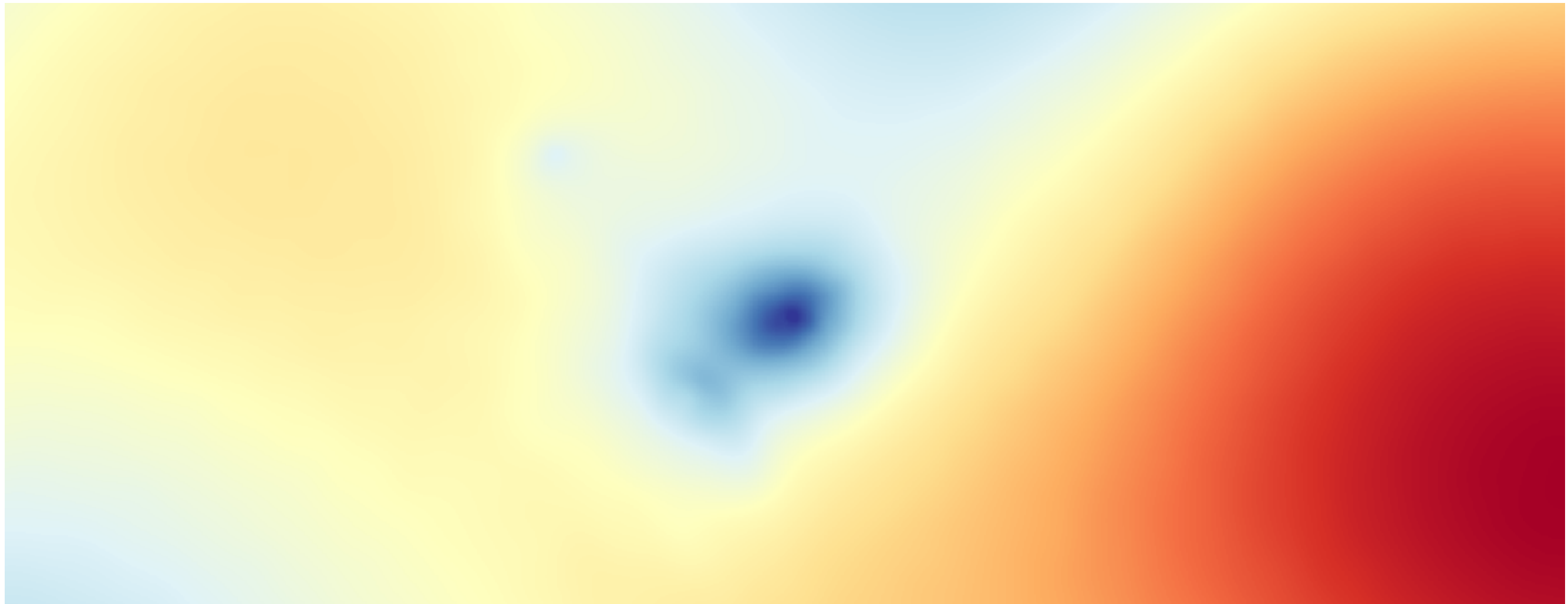
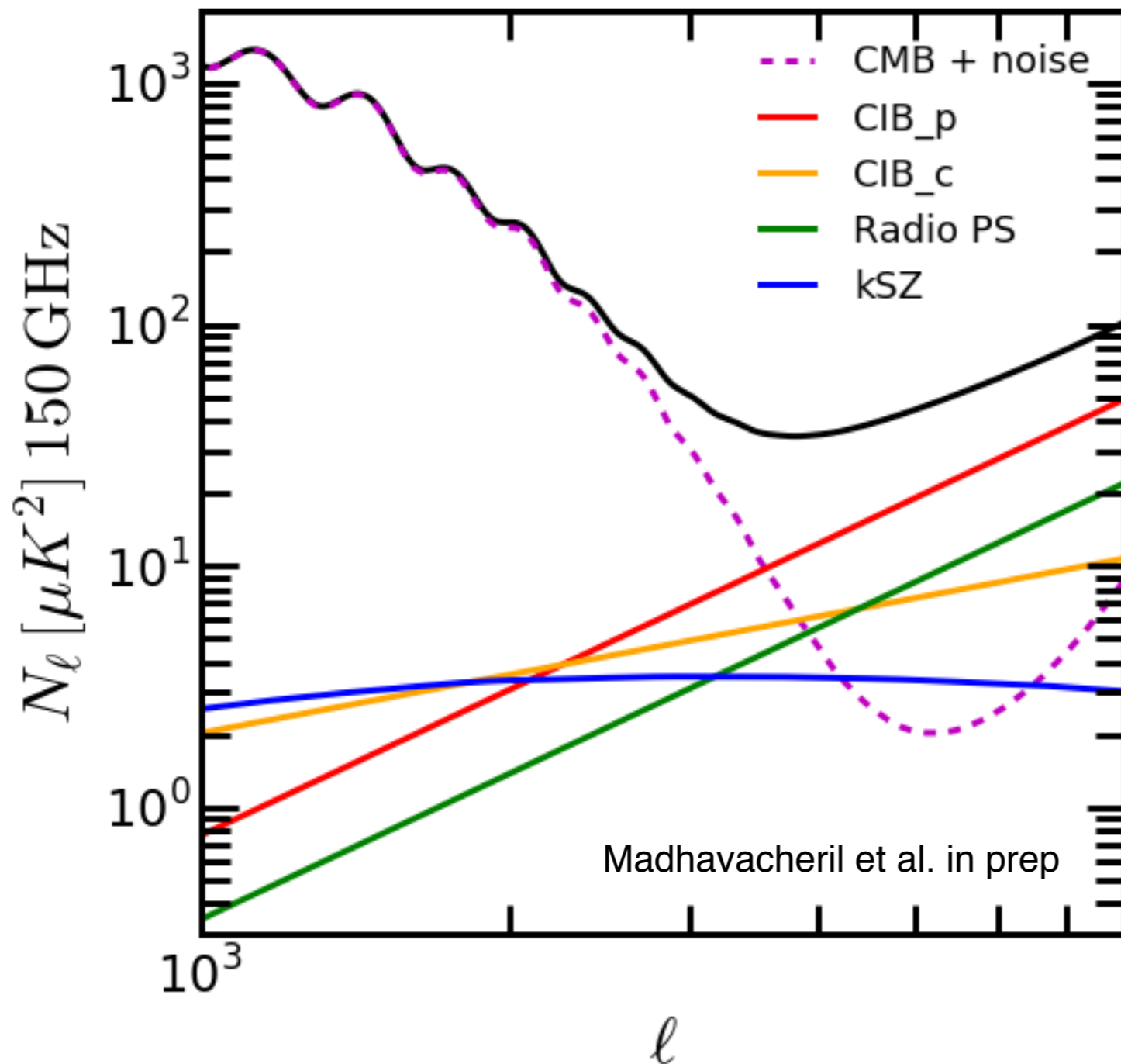


# mnu and w from lensing-calibrated clusters



Nick Battaglia  
with Mat Madhavacheril, Hironao Miyatake, & David Spergel

# What's in the forecast?



95 & 150 GHz at 1.5  $\mu\text{K}'$

S/N > 6 (conservative)  
clusters

fsky = 0.4

Including: non-white noise,  
CMB, CIB (poisson and  
clustered), Radio sources,  
and kSZ

Marginalize over scaling  
relation uncertainties

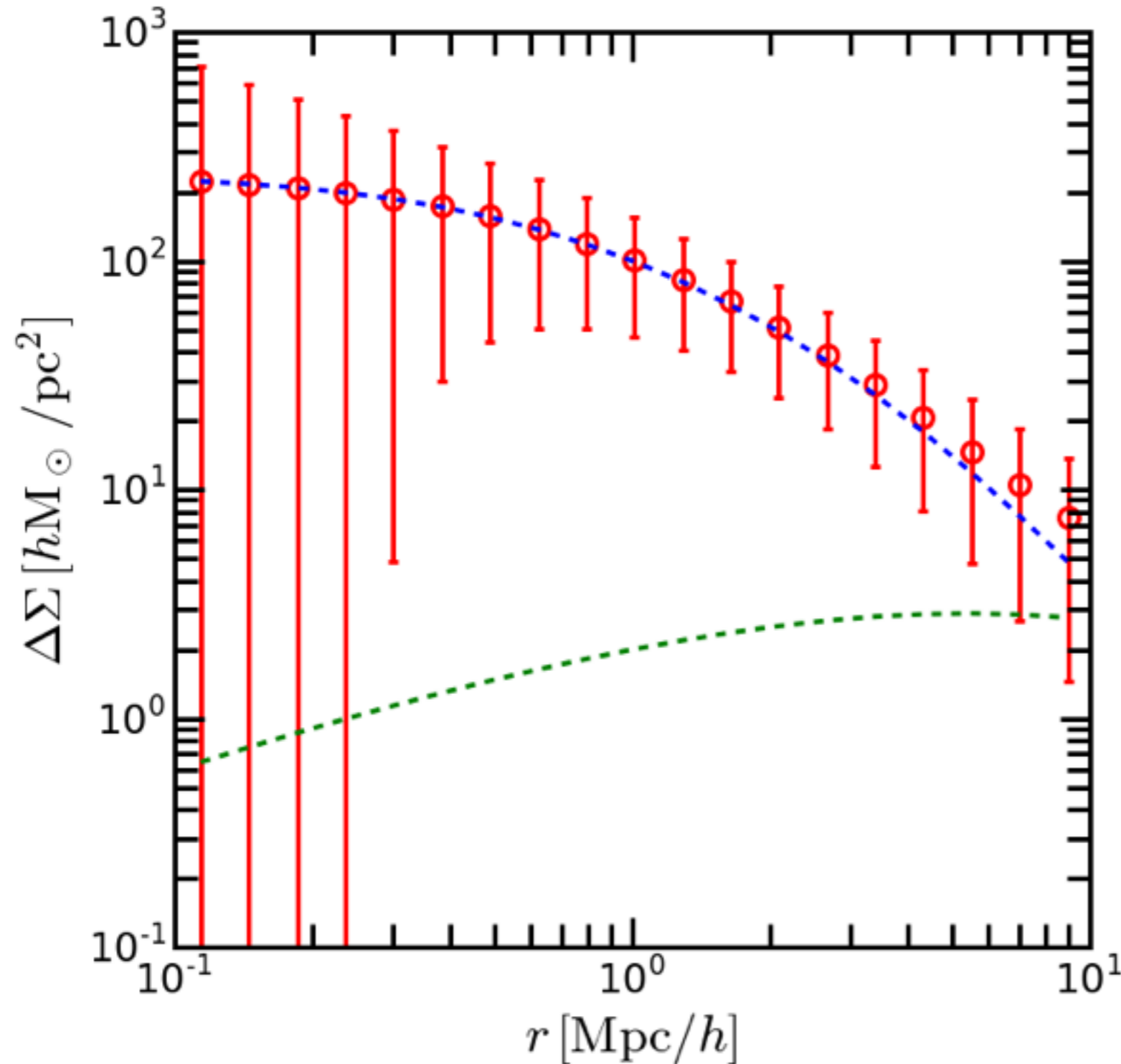
$$A_Y \left( \frac{M}{M_*} \right)^{\alpha_Y} e^{\beta_Y \log^2(M/M_*)} (1+z)^{\gamma_Y}$$

Planck tau prior 0.01    No DESI prior

Marginalize over scatter

Comparisons with Louis & Alonso and Brad Benson via priv. comm

# Optical WL mass calibration



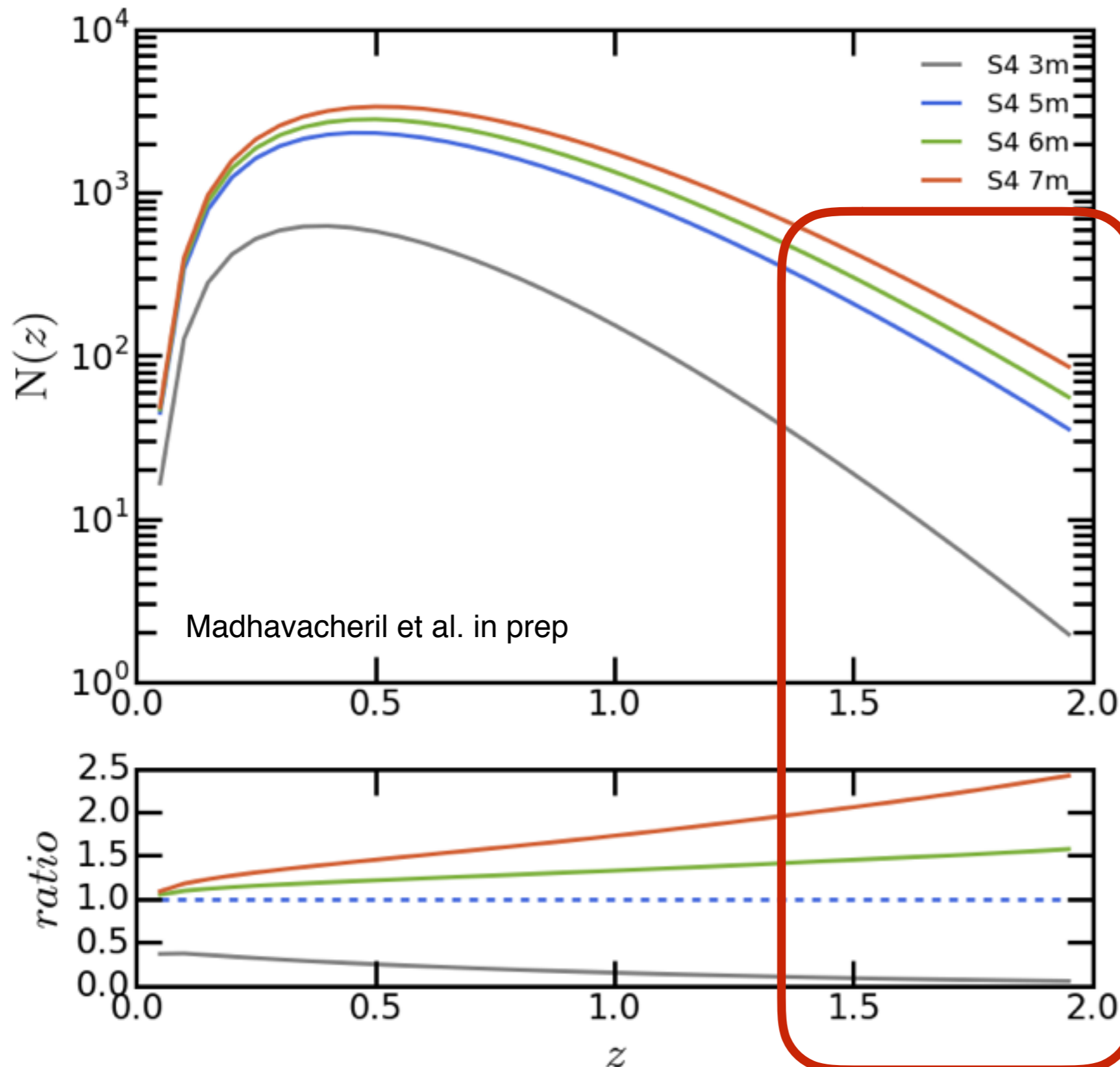
Assume HSC-like coverage  
across over entire fields  
(ie LSST-lite)

Fit HSC forecast errors  
Make  $\Delta M/M$  grid

2 modes for Optical WL  
use out to  $z < 2$   
use out to  $z < 1$

See Mat's talk for CMB  
halo lensing comparison

# Cluster number counts



Total clusters  $z < 2$   
with  $S/N > 6$ :

3m ~ 8400

5m ~ 37500

6m ~ 47000

7m ~ 58000

Total clusters  $z > 1$   
with  $S/N > 6$ :

3m ~ 820

5m ~ 6700

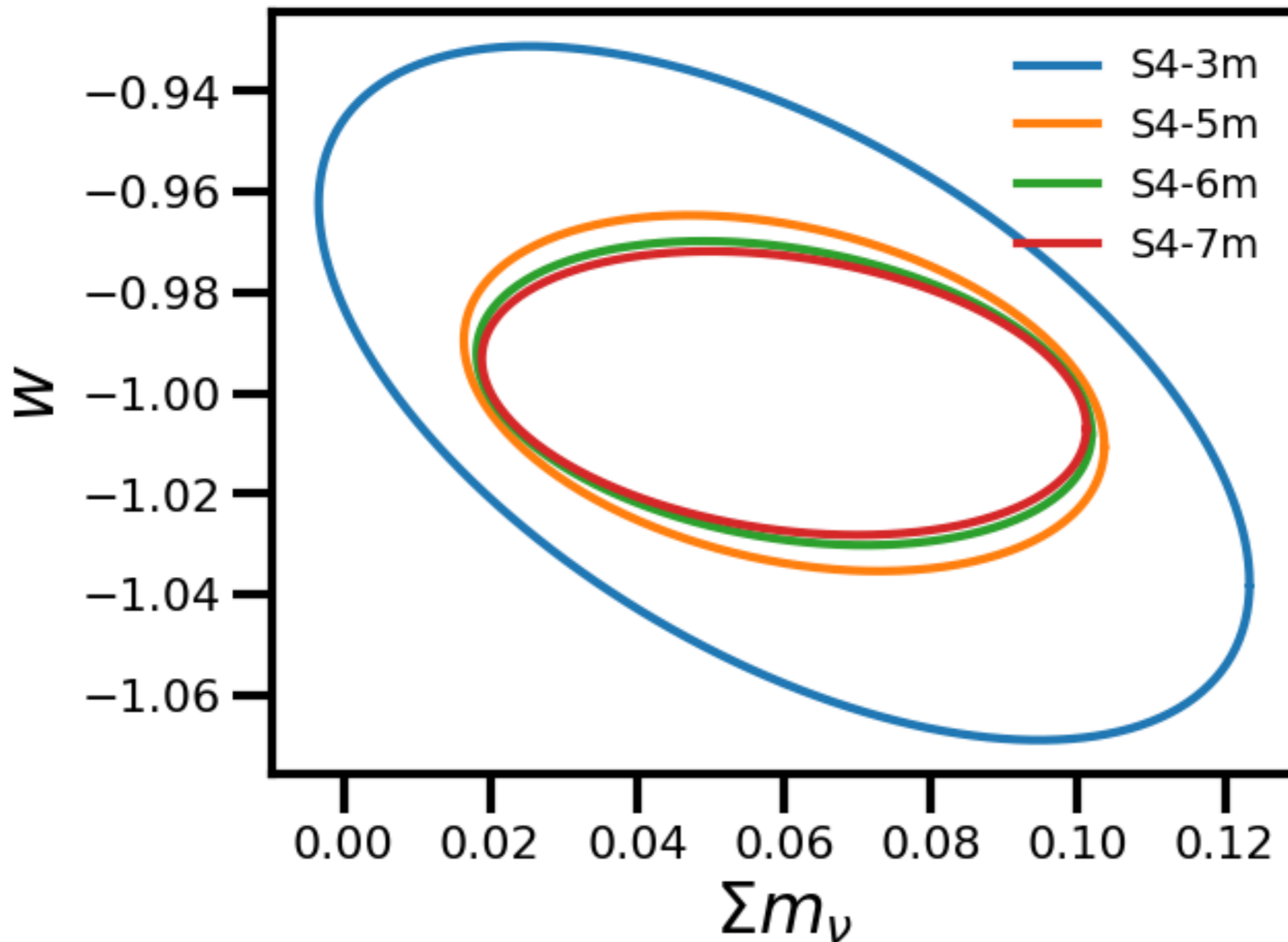
6m ~ 9300

7m ~ 12600

Discovery space

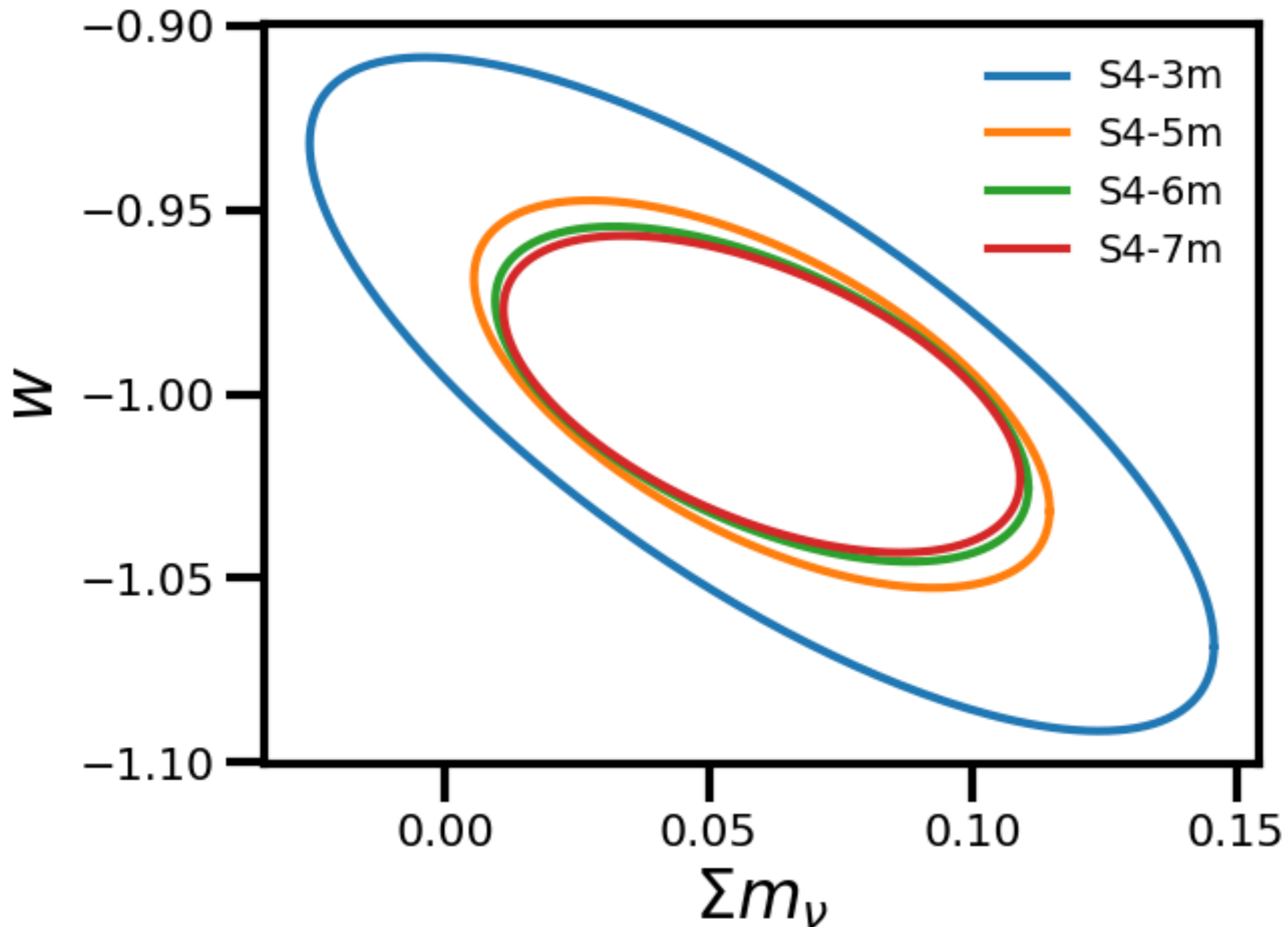
# Parameters resolution study

Take away - minimum 5m



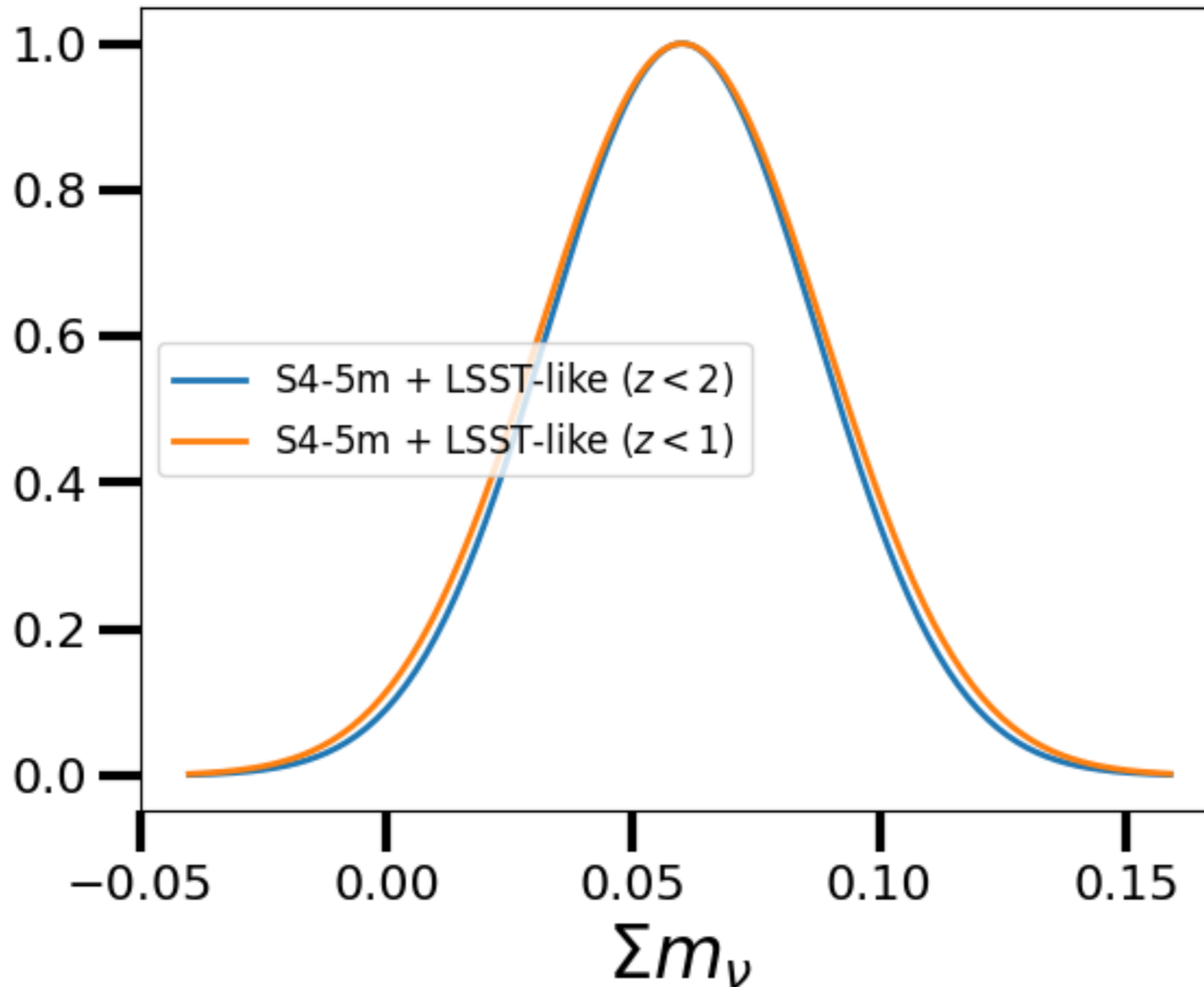
# Parameters resolution study

If we only trust optical weak out to  $z = 1$



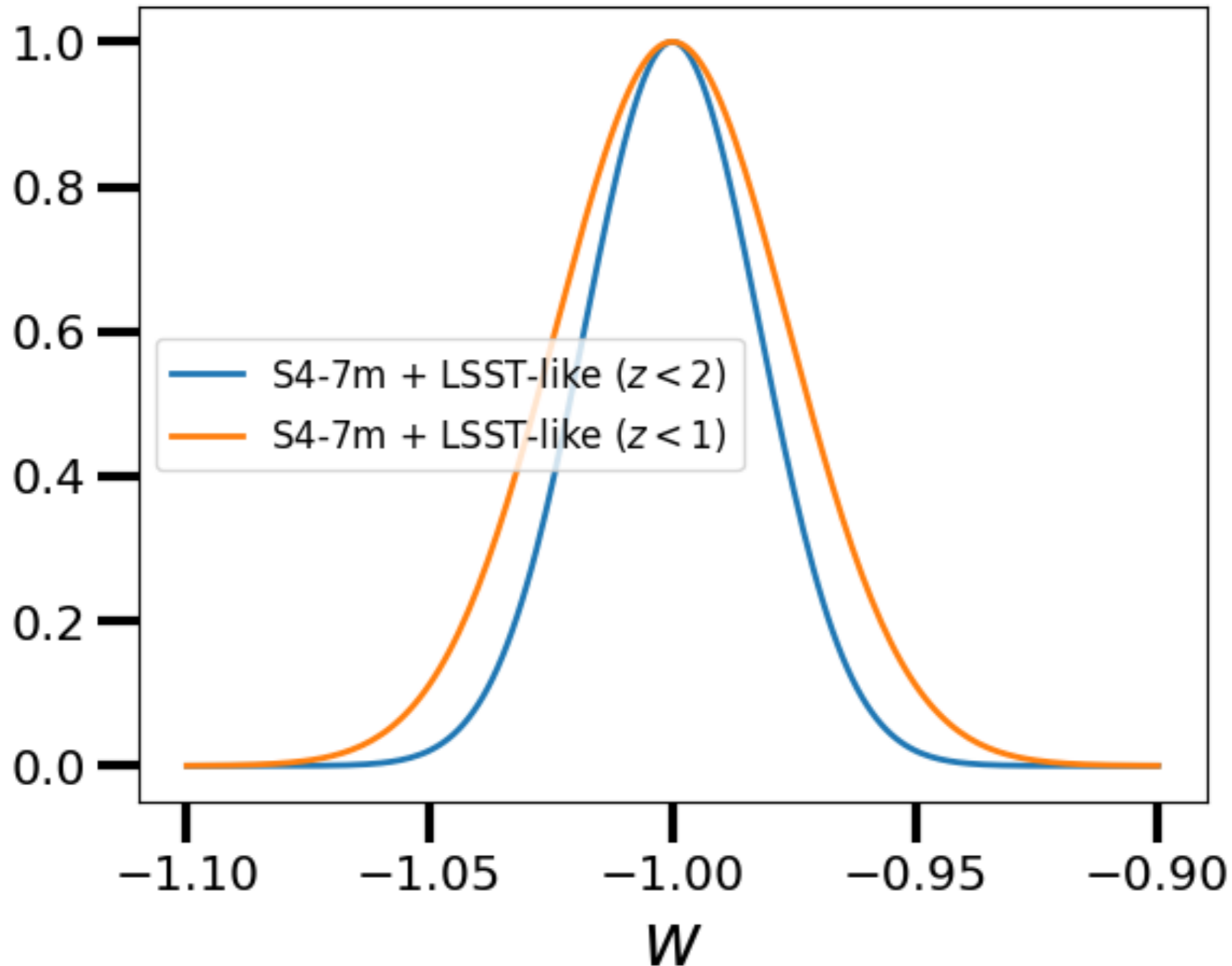
# Parameters redshift study

High-z clusters no impact on the sum of neutrino masses



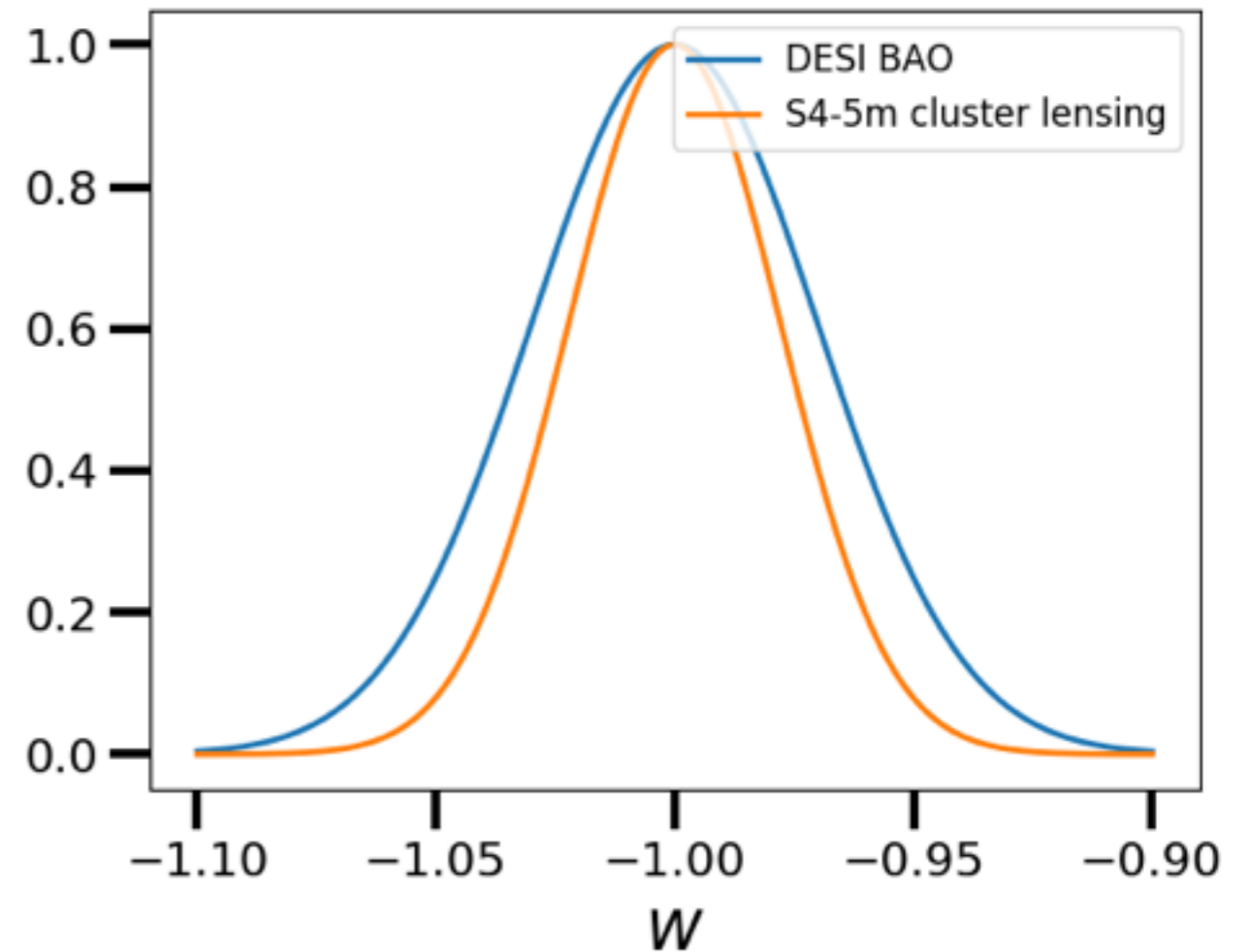
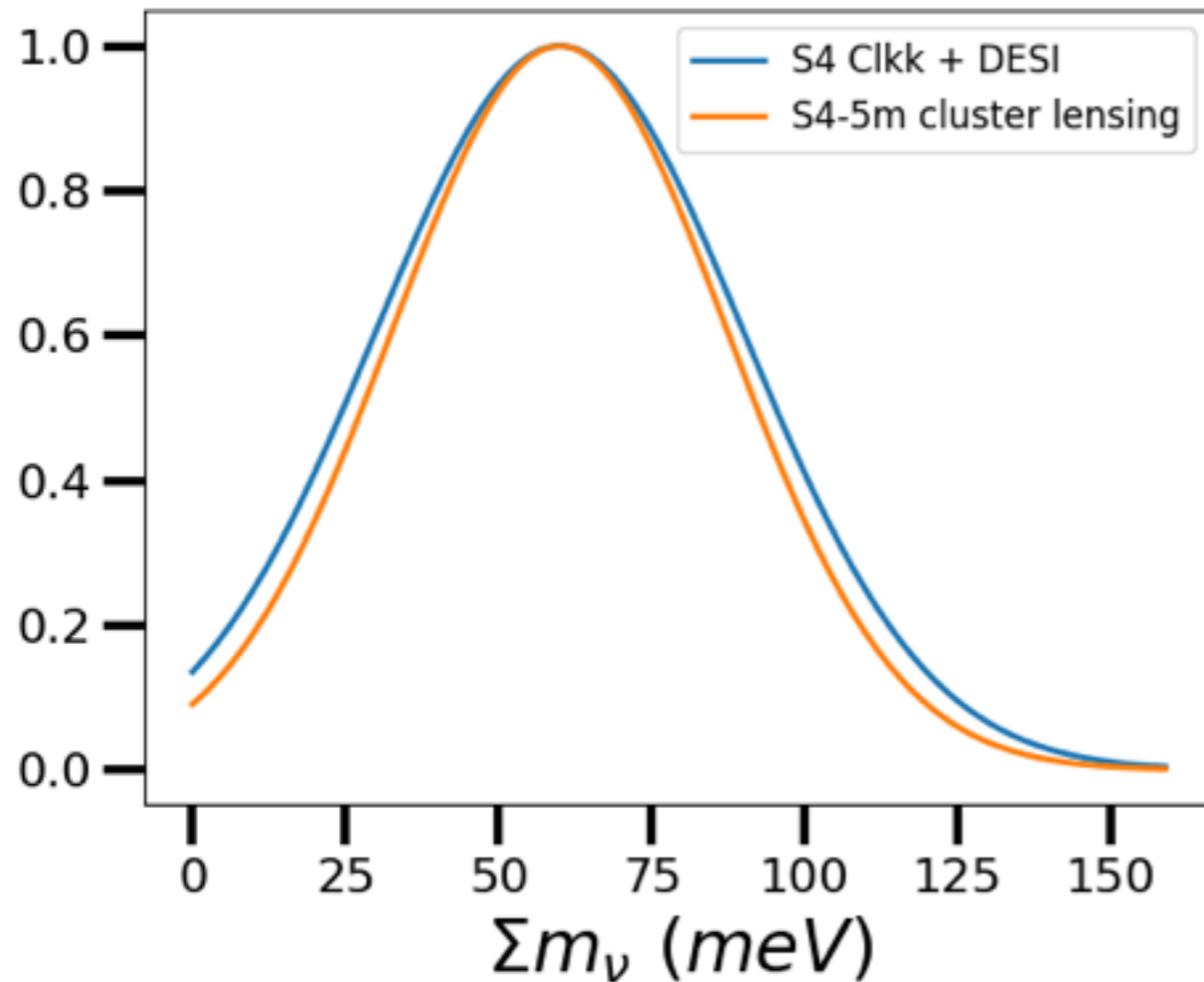
# Parameters redshift study

High- $z$  mass calibration does matter for  $w$





# Parameters vs. other probes



Competitive, independent, and complementary constraints on the sum of neutrino masses and  $w$

Looking to add more probe comparisons

# Summary

SZ clusters are competitive probes of  $w$  and  $m_{\nu}$

Factor of  $\sim 2x$  more high- $z$  clusters going from 5-7m (astrophysics...)

CMB halo lensing (Mat's talk next) for high- $z$  mass calibration

## In progress

Test phase-2 simulations (Colin/Marcelo's talk)

Systematics, Systematics, Systematics (although we're being conservative)

## Science requirements

Minimum dish size is 5m for both  $w$  and  $m_{\nu}$

In the process of vary noise levels and fidelity of mass constraints

Optical surveys are required to confirm clusters and obtain redshifts