

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



Leah Bigwood

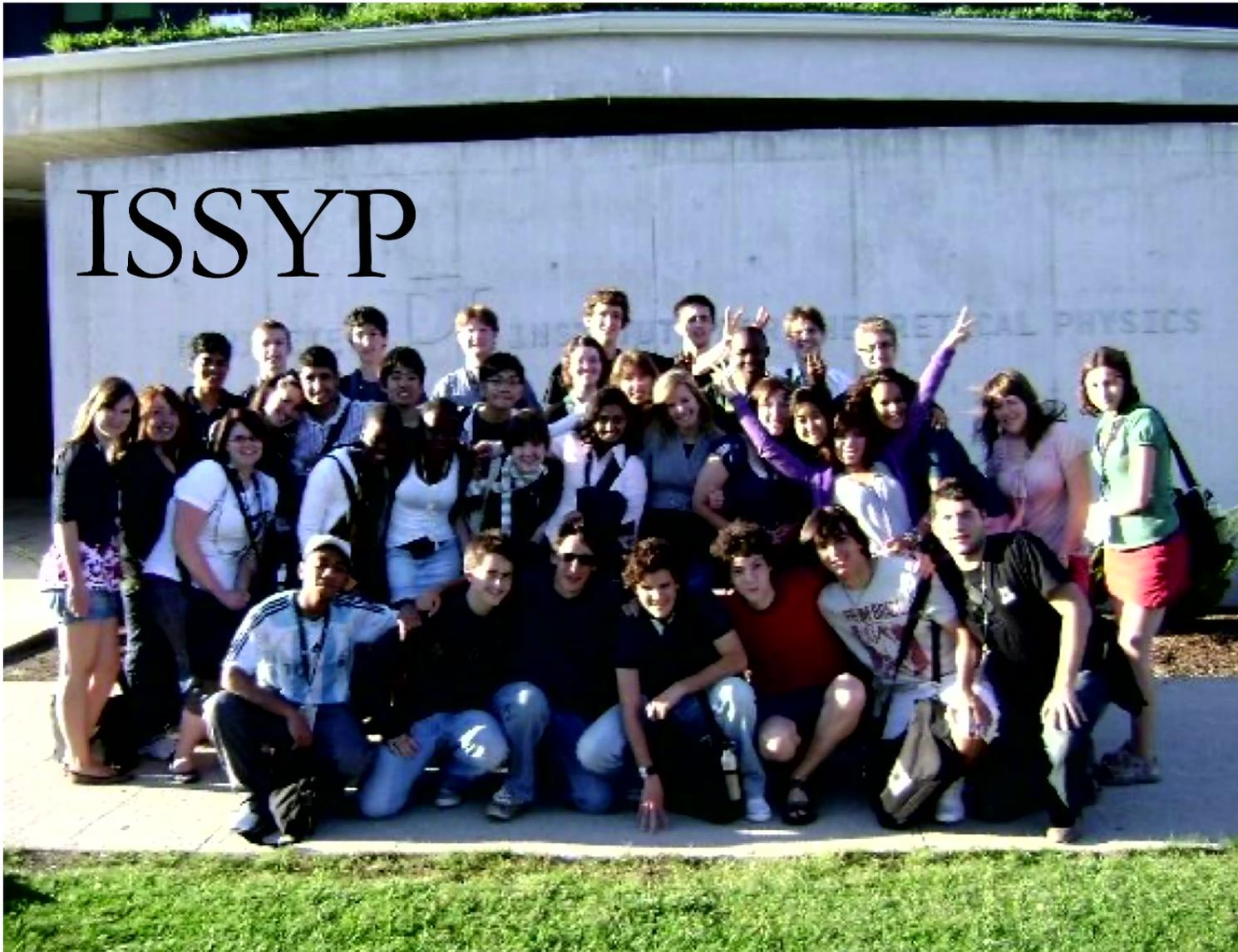
Jared Siegel

Masa Yamamoto

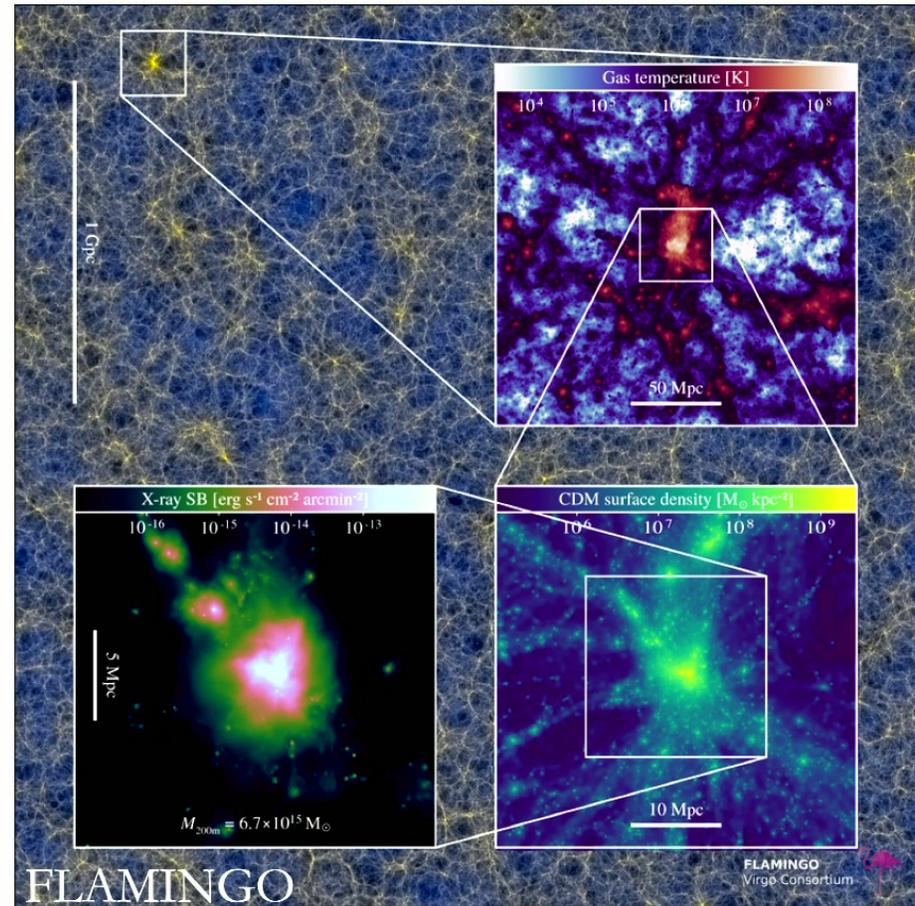
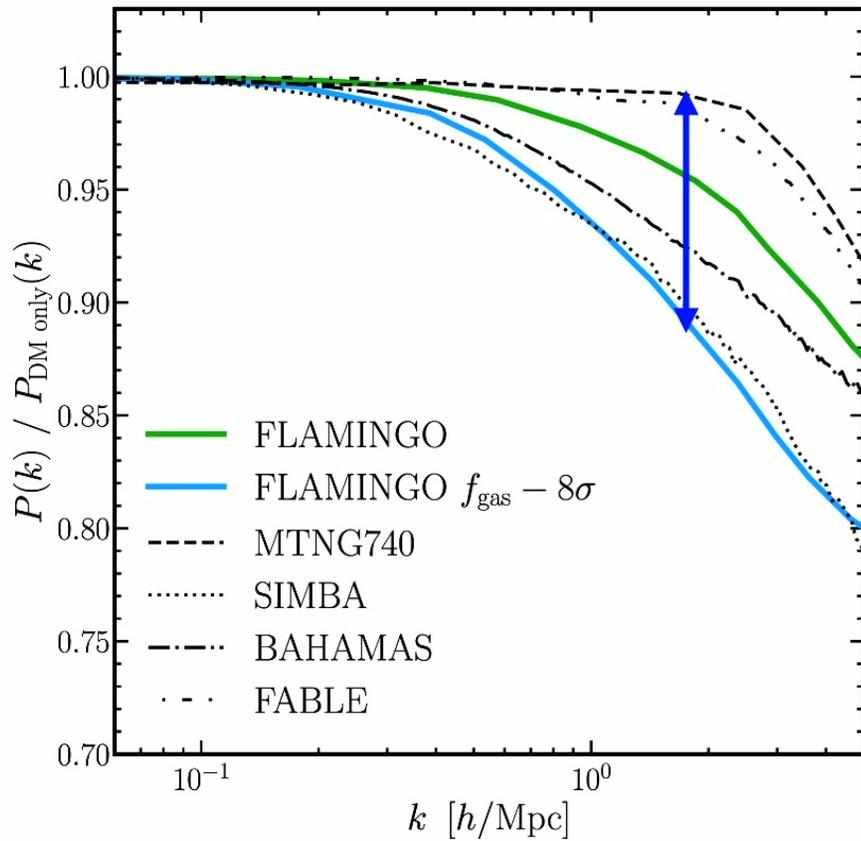
Ian McCarthy

DarkLab @Princeton

ISSYP

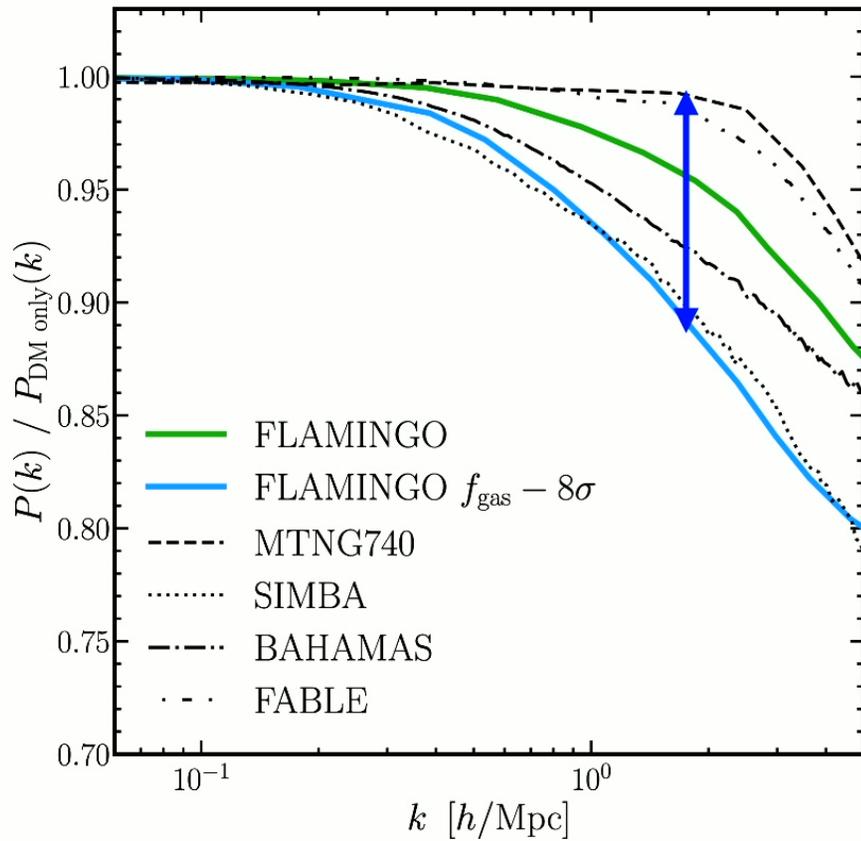


Cosmic shear challenges: modelling baryon feedback

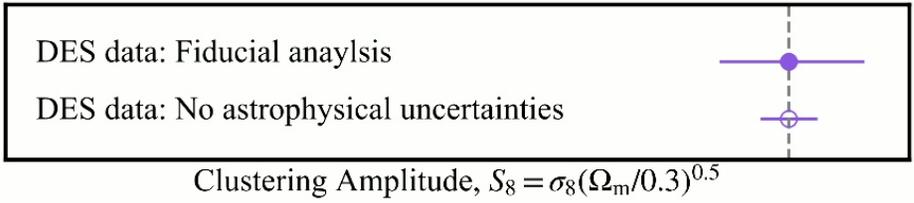
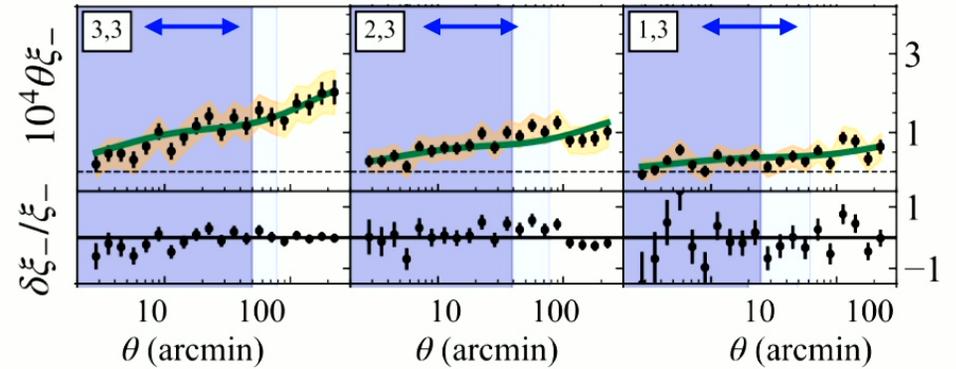


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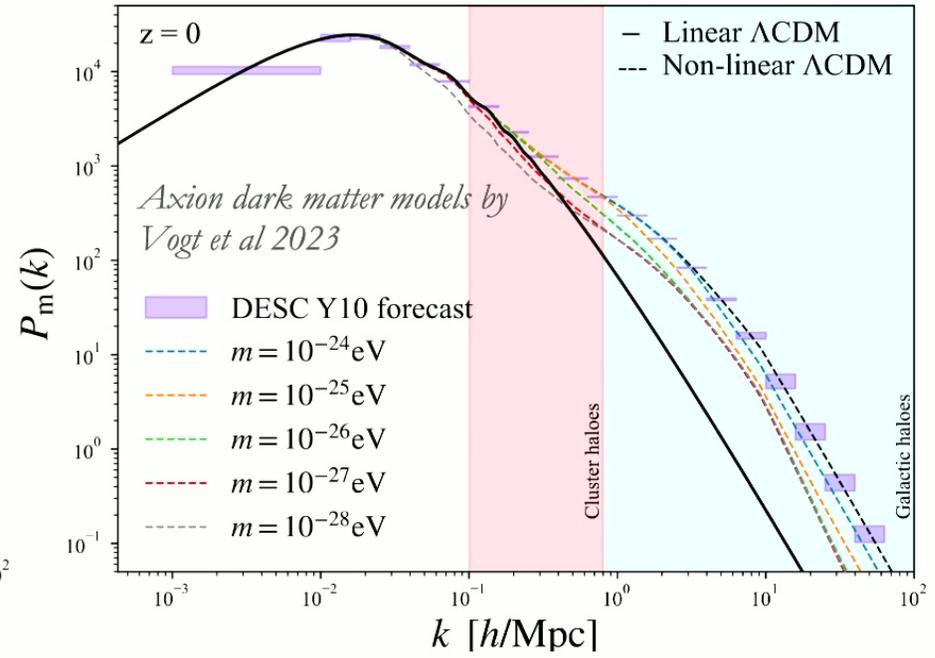
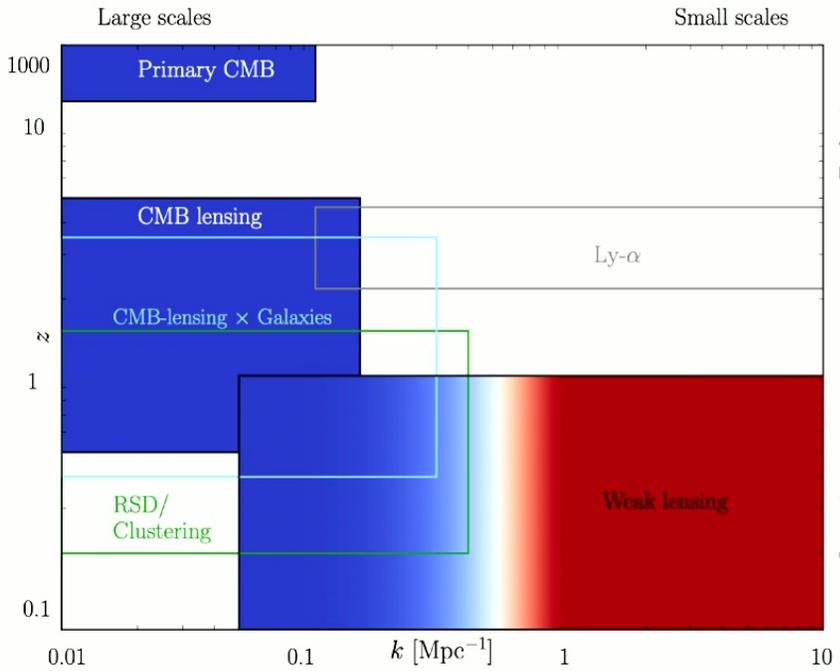
Cosmic shear challenges: modelling baryon feedback



DES Y3 cosmic shear measurements



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



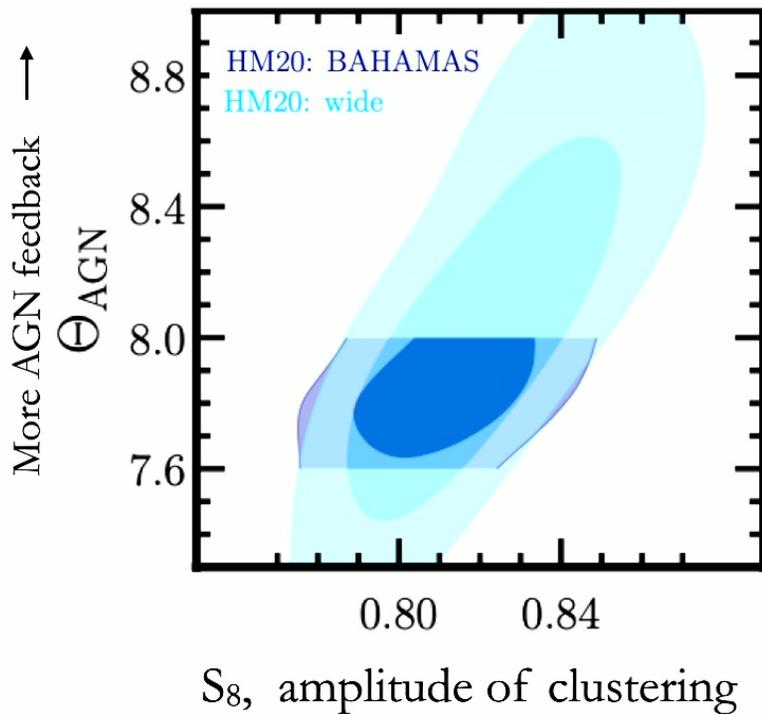
[Preston, Amon & Efstathiou 23]

[Preston, Amon & Efstathiou 24]

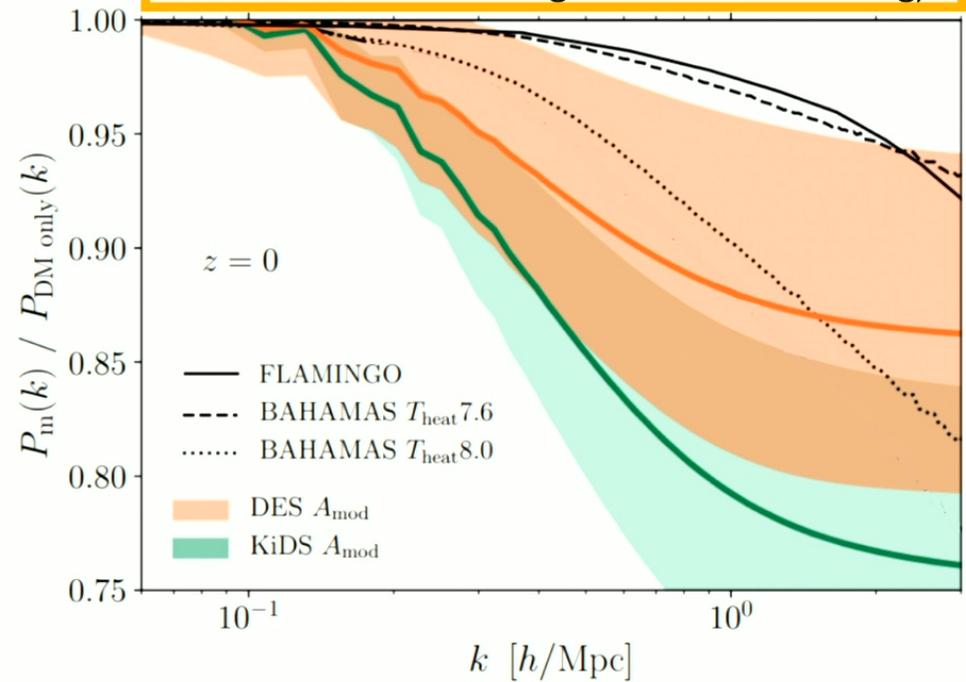
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Cosmic shear challenges: modelling baryon feedback

Halo model approach calibrated on BAHAMAS hydro-simulations



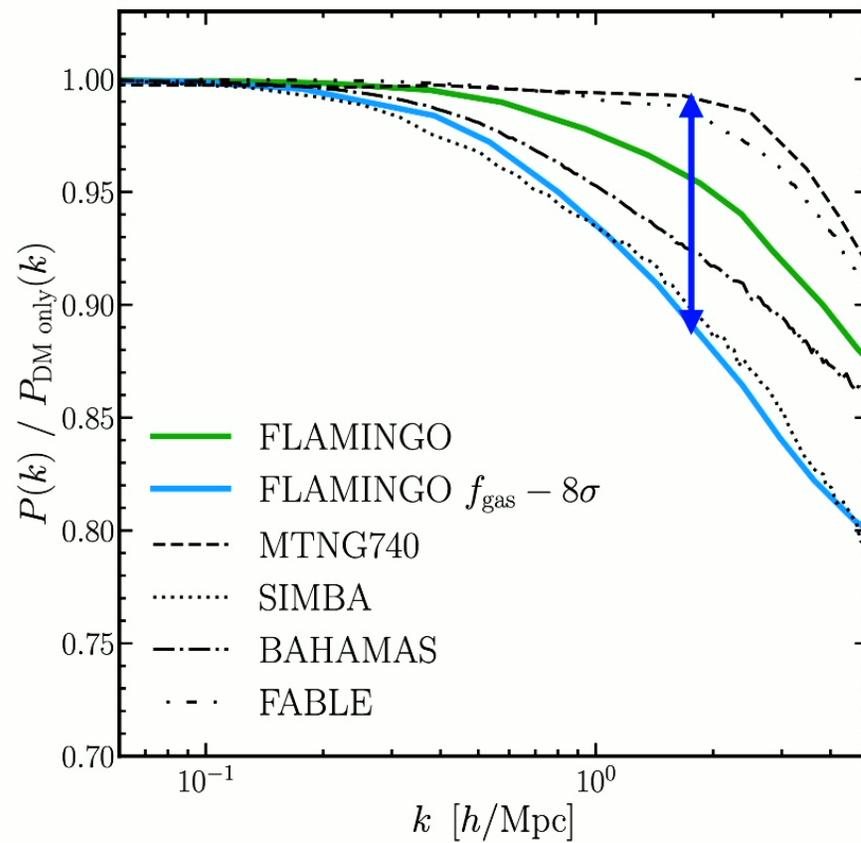
Extreme feedback? : Required suppression to reconcile weak lensing and CMB cosmology



[Amon & Efstathiou 22]

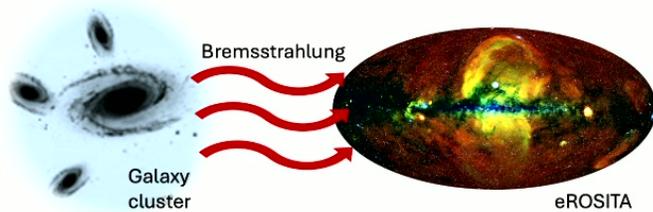
[Preston, Amon & Efstathiou 23]

Test models of baryon feedback: Implicit and explicit model priors

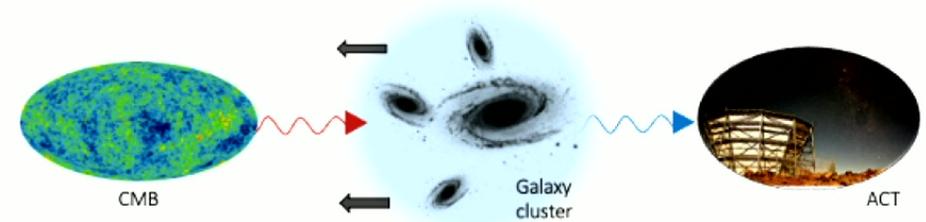


Test models of baryon feedback: Implicit and explicit model priors

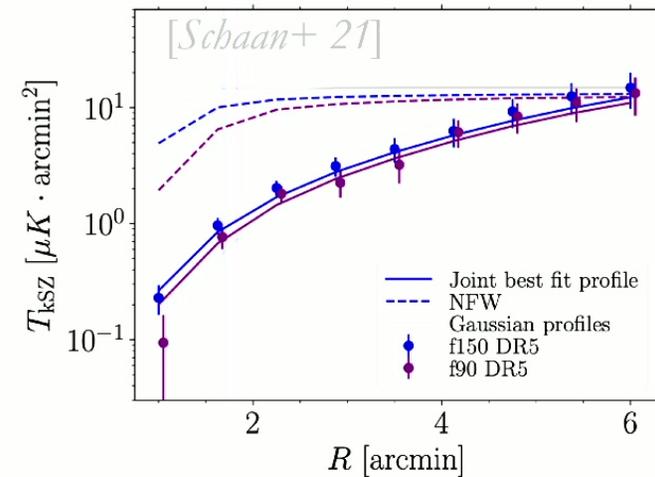
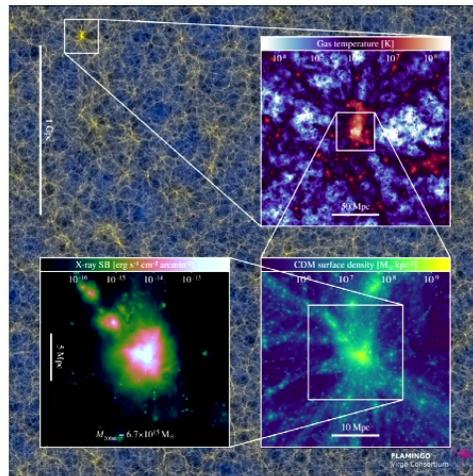
X-ray hot gas fractions:



kinetic SZ effect profiles:



Simulations:

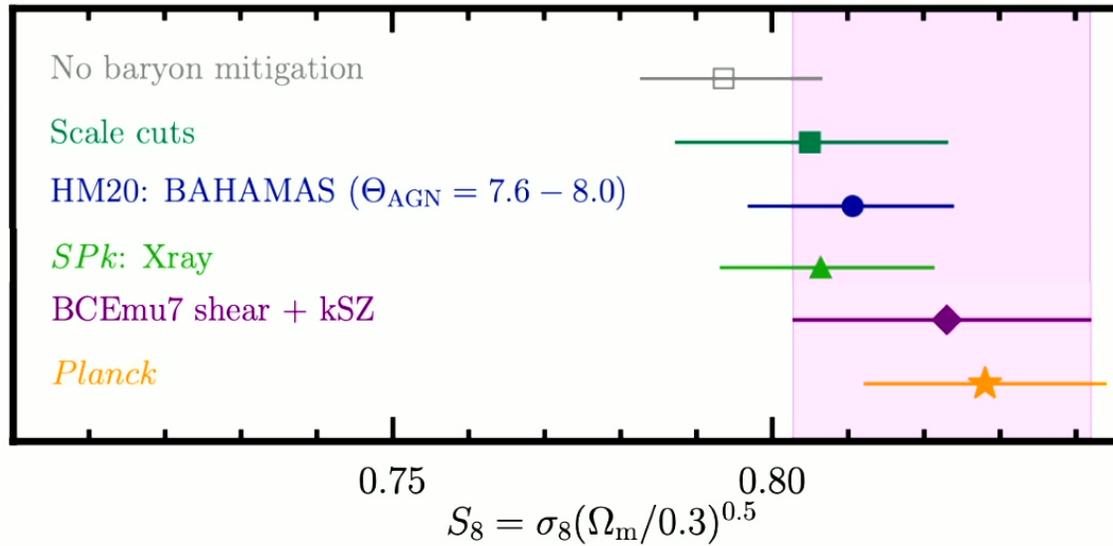


Test models of baryon feedback: Implicit and explicit model priors

X-ray hot gas fractions:

kinetic SZ effect profiles:

DES Y3 cosmic shear
+ XMM X-ray gas fractions



DES Y3 cosmic shear
+ ACT-BOSS kSZ

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

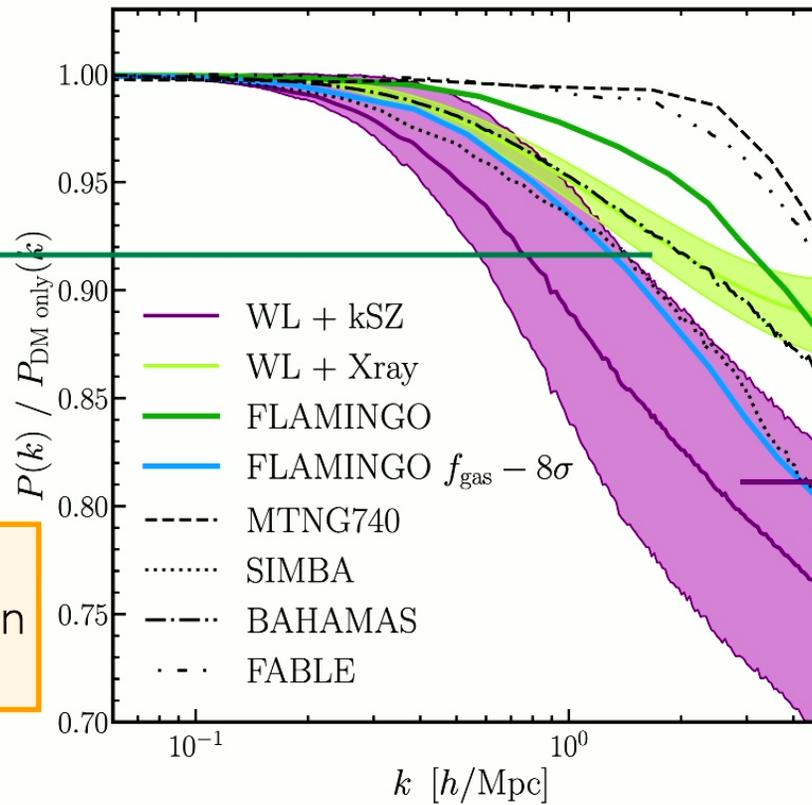
kSZ + cosmic shear: evidence for extreme feedback

X-ray hot gas fractions:

kinetic SZ effect profiles:

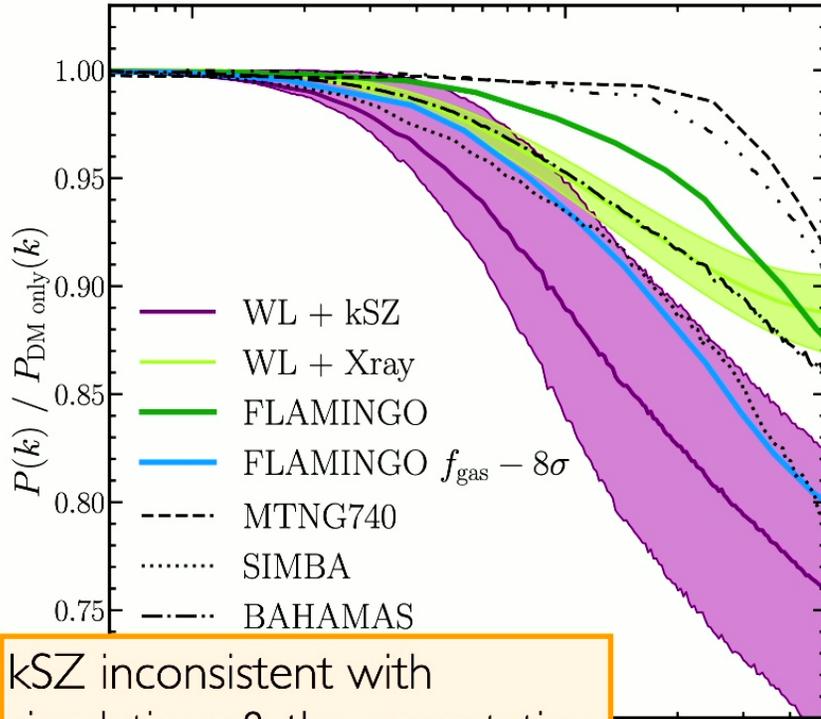
DES Y3 cosmic shear
+ XMM X-ray gas fractions

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

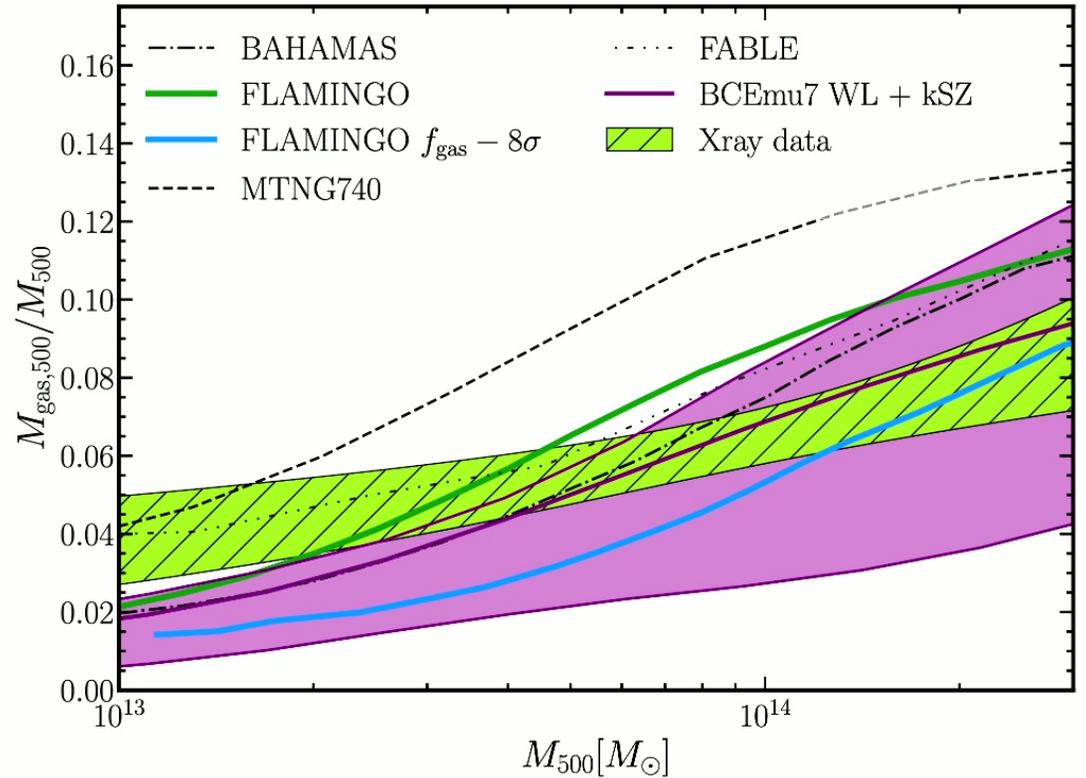


DES Y3 cosmic shear
+ ACT-BOSS kSZ

kSZ + cosmic shear: evidence for extreme feedback

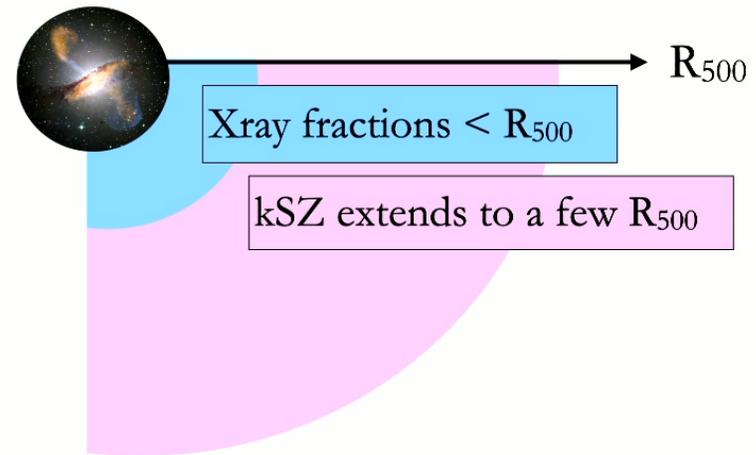
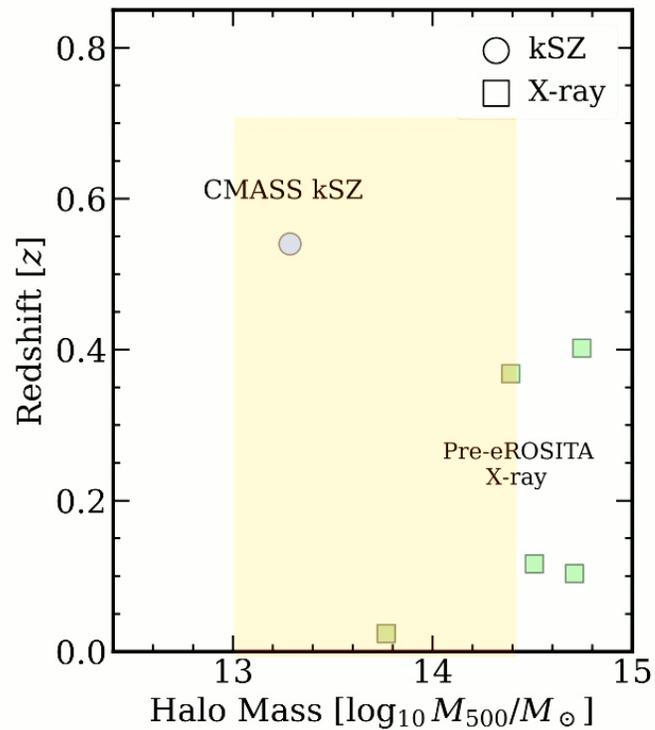


kSZ inconsistent with simulations & the expectation from X-ray gas fractions.

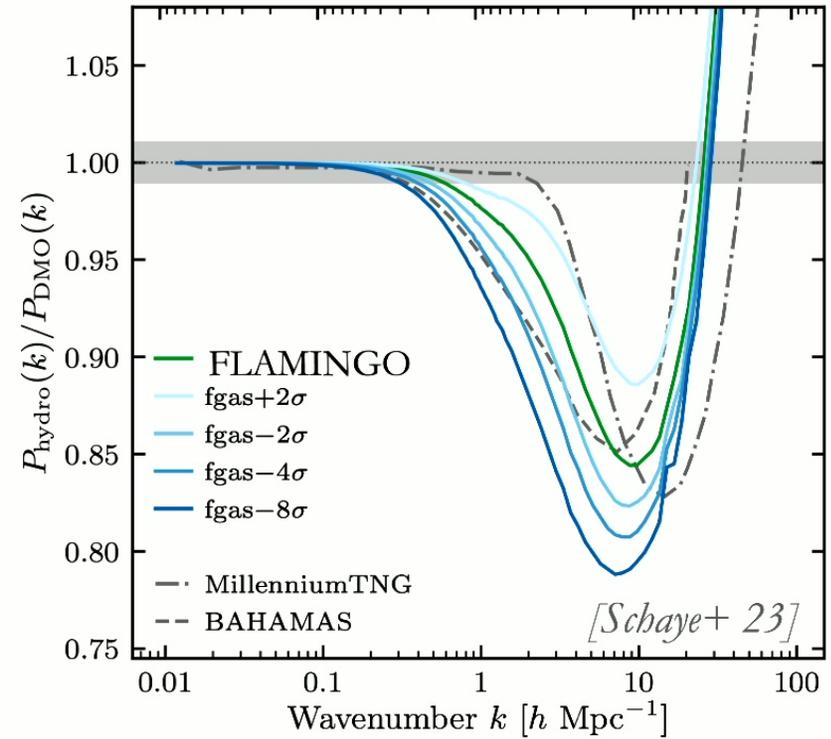
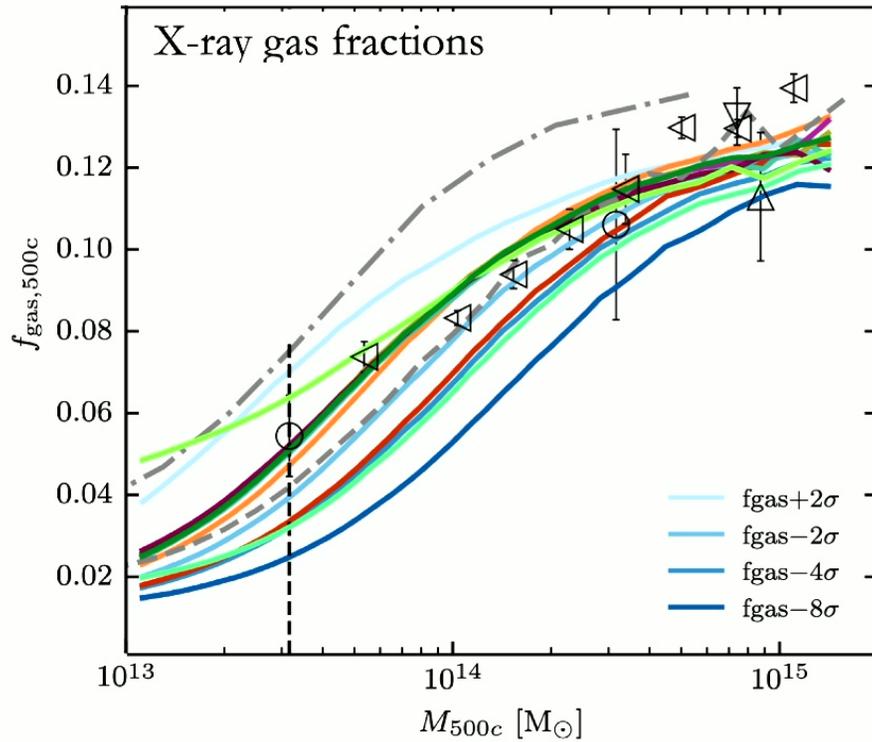


kSZ + X-ray predict different feedback strengths?

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

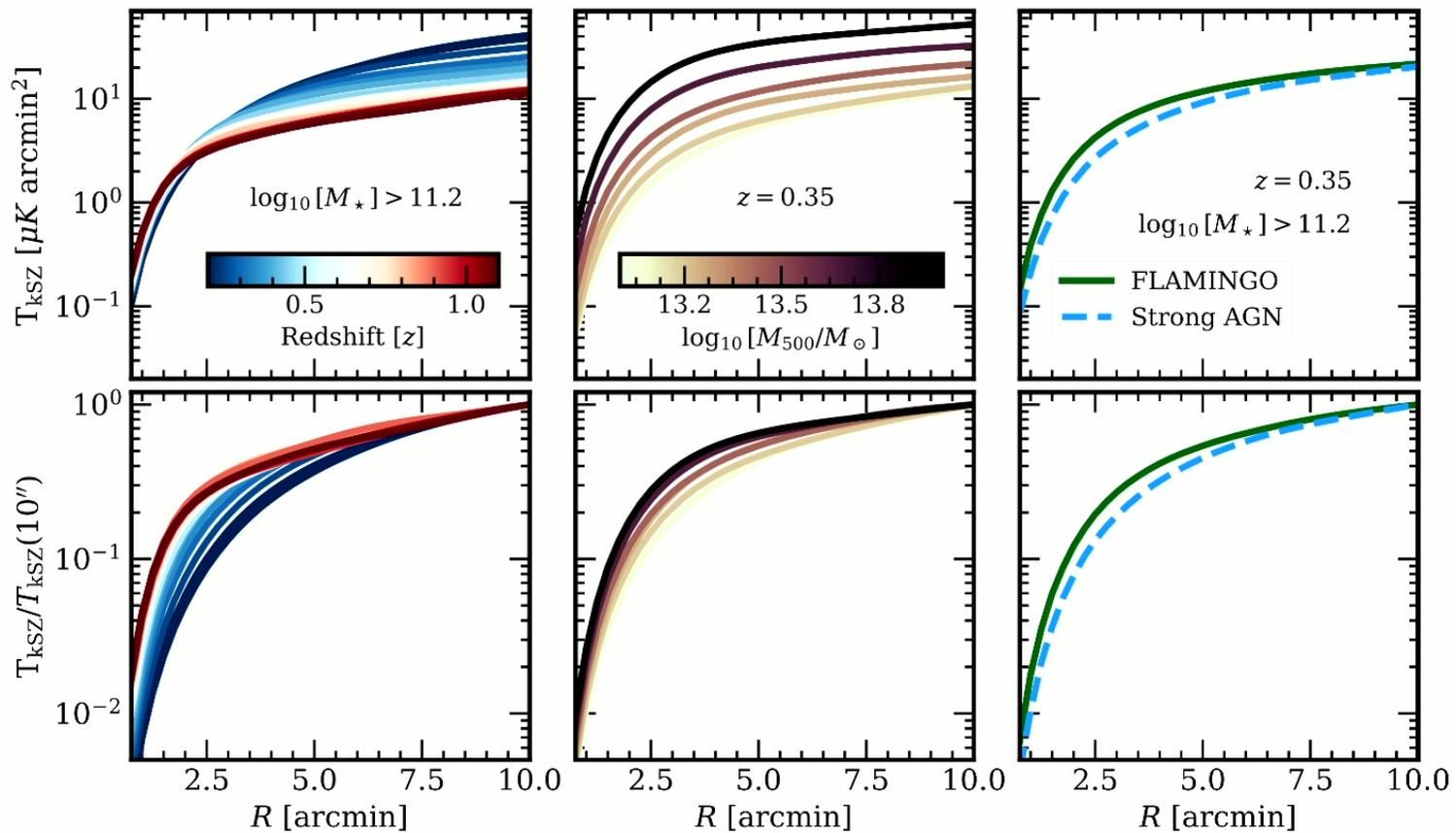


FLAMINGO simulations



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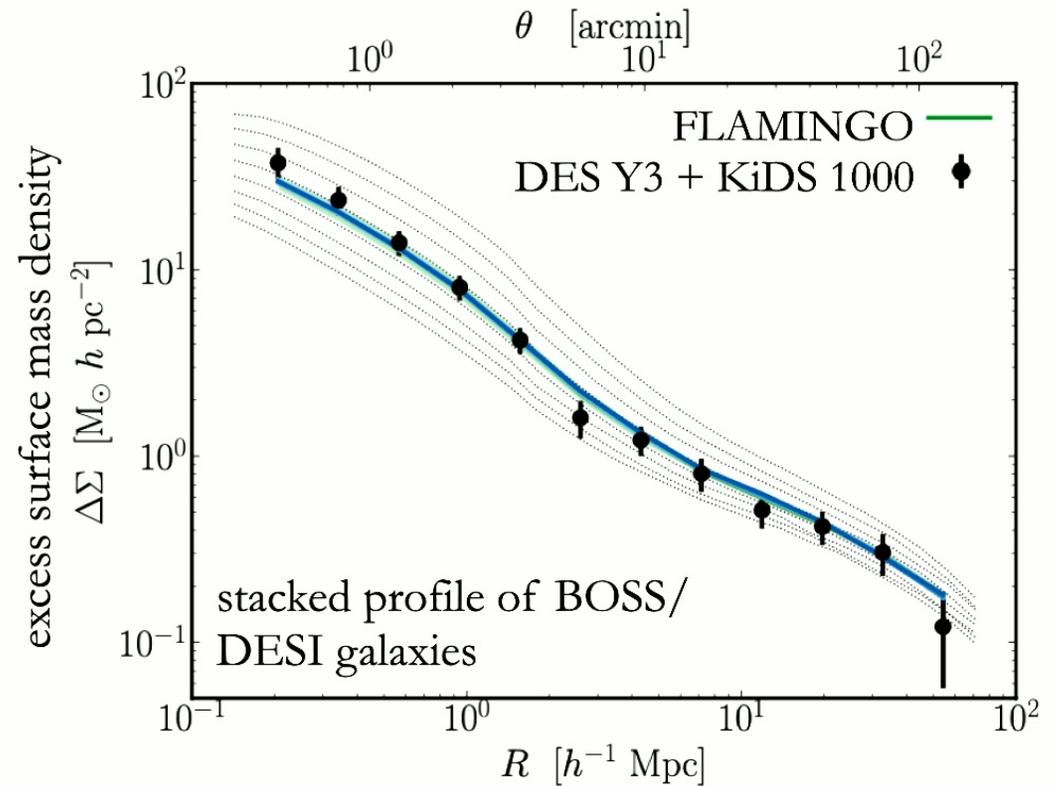
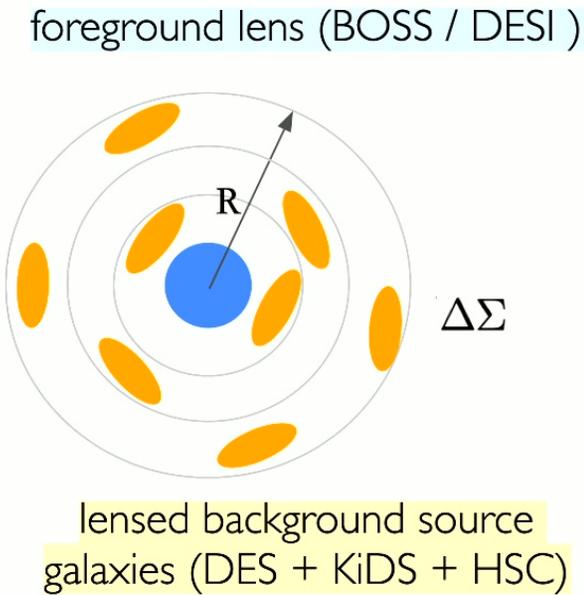
The importance of sample selection for studying kSZ in simulations:



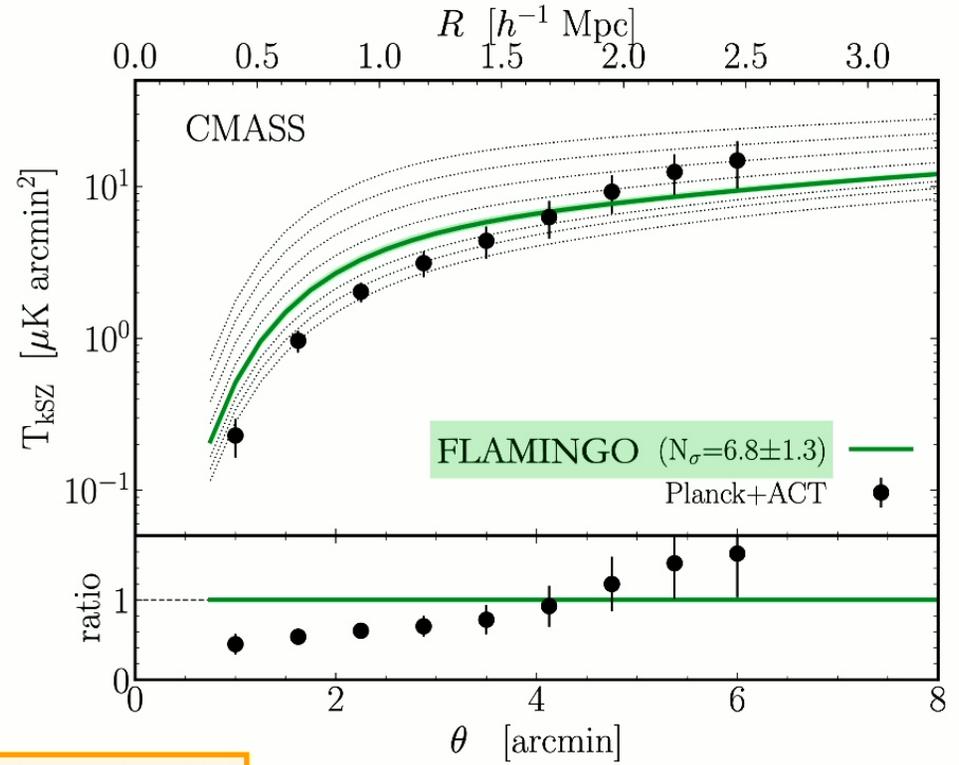
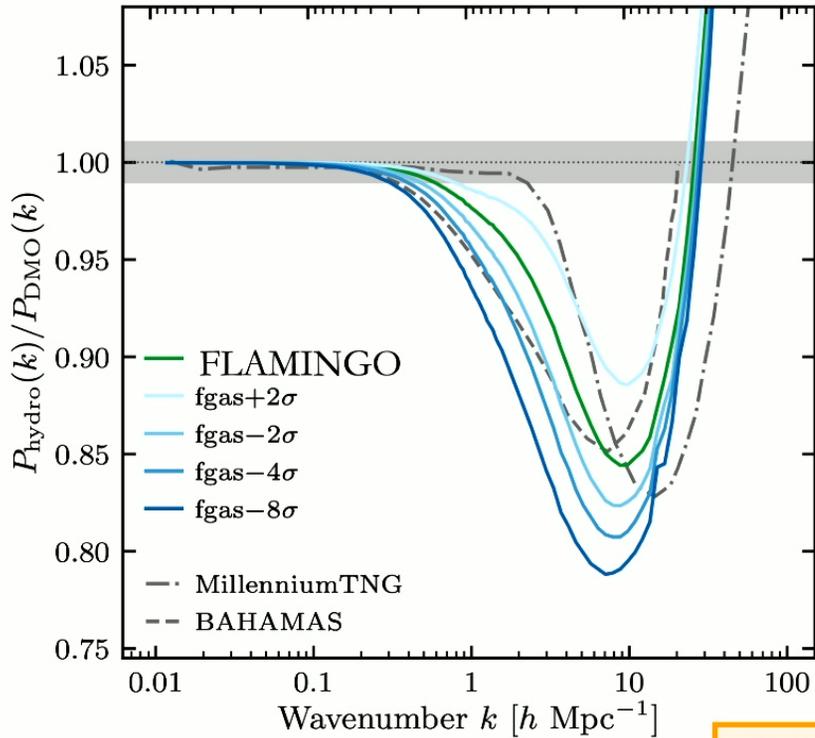
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[Siegel, Amon, McCarthy+ in review]

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



kSZ + galaxy-galaxy lensing: evidence for extreme feedback

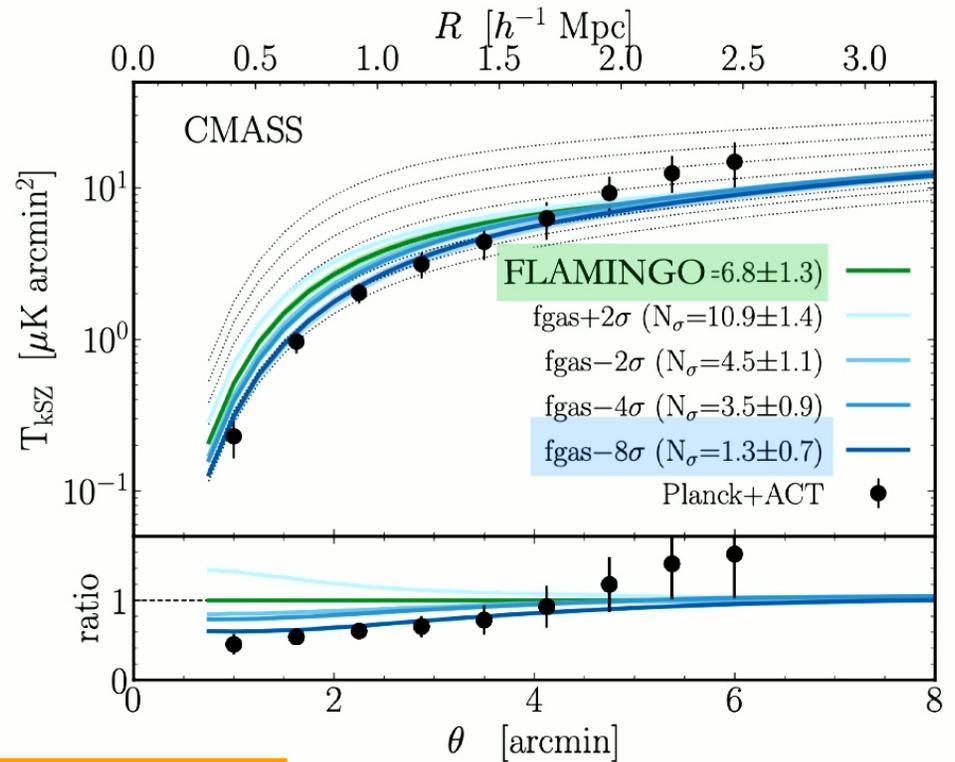
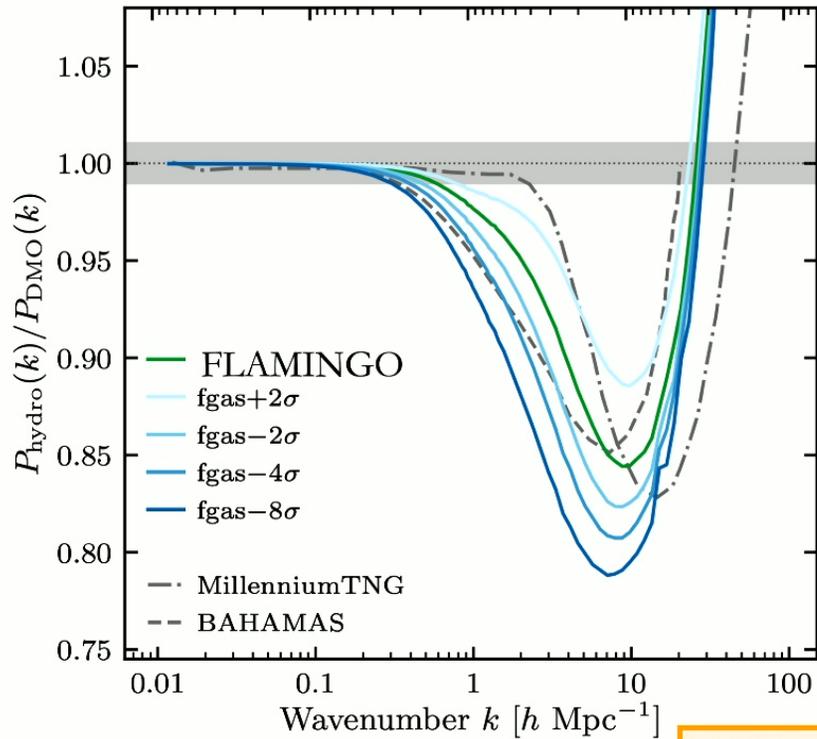


kSZ inconsistent with FLAMINGO by $\sim 7\sigma$

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[McCarthy, Amon, FLAMINGO+ 24]

kSZ + galaxy-galaxy lensing: evidence for extreme feedback

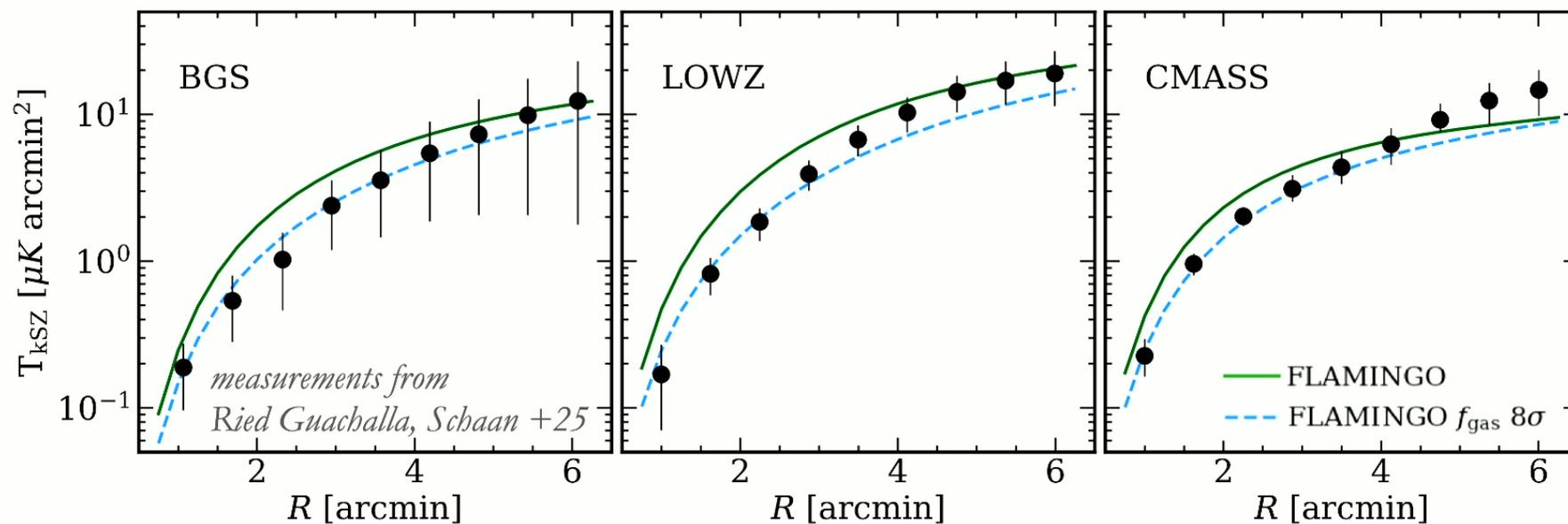


kSZ inconsistent with
FLAMINGO & X-ray fgas

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[McCarthy, Amon, FLAMINGO+ 24]

kSZ + galaxy-galaxy lensing: evidence for extreme feedback

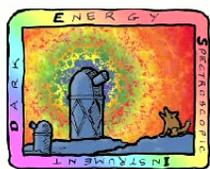
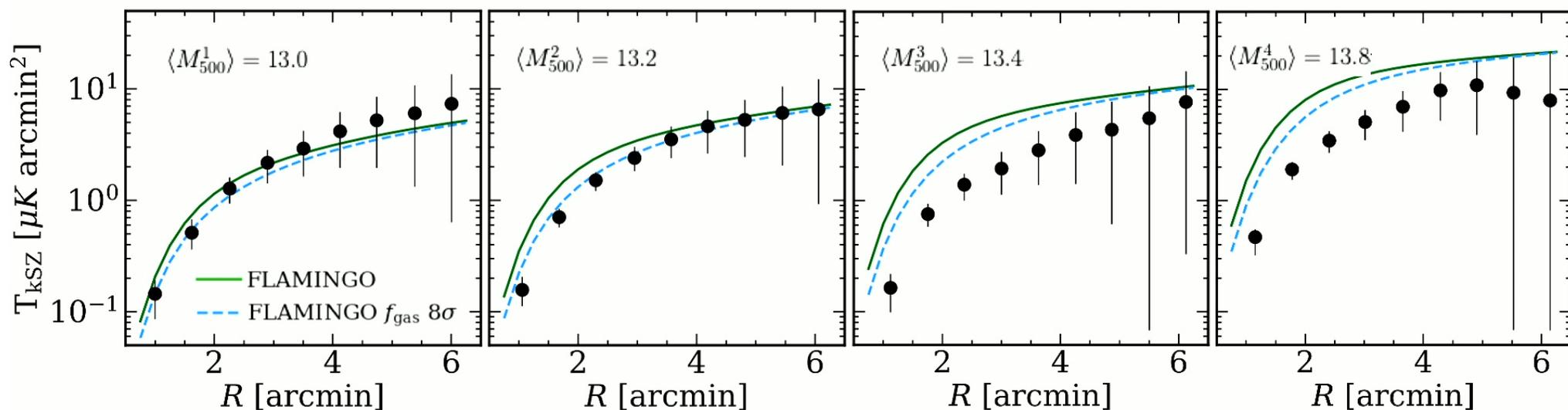


[Siegel, Amon, McCarthy+ in review]

[McCarthy, Amon, FLAMINGO+ 24]

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kSZ + galaxy-galaxy lensing: evidence for extreme feedback

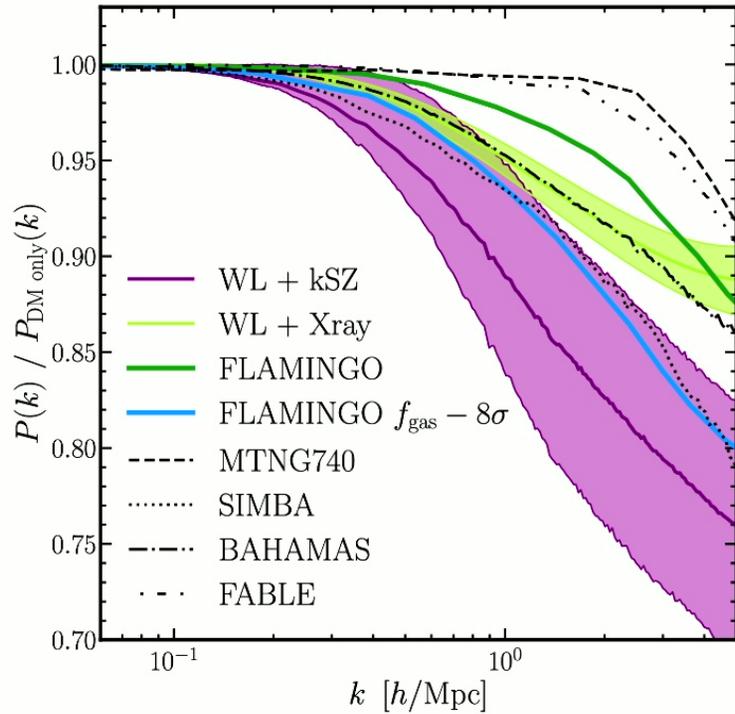


[Siegel, Amon, McCarthy+ in review]

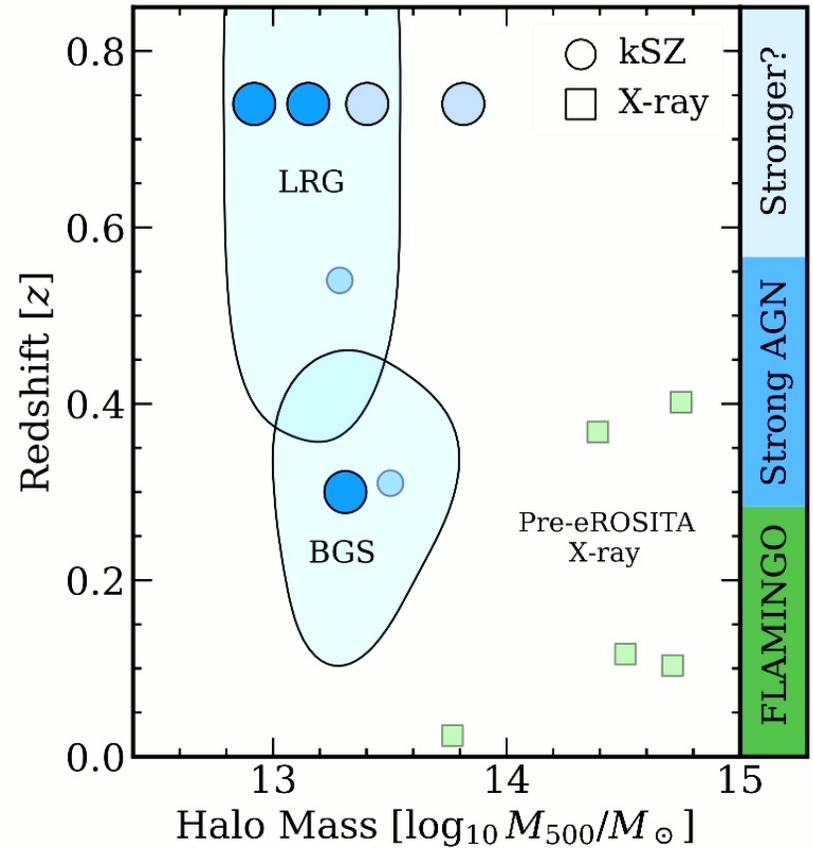
[McCarthy, Amon, FLAMINGO+ 24]

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



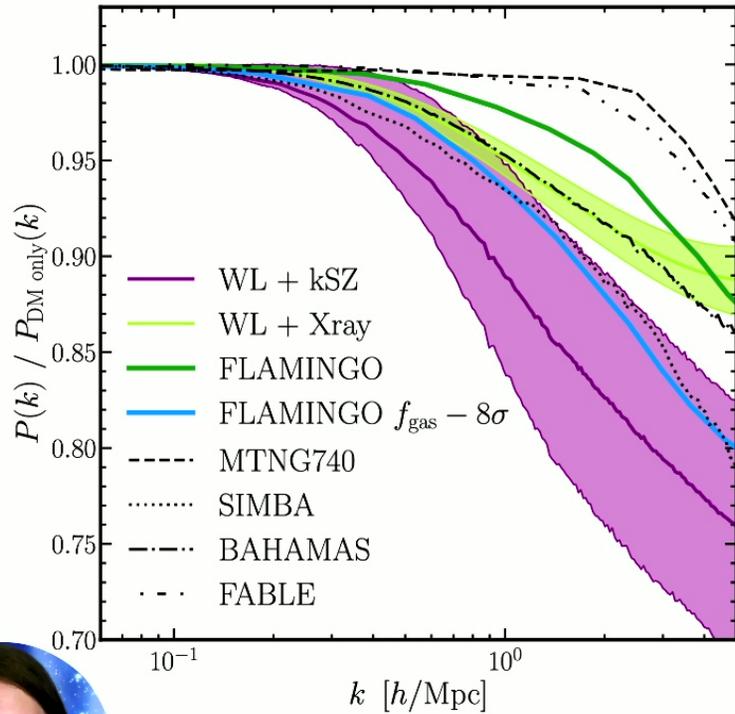
Constrained Pk suppression due to feedback with the kSZ effect *and* X-ray gas fractions



Built the framework to benchmark simulations with kSZ accurately

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



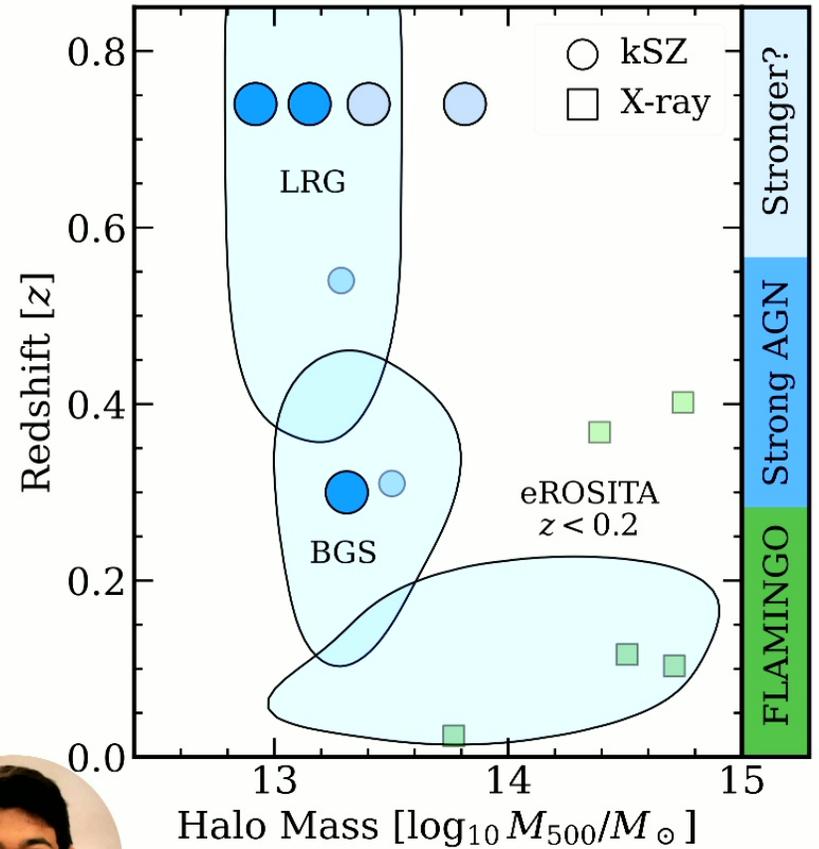
Leah Bigwood

Do any of the state-of-the-art simulations fit the data?



Jared Siegel

Do we have a consistent case across observables with new data?



extra slides

