



# Erratum: Tomographic measurement of the intergalactic gas pressure through galaxy-tSZ cross-correlations

by Nick Koukoufilippas<sup>1</sup>,<sup>★</sup> David Alonso,<sup>1</sup> Maciej Bilicki<sup>2</sup> and John A. Peacock<sup>3</sup>

<sup>1</sup>Department of Physics, University of Oxford, Keble Road, Oxford, OX1 3RH, UK

<sup>2</sup>Center for Theoretical Physics, Polish Academy of Sciences, al. Lotników 32/46, 02-668, Warsaw, Poland

<sup>3</sup>Institute for Astronomy, University of Edinburgh, Royal Observatory, Edinburgh, EH9 3HJ, UK

**Key words:** errata, addenda – methods: data analysis – cosmology: observations – large-scale structure of Universe.

The paper ‘Tomographic measurement of the intergalactic gas pressure through galaxy-tSZ cross-correlations’ was published in MNRAS, 491, 5464–5480 (2020). After publication a typographical error in our analysis pipeline code was discovered, which slightly affected some of our results. In particular, our implementation of the generalised NFW profile (GNFW) described in Arnaud et al. (2010) lacked a factor of  $1 - b_H$  in the calculation of  $R_{500}$ . We have corrected this error, re-run our analysis and present our updated results and comments (where applicable) in this manuscript.

- (i) Table 3 is updated with new best-fitting values.
- (ii) Likewise, Figs 8 and 9 are also updated with the new values of the best-fitting  $1 - b_H$  and  $\langle bP_e \rangle$ .
- (iii) Finally, our combined constraint on  $\bar{b}_H$  following this procedure (equation 48) is  $1 - \bar{b}_H = 0.75 \pm 0.03$ .

While the main conclusions remain unchanged, it is worth pointing out that the best-fitting mass bias value  $1 - b_H = 0.75 \pm 0.03$  is now at a  $\sim 3\text{--}4\sigma$  tension with the results measured by Planck Collaboration et al. (2016a) ( $1 - b_H = 0.58 \pm 0.04$ ), combining tSZ cluster number counts and the  $TT$  CMB power spectrum. Consequently, our results can no longer be viewed as evidence of compatibility between the best-fit cosmology and the clustering properties of galaxies in the datasets used. Further, the best-fitting value of the mass bias is no longer at odds with the one derived from hydrodynamical simulations (Biffi et al. 2016), the estimate from CMB lensing mass calibration (Zubeldia & Challinor 2019), and other direct calibration efforts (e.g. Smith et al. 2016; Eckert et al. 2019), which seem to prefer smaller missing mass fractions ( $1 - b_H \simeq 0.8$ ). Lastly, our results are in agreement with Chiang et al. (2020), who explore the cosmic thermal history using SZ tomography.

## ACKNOWLEDGEMENTS

We would like to sincerely thank Ruy Makiya who brought the issue to our attention.

## DATA AVAILABILITY

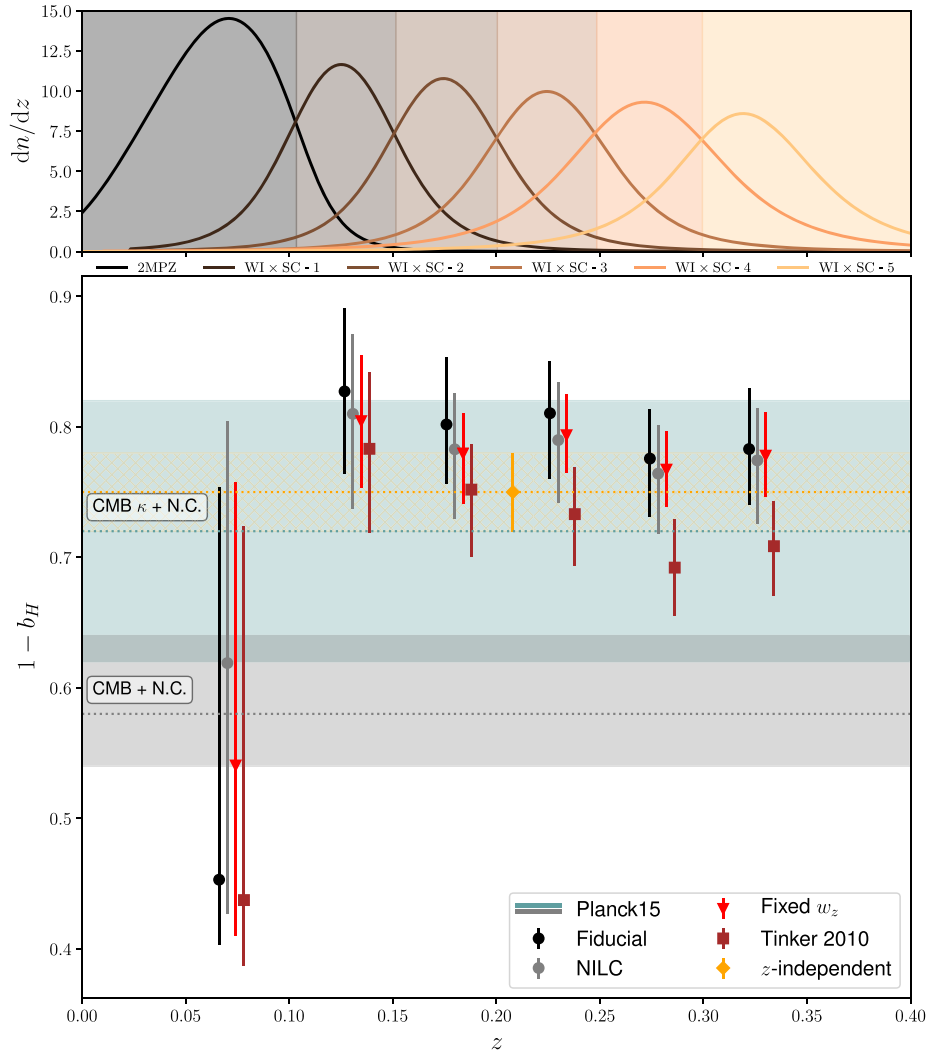
The authors would like to report on the availability of the data used in this analysis.

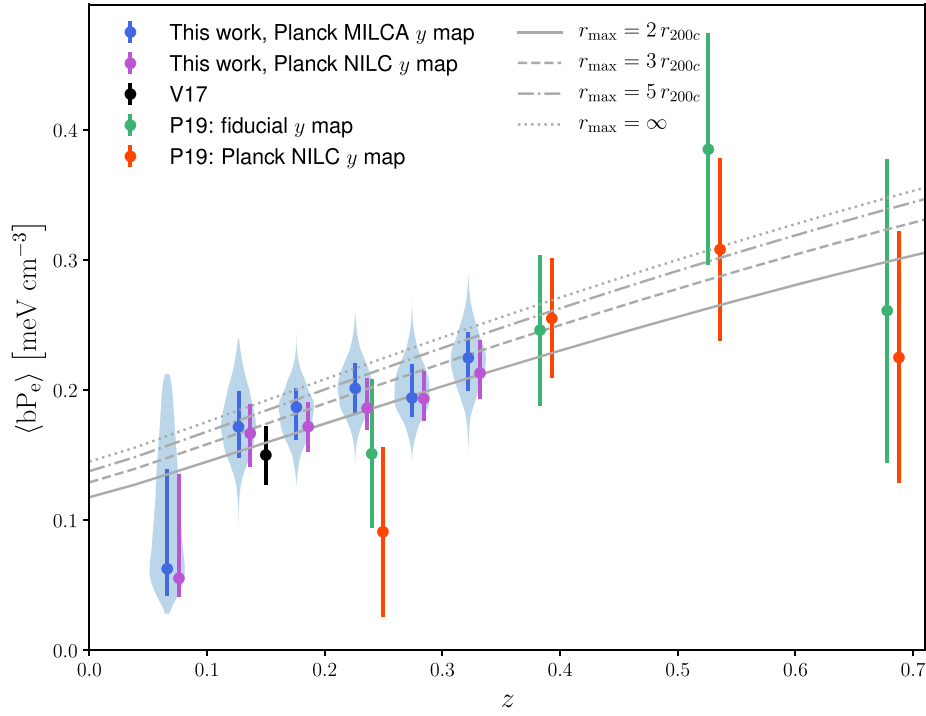
- (i) The Compton- $y$  maps are publicly available by the *Planck* collaboration (Planck Collaboration et al. 2016b).
- (ii) The low-redshift photometric redshift catalogues (2MASS Photometric Redshift catalogue, WISE  $\times$  SuperCOSMOS catalogue) are outlined in Bilicki et al. (2014) and Bilicki et al. (2016), respectively.

\* E-mail: [nick.koukoufilippas@physics.ox.ac.uk](mailto:nick.koukoufilippas@physics.ox.ac.uk)

**Table 3.** Summary table with the updated best-fitting parameters.

Sample	$\bar{z}$	$1 - b_H$ (best fit)	$1 - b_H$ (68% C.L.)	$\langle b P_e \rangle$ [meV cm <sup>-3</sup> ]	$\chi^2/\text{d.o.f.}$	PTE( $\chi^2$ )
2MPZ	0.07	0.66	$0.45^{+0.29}_{-0.10}$	$0.064^{+0.022}_{-0.074}$	0.91	0.59
WI×SC-1	0.13	0.88	$0.83^{+0.07}_{-0.06}$	$0.172^{+0.024}_{-0.028}$	1.23	0.18
WI×SC-2	0.18	0.84	$0.80^{+0.05}_{-0.05}$	$0.187^{+0.025}_{-0.015}$	0.82	0.76
WI×SC-3	0.23	0.81	$0.81^{+0.04}_{-0.04}$	$0.203^{+0.021}_{-0.019}$	1.01	0.46
WI×SC-4	0.27	0.74	$0.78^{+0.05}_{-0.05}$	$0.194^{+0.014}_{-0.026}$	0.82	0.78
WI×SC-5	0.32	0.75	$0.78^{+0.04}_{-0.05}$	$0.225^{+0.025}_{-0.019}$	1.29	0.09


**Figure 8.** Summary figure showing our updated constraints on the tSZ mass bias  $1 - b_H$ .



**Figure 9.** Summary figure showing our updated constraints on the bias-weighted thermal pressure  $\langle bP_e \rangle$ .

## REFERENCES

- Arnaud M., Pratt G. W., Piffaretti R., Böhringer H., Croston J. H., Pointecouteau E., 2010, *A&A*, 517, A92  
 Biffi V., 2016, *ApJ*, 827, 112  
 Bilicki M., 2016, *ApJS*, 225, 5  
 Bilicki M., Jarrett T. H., Peacock J. A., Cluver M. E., Steward L., 2014, *ApJS*, 210, 9  
 Chiang Y., Makiya R., Ménard B., Komatsu E., 2020, preprint ([arXiv:2006.14650](https://arxiv.org/abs/2006.14650))  
 Eckert D., 2019, *A&A*, 621, A40  
 Planck Collaboration et al., 2016a, *A&A*, 594, A24  
 Planck Collaboration et al., 2016b, *A&A*, 594, A22  
 Smith G. P., 2016, *MNRAS*, 456, L74  
 Zubeldia Í., Challinor A., 2019, *MNRAS*, 489, 401

This paper has been typeset from a  $\text{\LaTeX}$  file prepared by the author.