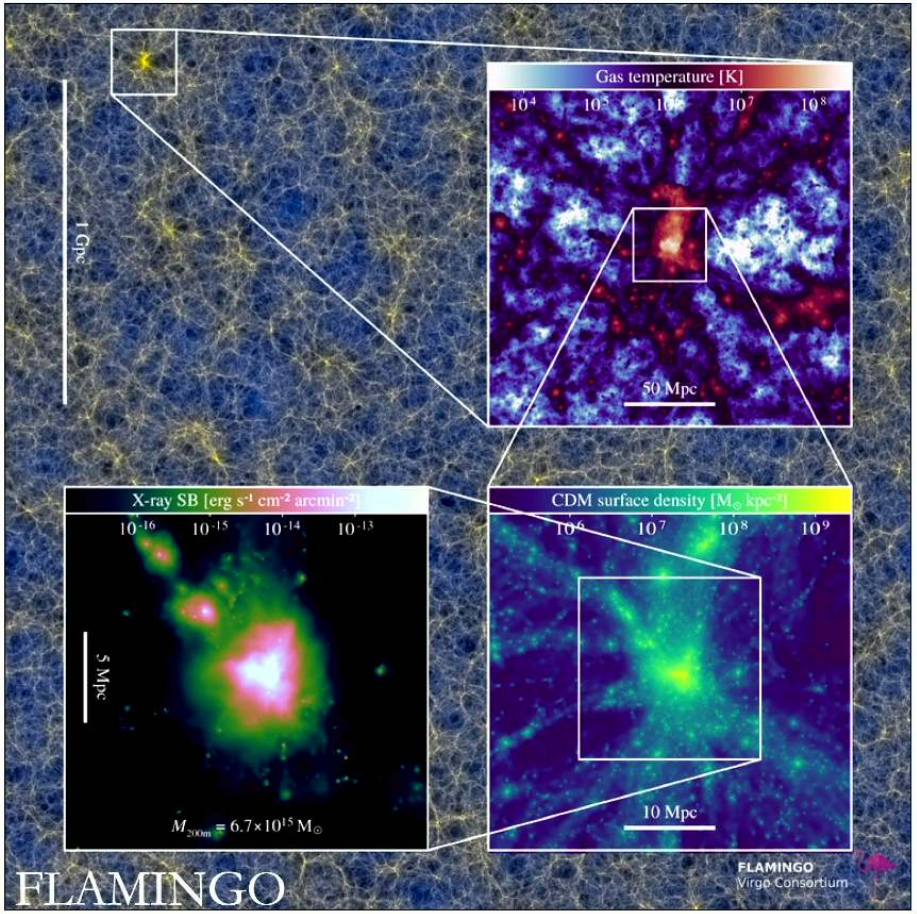
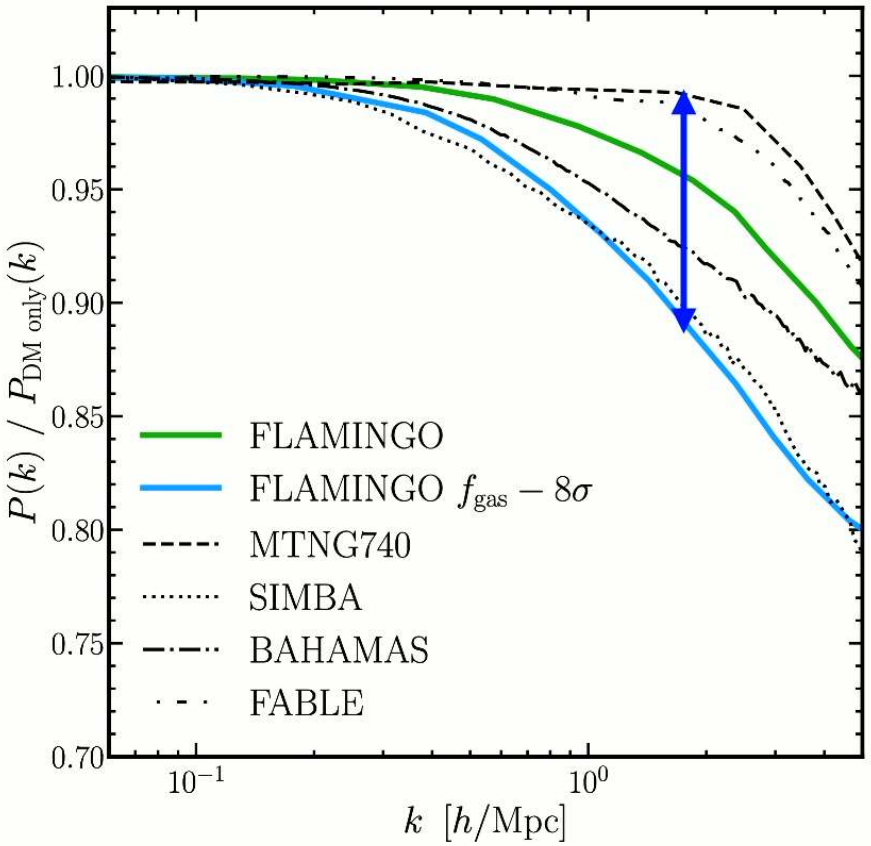


Cosmic shear challenges: modelling baryon feedback

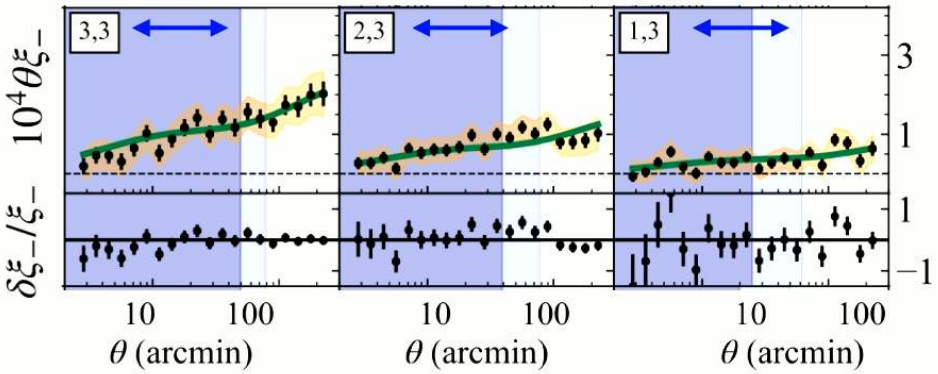


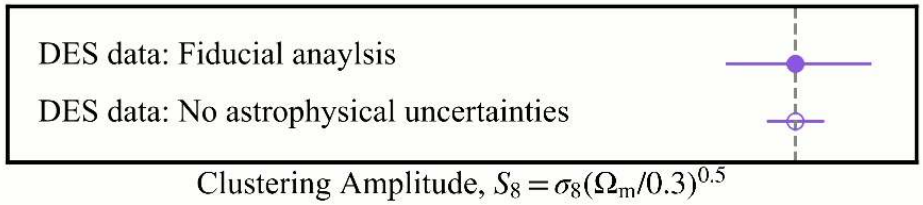


Cosmic shear challenges: modelling baryon feedback

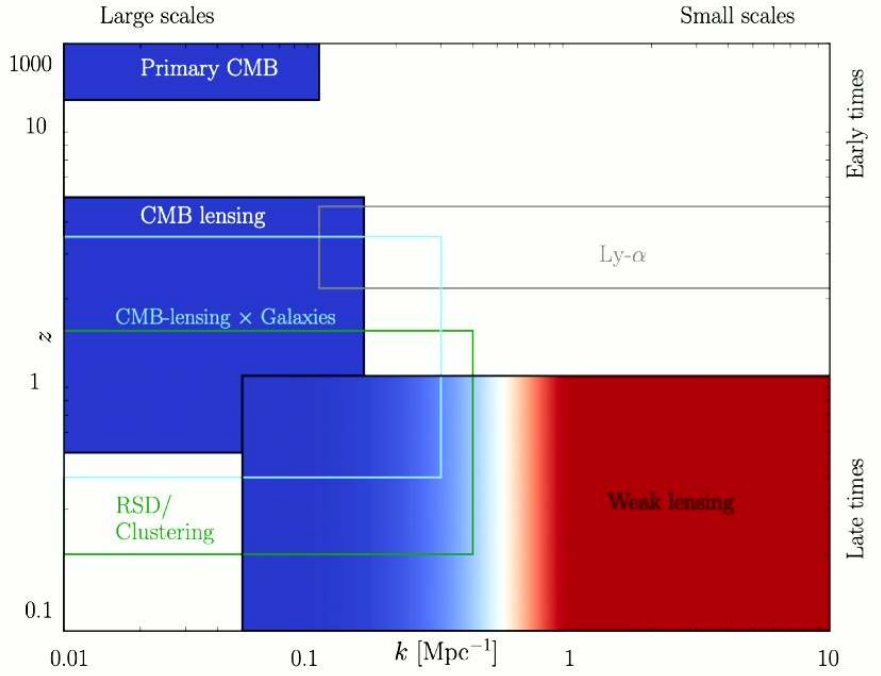


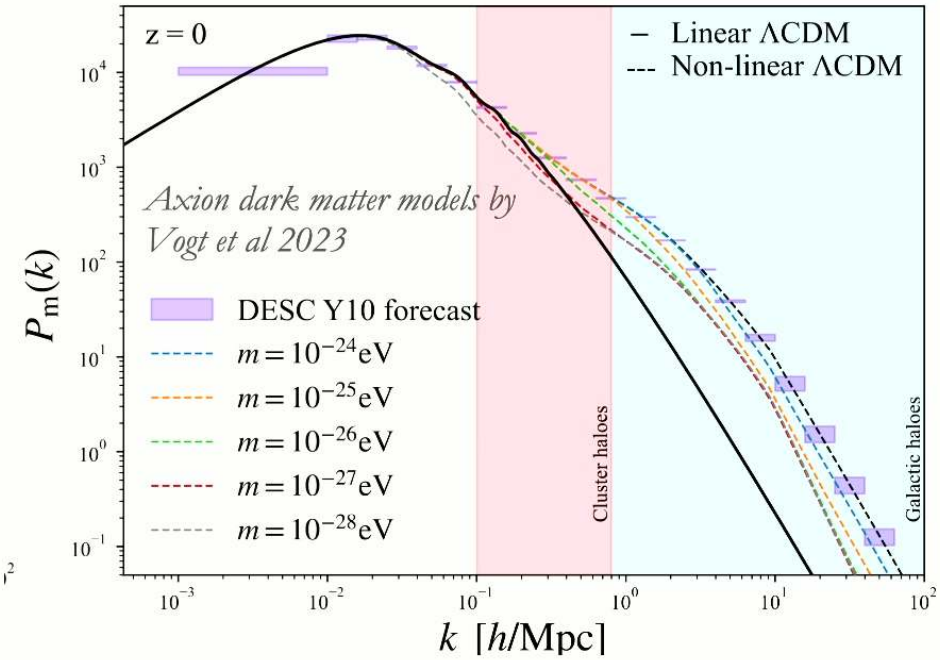
DES Y3 cosmic shear measurements





Next-generation cosmic shear: Test LCDM into the non-linear regime



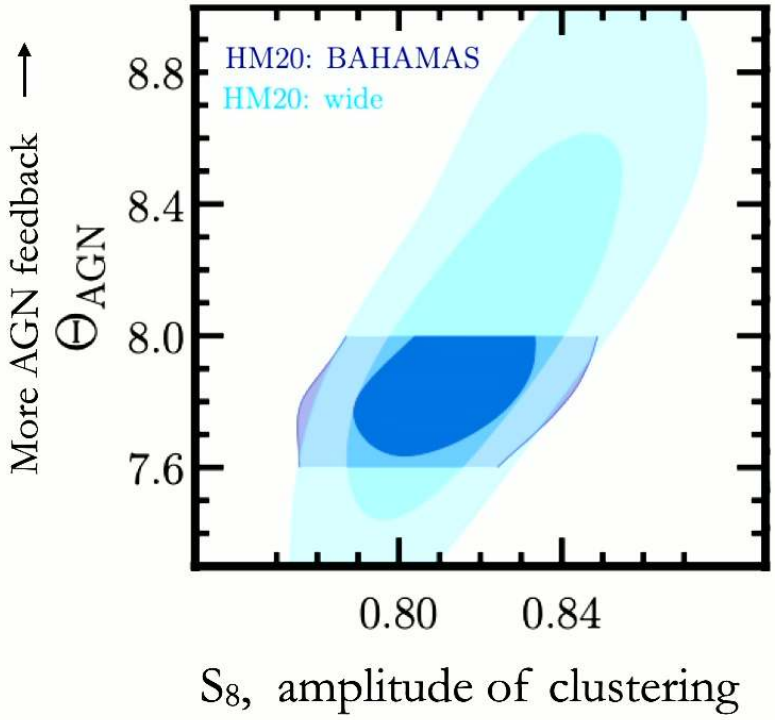


[*Preston, Amon & Efstathiou 23*]

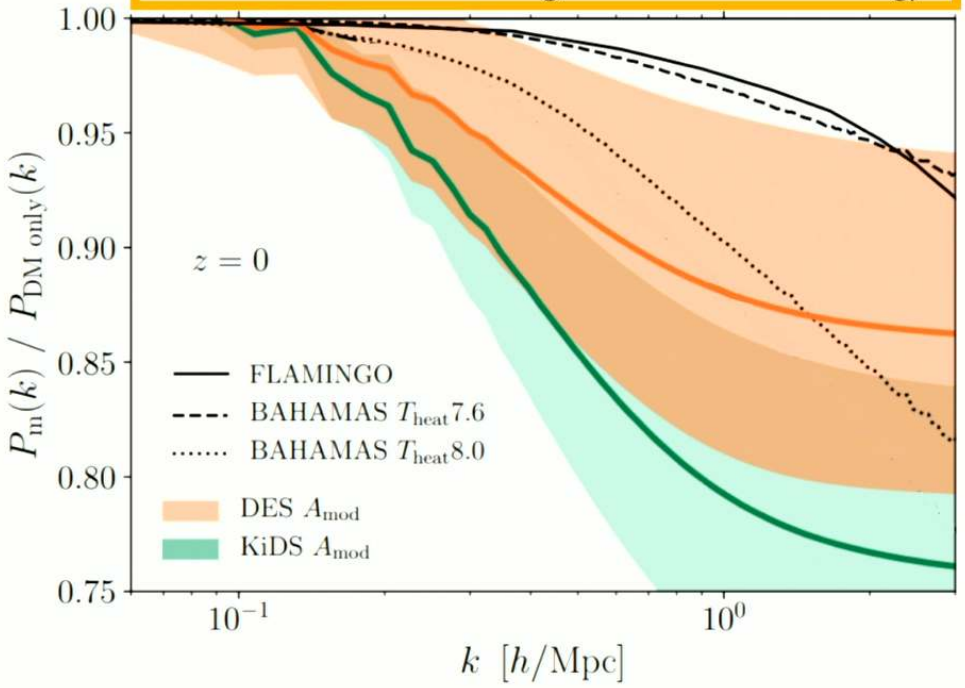
[*Preston, Amon & Efstathiou 24*]

Cosmic shear challenges: modelling baryon feedback

Halo model approach calibrated on BAHAMAS hydro-simulations

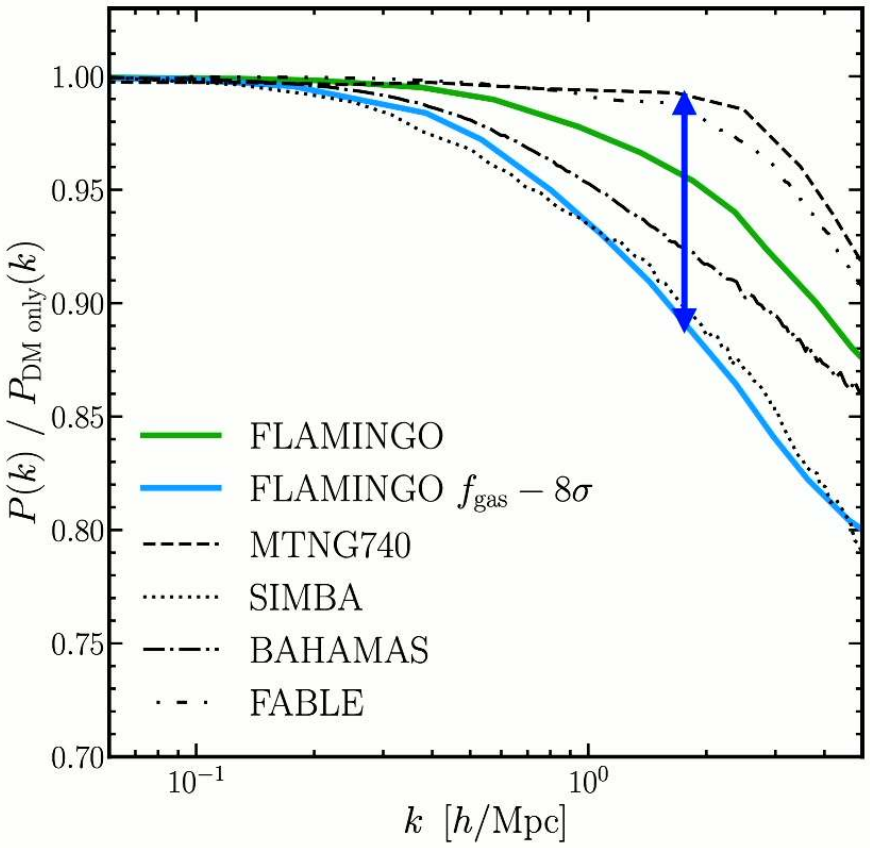


Extreme feedback? : Required suppression to reconcile weak lensing and CMB cosmology



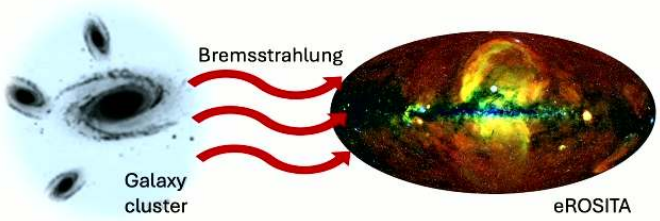
[*Amon & Efstathiou 22*]
[*Preston, Amon & Efstathiou 23*]

Test models of baryon feedback: Implicit and explicit model priors

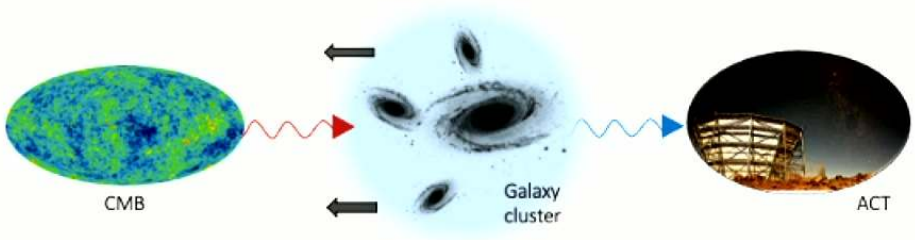


Test models of baryon feedback: Implicit and explicit model priors

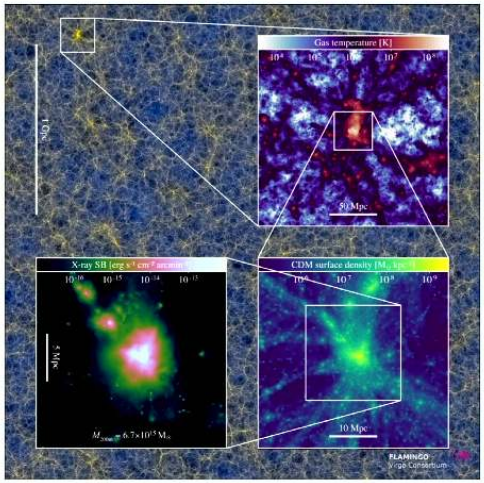
X-ray hot gas fractions:

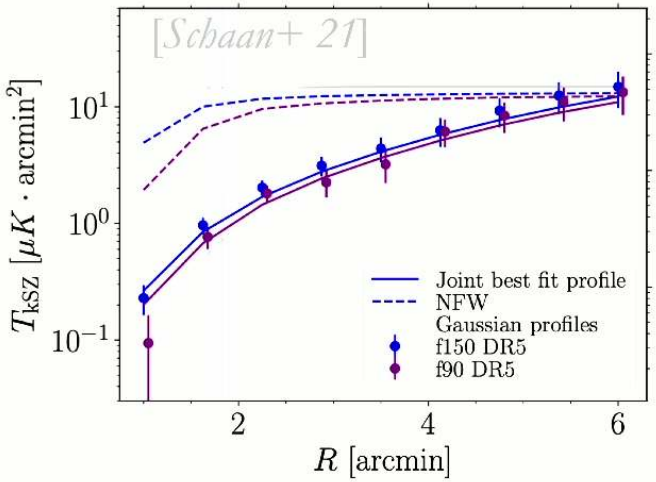


kinetic SZ effect profiles:



Simulations:



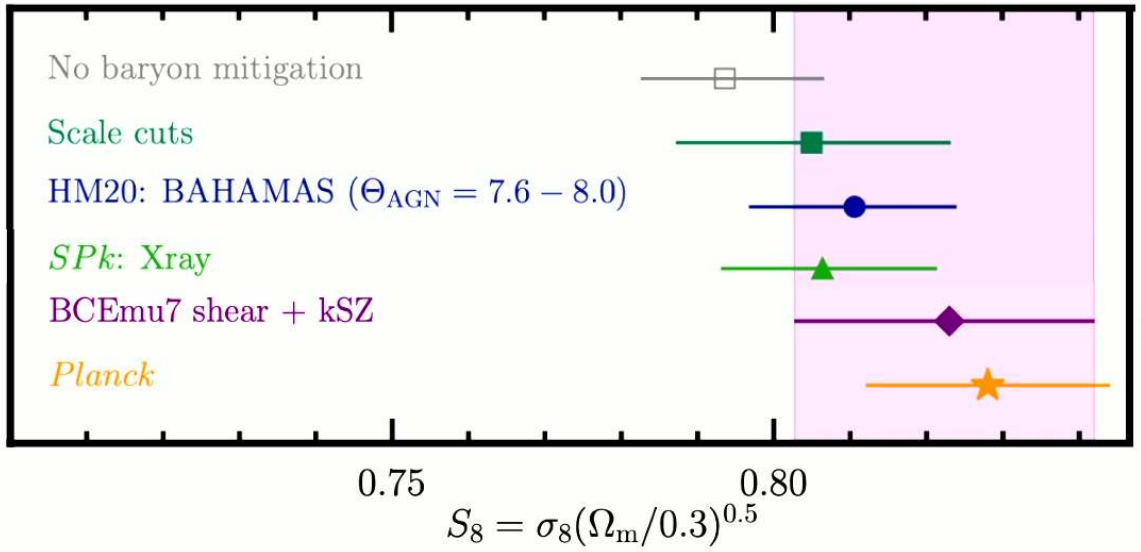


Test models of baryon feedback: Implicit and explicit model priors

X-ray hot gas fractions:

kinetic SZ effect profiles:

DESY3 cosmic shear
+ XMM X-ray gas fractions



DESY3 cosmic shear
+ ACT-BOSS kSZ

Gas priors are important!
Do X-ray and kSZ give a consistent view of feedback?

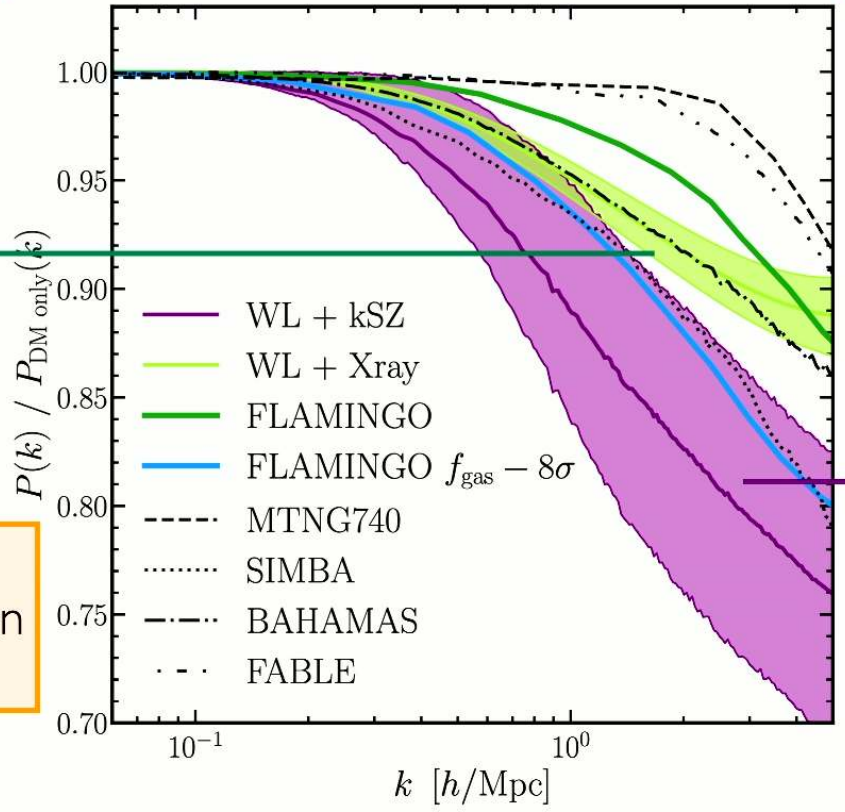
[*Bigwood, Amon+ 24*]

kSZ + cosmic shear: evidence for extreme feedback

X-ray hot gas fractions:

DES Y3 cosmic shear
+ XMM X-ray gas fractions

kSZ inconsistent with simulations & the expectation from X-ray gas fractions.



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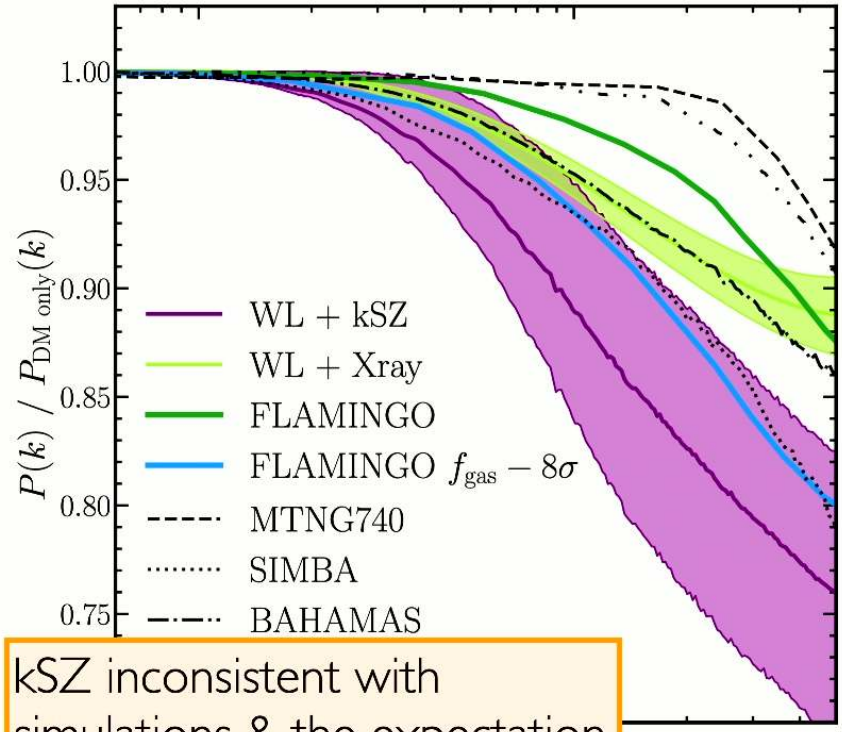
kSZ + cosmic shear: evidence for extreme feedback



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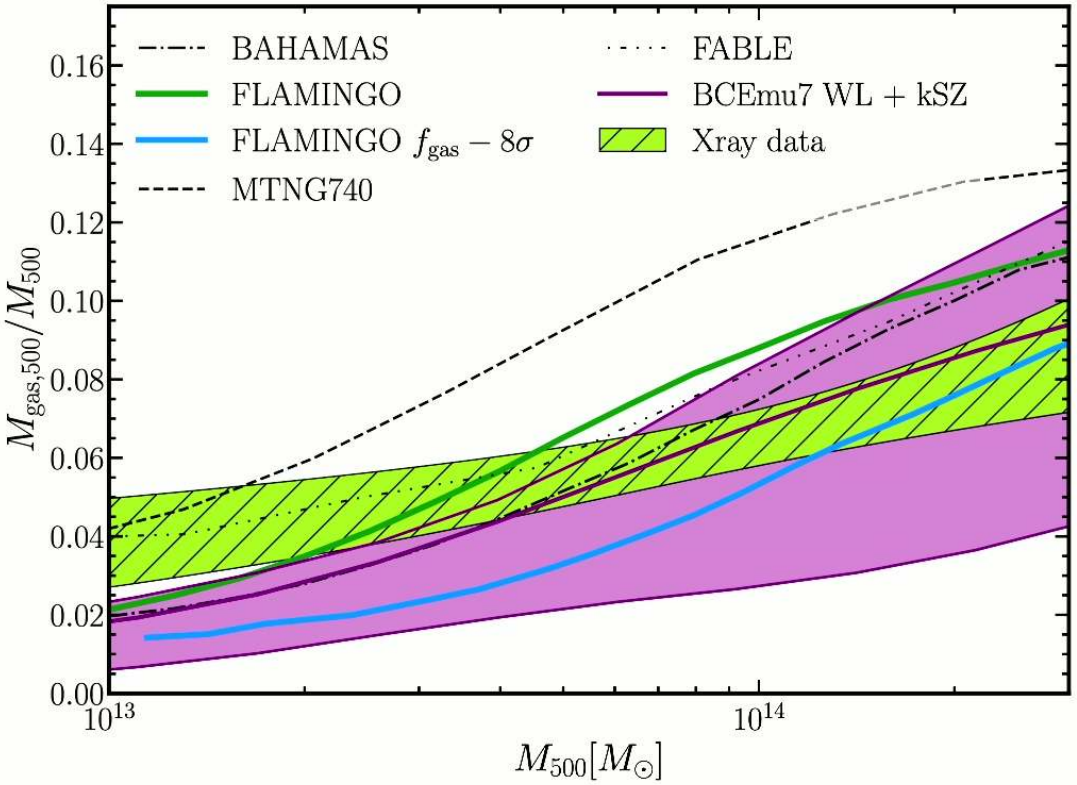
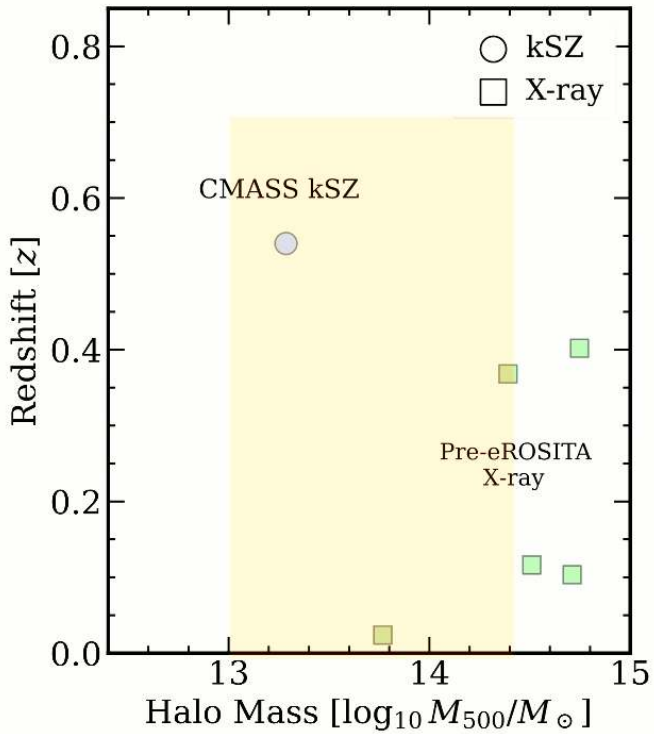
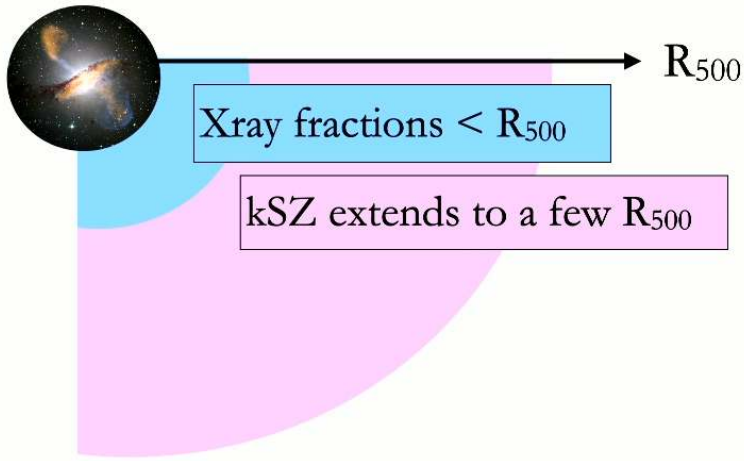


[*Bigwood, Amon+ 24*]

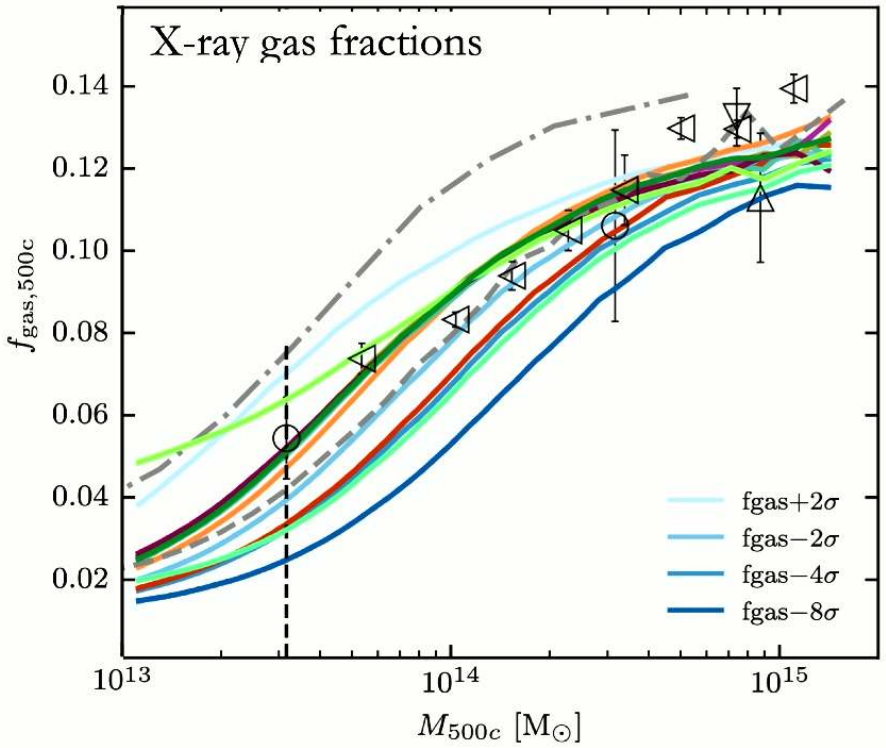
kSZ + X-ray predict different feedback strengths?

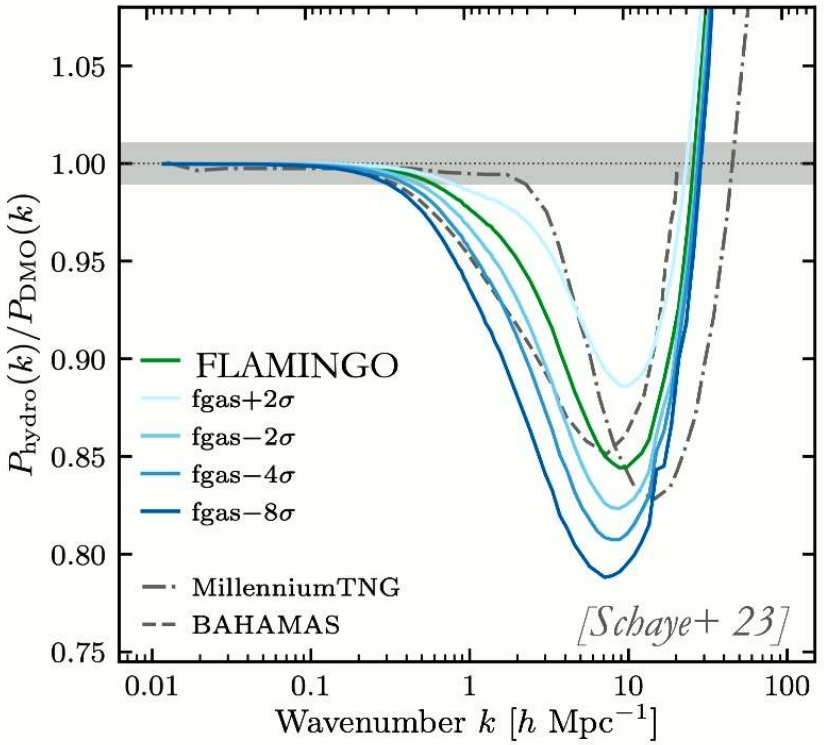
Compared to X-ray, kSZ probe different *masses* , *redshifts* and *scale extent* of halos



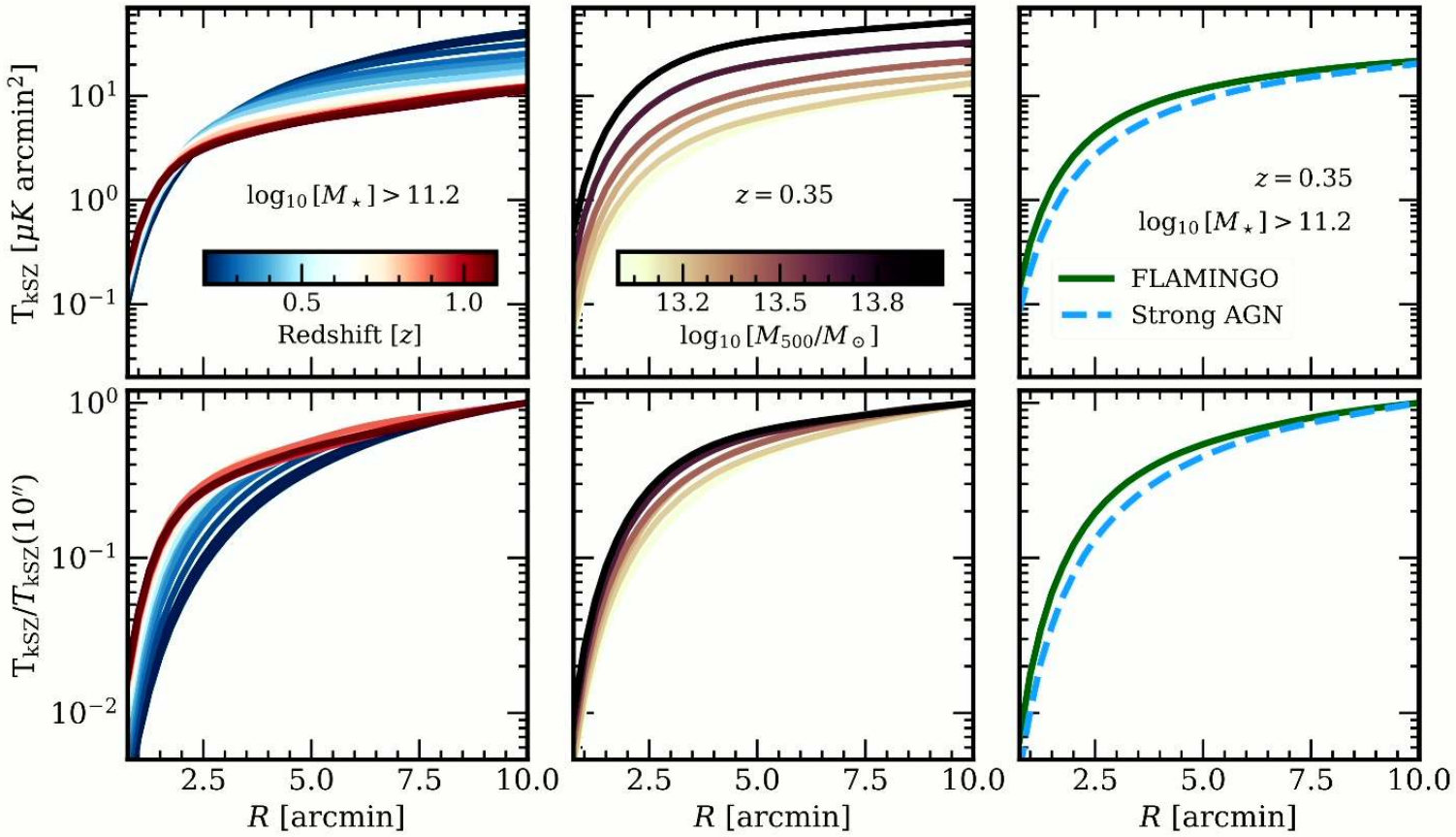


FLAMINGO simulations





The importance of sample selection for studying kSZ in simulations:

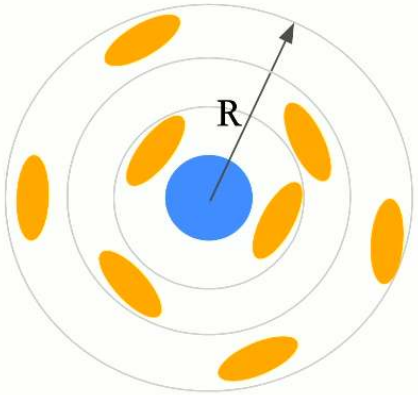


Amon | Princeton

[*Siegel, Amon, McCarthy+ in review*]

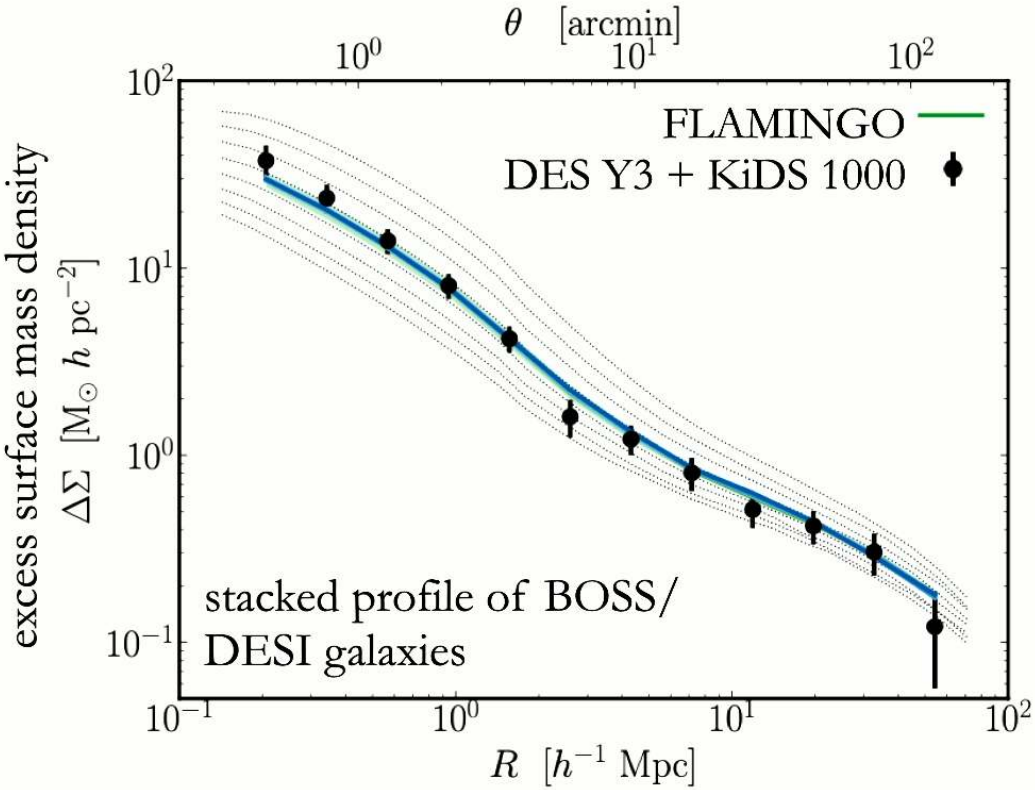
The importance of sample selection for studying kSZ in simulations: galaxy-galaxy lensing

foreground lens (BOSS / DESI)



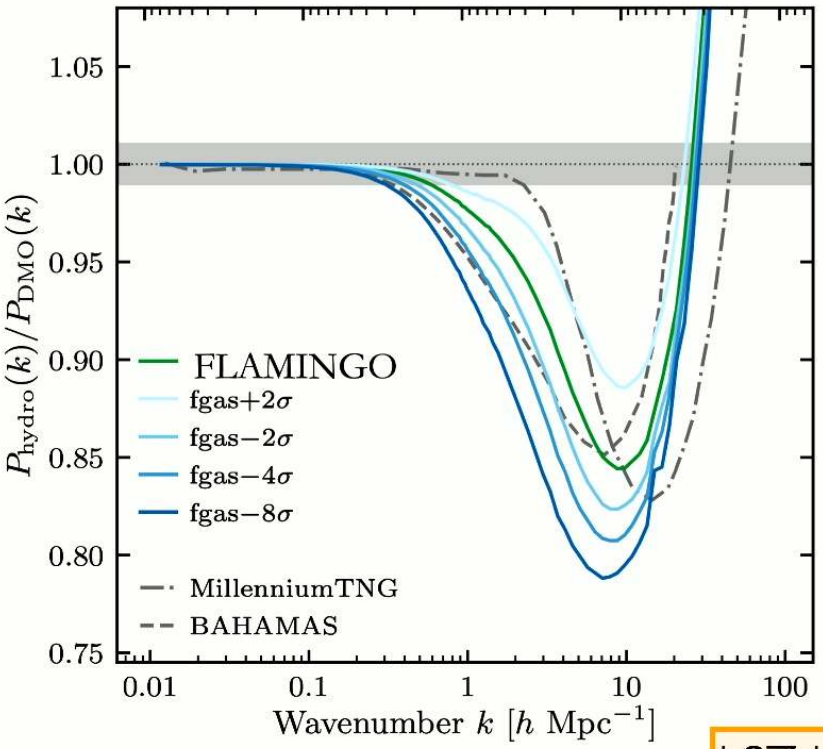
$\Delta\Sigma$

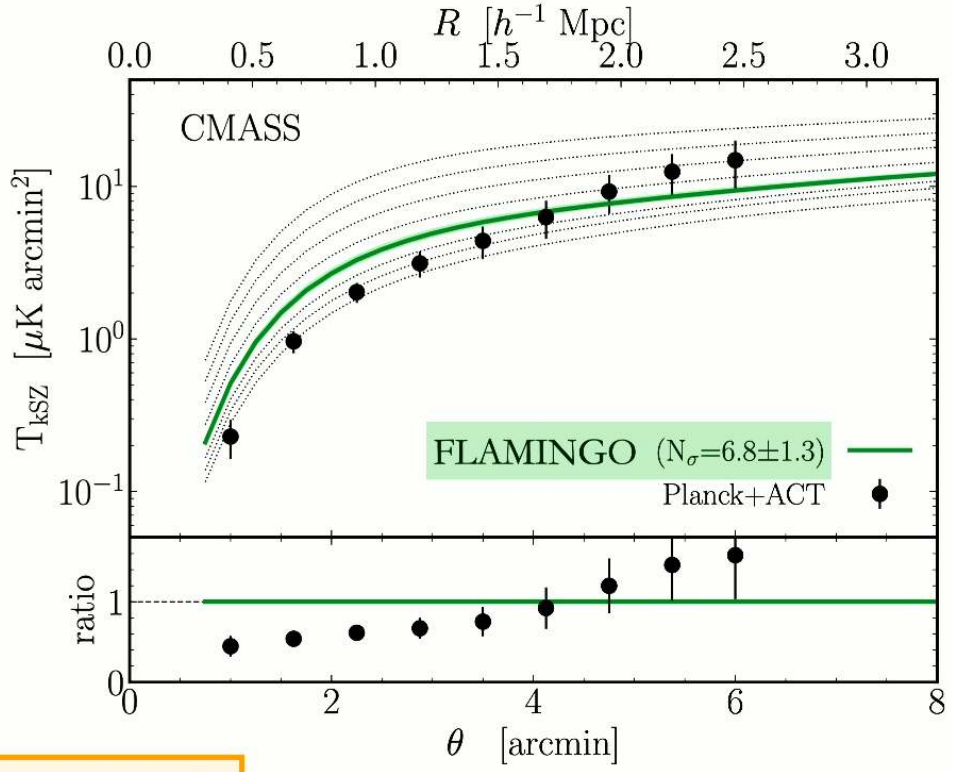
lensed background source galaxies (DES + KiDS + HSC)



[*Siegel, Amon, McCarthy+ in review*] [*McCarthy, Amon, FLAMINGO+ 24*]

kSZ + galaxy-galaxy lensing: evidence for extreme feedback

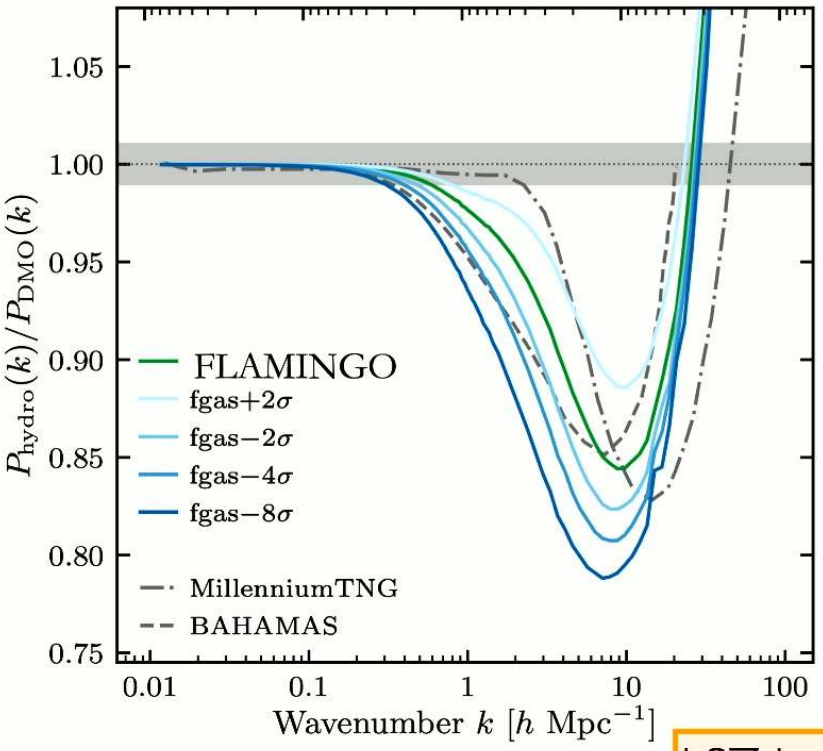


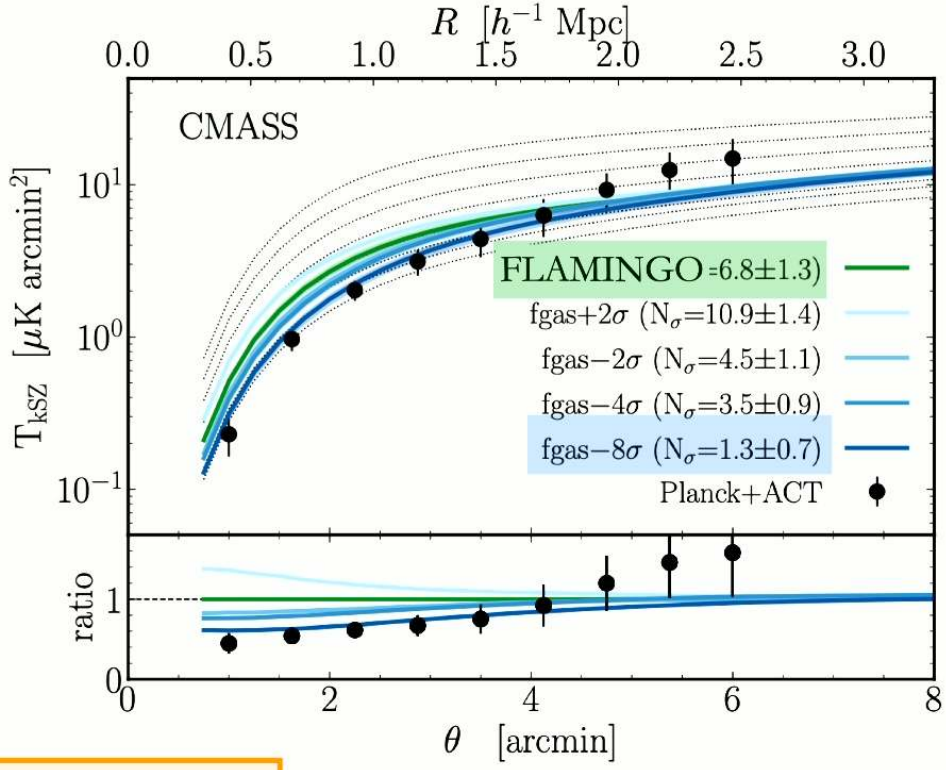


kSZ inconsistent with FLAMINGO by ~7σ

[*McCarthy, Amon, FLAMINGO+ 24*]

kSZ + galaxy-galaxy lensing: evidence for extreme feedback

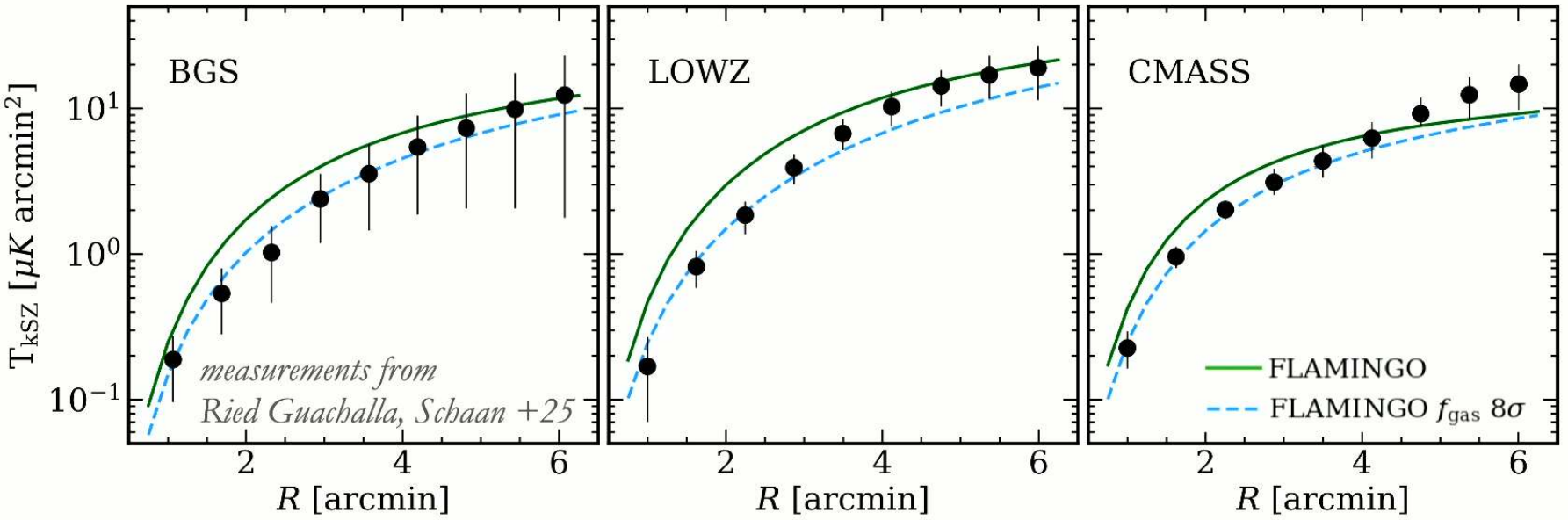




kSZ inconsistent with FLAMINGO & X-ray fgas

[*McCarthy, Amon, FLAMINGO+ 24*]

kSZ + galaxy-galaxy lensing: evidence for extreme feedback



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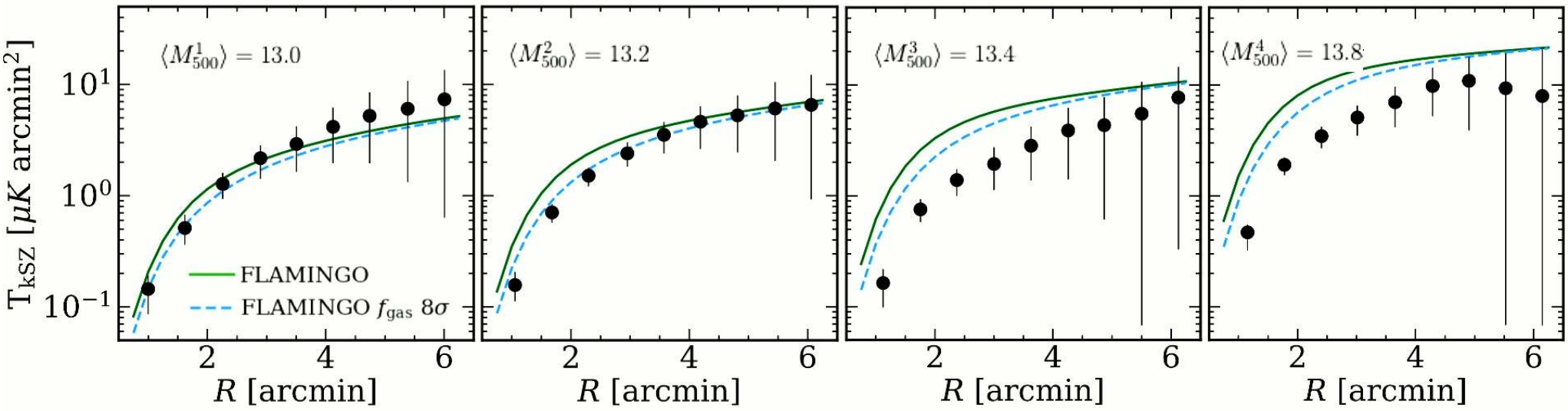

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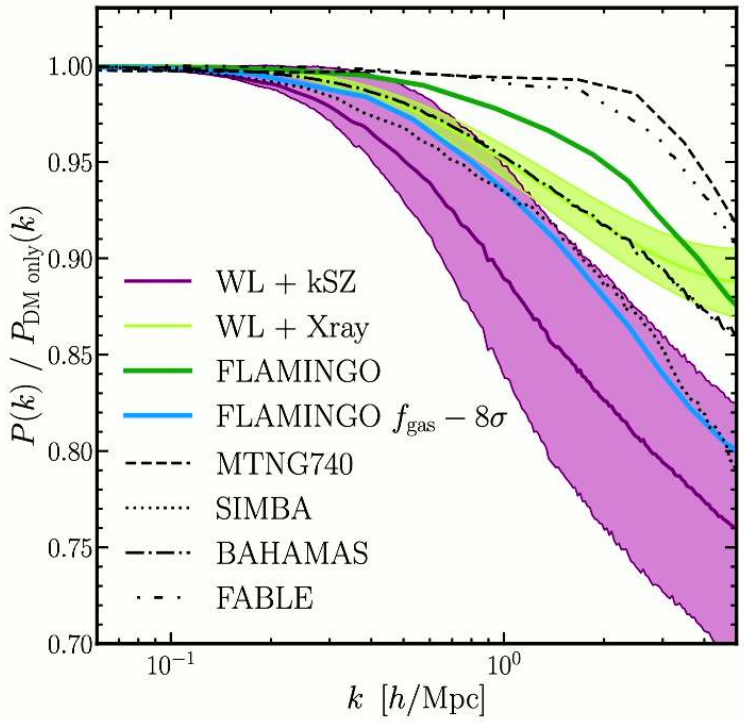
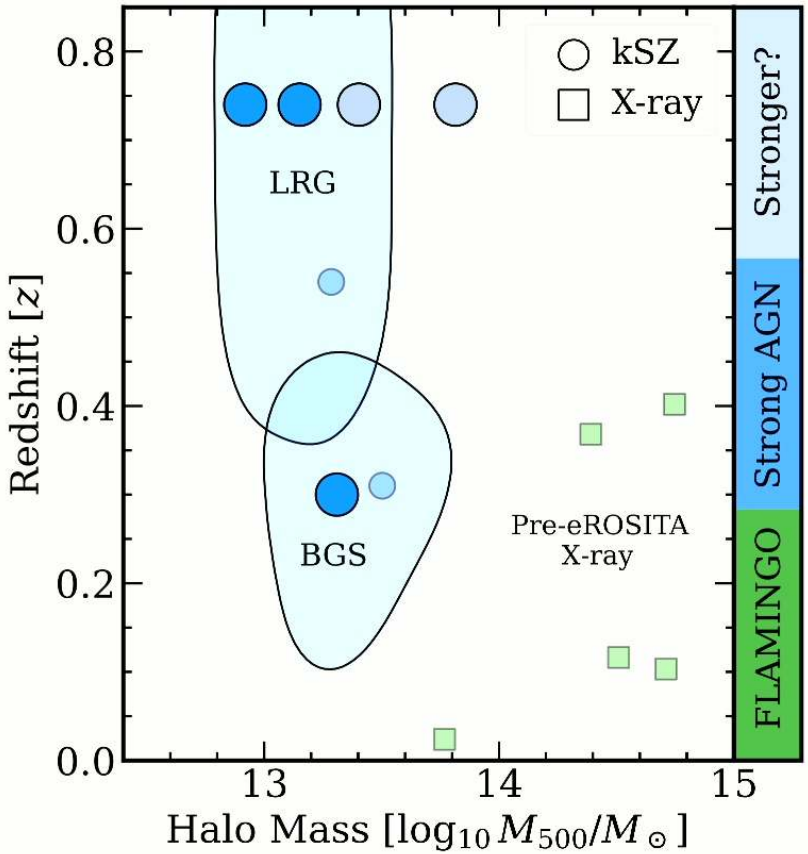
There is mounting evidence that feedback is 'extreme' but inconsistencies between kSZ & X-ray



Constrained Pk suppression due to feedback with the kSZ effect *and* X-ray gas fractions



Built the framework to benchmark simulations with kSZ *accurately*

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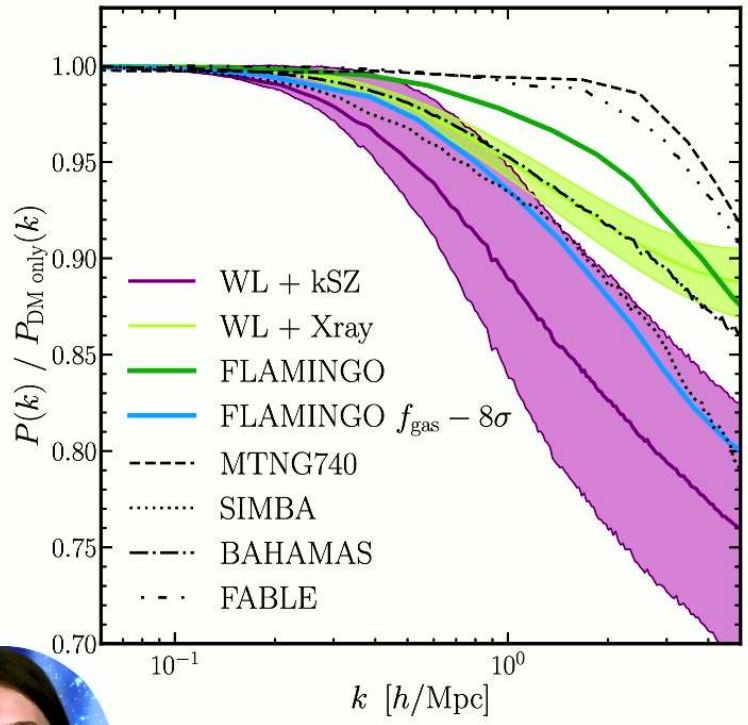
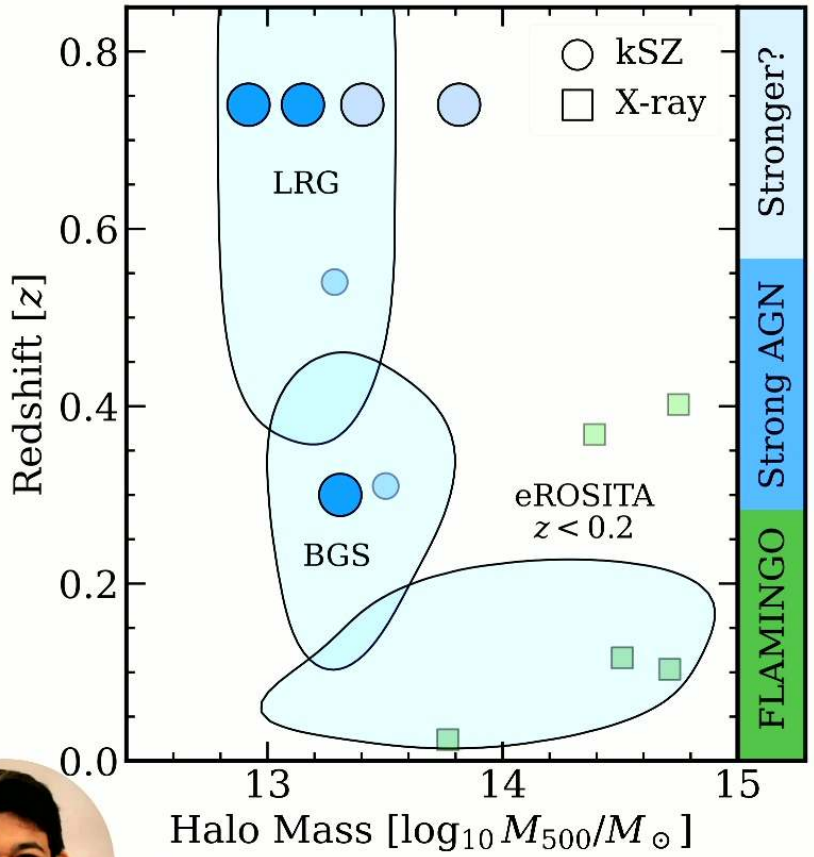


Leah Bigwood

Do <u>any</u> of the state-of-the-art simulations fit the data?



Jared Siegel

Do we have <u>a consistent case across observables</u> with new data?

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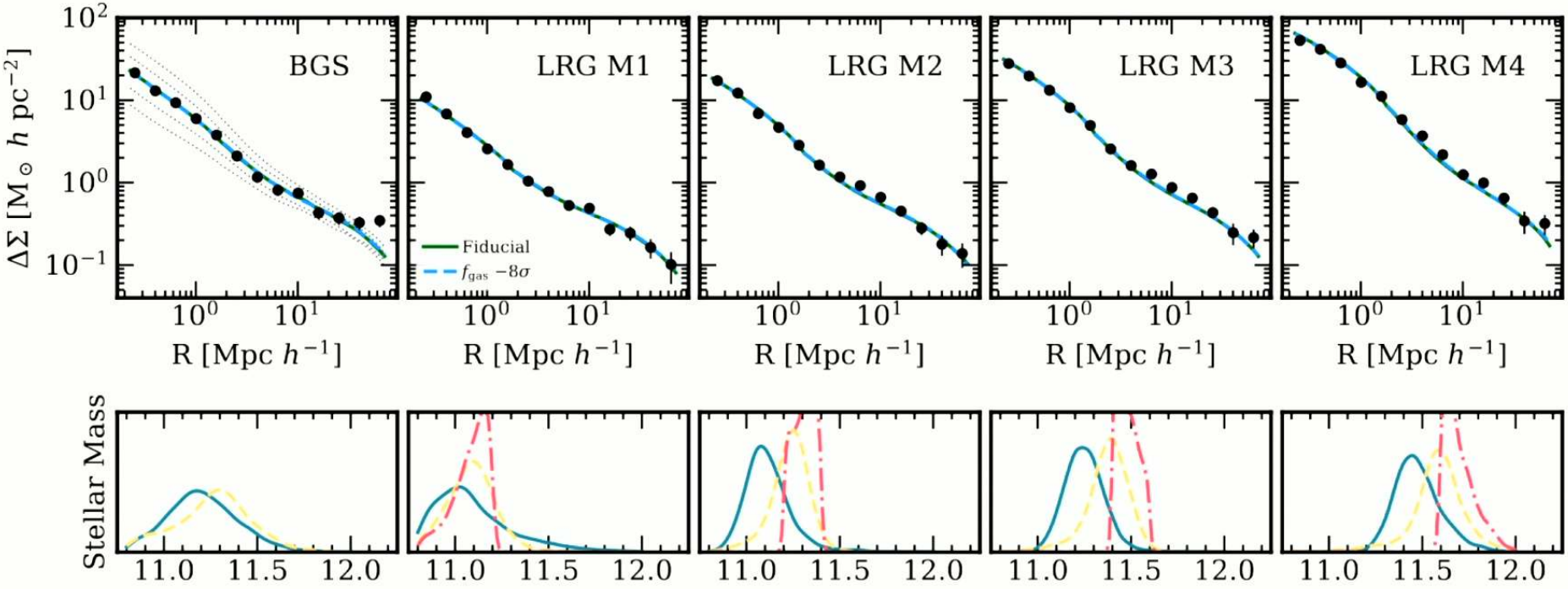
extra slides


BGS
LRG M1
LRG M2
LRG M3
LRG M4
Fiducial
f_{gas} -8σ
$\Delta\Sigma$ [$M_\odot$ h pc^{-2}]
R [Mpc h^{-1}]
Stellar Mass