

Bibliography

- [1] S. Dodelson, *Modern Cosmology*. Elsevier, 2003.
- [2] V. Mukhanov, *Physical foundations of Cosmology*. Cambridge University Press, 2005.
- [3] S. Weinberg, *Cosmology*. Oxford University Press, 2008.
- [4] J. A. Peacock, *Cosmological physics*. Cambridge University Press, 1999.
- [5] P. Schneider, *Extragalactic astronomy and Cosmology: an introduction*. Springer, 2014.
- [6] http://www.schoolphysics.co.uk/age16-19/Astrophysics/text/Red_Shift/index.html.
- [7] E. Hubble, “A relation between distance and radial velocity among extra-galactic nebulae,” *Proceedings of the National Academy of Sciences*, vol. 15, no. 3, p. 168, 1929.
- [8] J. N. Grieb, A. G. Sánchez, S. Salazar-Albornoz, R. Scoccimarro, M. Crocce, C. Dalla Vecchia, F. Montesano, H. Gil-Marín, A. J. Ross, F. Beutler, *et al.*, “The clustering of galaxies in the completed SDSS-III BOSS: Cosmological implications of the fourier space wedges of the final sample,” *Monthly Notices of the Royal Astronomical Society*, vol. 467, no. 2, p. 2085, 2017.

- [9] D. J. Fixsen, “The temperature of the cosmic microwave background,” *The Astrophysical Journal*, vol. **707**, no. 2, p. 916, 2009.
- [10] A. G. Riess, A. V. Filippenko, P. Challis, A. Clocchiatti, A. Diercks, P. M. Garnavich, R. L. Gilliland, C. J. Hogan, S. Jha, R. P. Kirshner, *et al.*, “Observational evidence from supernovae for an accelerating Universe and a cosmological constant,” *The Astronomical Journal*, vol. 116, no. 3, p. 1009, 1998.
- [11] S. Perlmutter, G. Aldering, G. Goldhaber, R. Knop, P. Nugent, P. Castro, S. Deustua, S. Fabbro, A. Goobar, D. Groom, *et al.*, “Measurements of Ω and Λ from 42 high-redshift supernovae,” *The Astrophysical Journal*, vol. 517, no. 2, p. 565, 1999.
- [12] A. R. Liddle and D. H. Lyth, *Cosmological inflation and large-scale structure*. Cambridge University Press, 2000.
- [13] <http://www.everythingselectric.com/cosmic-coincidence-problem/>.
- [14] F. Zwicky, “The redshift of extragalactic nebulae,” *Helv. Phys. Acta*, vol. 6, p. 110, 1933.
- [15] G. Bertone, D. Hooper, and J. Silk, “Particle dark matter: evidence, candidates and constraints,” *Physics Reports*, vol. 405, no. 5-6, p. 279, 2005.
- [16] K. Arun, S. Gudennavar, and C. Sivaram, “Dark matter, dark energy, and alternate models: A review,” *Advances in Space Research*, vol. 60, no. 1, p. 166, 2017.
- [17] J. L. Feng, “Dark matter candidates from particle physics and methods of detection,” *Annual Review of Astronomy and Astrophysics*, vol. 48, p. 495, 2010.
- [18] J. M. Gaskins, “A review of indirect searches for particle dark matter,” *Contemporary Physics*, vol. 57, no. 4, p. 496, 2016.

- [19] J. Liu, X. Chen, and X. Ji, “Current status of direct dark matter detection experiments,” *Nature Physics*, vol. 13, no. 3, p. 212, 2017.
- [20] T. Padmanabhan, “Cosmological constant—the weight of the vacuum,” *Physics Reports*, vol. 380, no. 5, p. 235, 2003.
- [21] P. J. E. Peebles and B. Ratra, “The cosmological constant and dark energy,” *Reviews of modern physics*, vol. 75, no. 2, p. 559, 2003.
- [22] E. J. Copeland, M. Sami, and S. Tsujikawa, “Dynamics of dark energy,” *International Journal of Modern Physics D*, vol. 15, no. 11, p. 1753, 2006.
- [23] <https://ned.ipac.caltech.edu/level5/March03/Freedman/Figures/fig10.jpg>.
- [24] A. Friedman, “On the curvature of space,” *General relativity and gravitation*, vol. 31, no. 12, p. 1991, 1999.
- [25] G. Lemaître, “Expansion of the Universe, A homogeneous Universe of constant mass and increasing radius accounting for the radial velocity of extra-galactic nebulae,” *Monthly Notices of the Royal Astronomical Society*, vol. 91, p. 483, 1931.
- [26] H. P. Robertson, “Kinematics and World-structure,” *The Astrophysical Journal*, vol. 82, p. 284, 1935.
- [27] A. G. Walker, “On Milne’s theory of World-Structure,” *Proceedings of the London Mathematical Society*, vol. 2, no. 1, p. 90, 1937.
- [28] A. Einstein *et al.*, “The foundation of the general theory of relativity,” *Annalen der Physik*, vol. 49, no. 7, p. 769, 1916.
- [29] D. Fixsen, “The temperature of the cosmic microwave background,” *The astrophysical journal*, vol. 707, no. 2, p. 916, 2009.

- [30] G. Mangano, G. Miele, S. Pastor, T. Pinto, O. Pisanti, and P. D. Serpico, “Relic neutrino decoupling including flavour oscillations,” *Nuclear Physics B*, vol. 729, no. 1-2, p. 221, 2005.
- [31] C.-P. Ma and E. Bertschinger, “Cosmological perturbation theory in the synchronous and conformal Newtonian gauges,” *arXiv preprint astro-ph/9506072*, 1995.
- [32] P. A. Ade, N. Aghanim, M. Arnaud, M. Ashdown, J. Aumont, C. Baccigalupi, A. Banday, R. Barreiro, J. Bartlett, N. Bartolo, *et al.*, “Planck 2015 results-xiii: cosmological parameters,” *Astronomy and Astrophysics*, vol. 594, p. A13, 2016.
- [33] S. Weinberg, “The cosmological constant problem,” *Reviews of modern physics*, vol. 61, no. 1, p. 1, 1989.
- [34] I. Zlatev, L. Wang, and P. J. Steinhardt, “Quintessence, cosmic coincidence, and the cosmological constant,” *Physical Review Letters*, vol. 82, no. 5, p. 896, 1999.
- [35] J. S. Bullock and M. Boylan-Kolchin, “Small-scale challenges to the Λ CDM paradigm,” *Annual Review of Astronomy and Astrophysics*, vol. 55, p. 343, 2017.
- [36] B. Moore, “Evidence against dissipation-less dark matter from observations of galaxy haloes,” *Nature*, vol. 370, no. 6491, p. 629, 1994.
- [37] A. Klypin, A. V. Kravtsov, O. Valenzuela, and F. Prada, “Where are the missing galactic satellites?,” *The Astrophysical Journal*, vol. 522, no. 1, p. 82, 1999.
- [38] M. Boylan-Kolchin, J. S. Bullock, and M. Kaplinghat, “Too big to fail? the puzzling darkness of massive milky way subhaloes,” *Monthly Notices of the Royal Astronomical Society: Letters*, vol. 415, no. 1, p. L40, 2011.
- [39] A. G. Riess, L. M. Macri, S. L. Hoffmann, D. Scolnic, S. Casertano, A. V. Filippenko, B. E. Tucker, M. J. Reid, D. O. Jones, J. M. Silverman, *et al.*, “A 2.4%

- determination of the local value of the Hubble constant,” *The Astrophysical Journal*, vol. 826, no. 1, p. 56, 2016.
- [40] L. S. Collaboration, V. Collaboration, M. Collaboration, D. E. C. G.-E. Collaboration, D. Collaboration, D. Collaboration, L. C. O. Collaboration, V. Collaboration, M. Collaboration, *et al.*, “A gravitational-wave standard siren measurement of the Hubble constant,” *Nature*, vol. 551, no. 7678, p. 85, 2017.
- [41] X. Zhang, “Gravitational wave standard sirens and cosmological parameter measurement,” *arXiv:1905.11122*, 2019.
- [42] C. Heymans, E. Grocutt, A. Heavens, M. Kilbinger, T. D. Kitching, F. Simpson, J. Benjamin, T. Erben, H. Hildebrandt, H. Hoekstra, *et al.*, “CFHTLENS tomographic weak lensing cosmological parameter constraints: mitigating the impact of intrinsic galaxy alignments,” *Monthly Notices of the Royal Astronomical Society*, vol. 432, no. 3, p. 2433, 2013.
- [43] P. A. Ade, N. Aghanim, C. Armitage-Caplan, M. Arnaud, M. Ashdown, F. Atrio-Barandela, J. Aumont, C. Baccigalupi, A. Banday, R. Barreiro, *et al.*, “Planck 2013 results-xx: cosmology from Sunyaev–Zel’dovich cluster counts,” *Astronomy and Astrophysics*, vol. 571, p. A20, 2014.
- [44] F. Köhlinger, M. Viola, B. Joachimi, H. Hoekstra, E. Van Uitert, H. Hildebrandt, A. Choi, T. Erben, C. Heymans, S. Joudaki, *et al.*, “KiDS-450: the tomographic weak lensing power spectrum and constraints on cosmological parameters,” *Monthly Notices of the Royal Astronomical Society*, vol. 471, no. 4, p. 4412, 2017.
- [45] H. Hildebrandt, M. Viola, C. Heymans, S. Joudaki, K. Kuijken, C. Blake, T. Erben, B. Joachimi, D. Klaes, L. t. Miller, *et al.*, “KiDS-450: cosmological parameter constraints from tomographic weak gravitational lensing,” *Monthly Notices of the Royal Astronomical Society*, vol. 465, no. 2, p. 1454, 2016.

- [46] T. D. Kitching, L. Verde, A. F. Heavens, and R. Jimenez, “Discrepancies between CFHTLENS cosmic shear and Planck: new physics or systematic effects?,” *Monthly Notices of the Royal Astronomical Society*, vol. 459, no. 1, p. 971, 2016.
- [47] Z. Sakr, S. Ilić, A. Blanchard, J. Bittar, and W. Farah, “Cluster counts: calibration issue or new physics?,” *Astronomy and Astrophysics*, vol. 620, p. A78, 2018.
- [48] R. A. Battye, T. Charnock, and A. Moss, “Tension between the power spectrum of density perturbations measured on large and small scales,” *Physical Review D*, vol. 91, no. 10, p. 103508, 2015.
- [49] J. L. Bernal, L. Verde, and A. G. Riess, “The trouble with H_0 ,” *Journal of Cosmology and Astroparticle Physics*, vol. 2016, no. 10, p. 019, 2016.
- [50] T. Bringmann, F. Kahlhoefer, K. Schmidt-Hoberg, and P. Walia, “Converting non-relativistic dark matter to radiation,” *Physical Review D*, vol. 98, no. 2, p. 023543, 2018.
- [51] R. C. Nunes, “Structure formation in $f(T)$ gravity and a solution for H_0 tension,” *Journal of Cosmology and Astroparticle Physics*, vol. 2018, no. 05, p. 052, 2018.
- [52] S. M. Feeney, H. V. Peiris, A. R. Williamson, S. M. Nissanke, D. J. Mortlock, J. Alsing, and D. Scolnic, “Prospects for resolving the Hubble constant tension with standard sirens,” *Physical Review Letters*, vol. 122, no. 6, p. 061105, 2019.
- [53] R. A. Battye and A. Moss, “Evidence for massive neutrinos from CMB and lensing observations,” *Physical Review Letters*, vol. 112, no. 5, p. 051303, 2014.
- [54] B. Leistedt, H. V. Peiris, and L. Verde, “No new cosmological concordance with massive sterile neutrinos,” *Physical Review Letters*, vol. 113, no. 4, p. 041301, 2014.

-
- [55] S. Mohanty, S. Anand, P. Chaubal, A. Mazumdar, and P. Parashari, “ σ_8 discrepancy and its solutions,” *Journal of Astrophysics and Astronomy*, vol. 39, no. 4, p. 46, 2018.
- [56] S. Anand, P. Chaubal, A. Mazumdar, and S. Mohanty, “Cosmic viscosity as a remedy for tension between Planck and LSS data,” *Journal of Cosmology and Astroparticle Physics*, vol. 2017, no. 11, p. 005, 2017.
- [57] L. Verde, “A practical guide to basic statistical techniques for data analysis in Cosmology,” *arXiv:0712.3028*, 2007.
- [58] R. Trotta, “Bayes in the sky: Bayesian inference and model selection in Cosmology,” *Contemporary Physics*, vol. 49, no. 2, p. 71, 2008.
- [59] M. P. Hobson, A. H. Jaffe, A. R. Liddle, P. Mukherjee, and D. Parkinson, *Bayesian methods in Cosmology*. Cambridge University Press, 2010.
- [60] R. Trotta, “Bayesian methods in Cosmology,” *arXiv:1701.01467*, 2017.
- [61] S. Brooks, A. Gelman, G. Jones, and X.-L. Meng, *Handbook of Markov chain Monte Carlo*. CRC press, 2011.
- [62] C. P. Robert and G. Casella, “The Metropolis-Hastings algorithm,” in *Monte Carlo Statistical Methods*, p. 231, Springer, 1999.
- [63] W. K. Hastings, “Monte Carlo sampling methods using Markov chains and their applications,” 1970.
- [64] A. Lewis and S. Bridle, “Cosmological parameters from CMB and other data: a Monte Carlo approach,” *Physical Review D*, vol. 66, no. 10, p. 103511, 2002.
- [65] B. Audren, J. Lesgourgues, K. Benabed, and S. Prunet, “Conservative constraints on early Cosmology with Monte Python,” *Journal of Cosmology and Astroparticle Physics*, vol. 2013, no. 02, p. 001, 2013.

- [66] A. Lewis, A. Challinor, and A. Lasenby, “Efficient computation of CMB anisotropies in closed FRW models,” *The Astrophysical Journal*, vol. 538, p. 473, 2000.
- [67] D. Blas, J. Lesgourgues, and T. Tram, “The CLASS-part ii: approximation schemes,” *Journal of Cosmology and Astroparticle Physics*, vol. 2011, no. 07, p. 034, 2011.
- [68] K. P. Burnham and D. R. Anderson, “Multimodel inference: understanding AIC and BIC in model selection,” *Sociological methods & research*, vol. 33, no. 2, p. 261, 2004.
- [69] H. Akaike, “A new look at the statistical model identification,” *IEEE Trans. Autom. Control*, vol. 19, no. 6, p. 716, 1974.
- [70] M. Y. J. Tan and R. Biswas, “The reliability of the Akaike information criterion method in cosmological model selection,” *Monthly Notices of the Royal Astronomical Society*, vol. 419, no. 4, p. 3292, 2012.
- [71] A. R. Liddle, “Information criteria for astrophysical model selection,” *Monthly Notices of the Royal Astronomical Society: Letters*, vol. 377, no. 1, p. L74, 2007.
- [72] A. A. Penzias and R. W. Wilson, “A measurement of excess antenna temperature at 4080 mc/s.,” *The Astrophysical Journal*, vol. 142, p. 419, 1965.
- [73] G. F. Smoot, C. L. Bennett, A. Kogut, E. Wright, J. Aymon, N. Boggess, E. Cheng, G. De Amici, S. Gulkis, M. Hauser, *et al.*, “Structure in the COBE differential microwave radiometer first-year maps,” *The Astrophysical Journal*, vol. 396, p. L1, 1992.
- [74] P. de Bernardis, P. A. Ade, J. Bock, J. Bond, J. Borrill, A. Boscaleri, K. Coble, B. Crill, G. De Gasperis, P. Farese, *et al.*, “A flat Universe from high-resolution maps of the CMB radiation,” *Nature*, vol. 404, no. 6781, p. 955, 2000.

- [75] A. E. Lange, P. A. Ade, J. Bock, J. Bond, J. Borrill, A. Boscaleri, K. Coble, B. Crill, P. De Bernardis, P. Farese, *et al.*, “Cosmological parameters from the first results of Boomerang,” *Physical Review D*, vol. 63, no. 4, p. 042001, 2001.
- [76] S. Hanany *et al.*, “A measurement of the CMB anisotropy on angular scales of 10 arcminutes to 5 degrees,” *The Astrophysical Journal Letters*, vol. 5, p. 545, 2000.
- [77] A. Balbi, P. Ade, J. Bock, J. Borrill, A. Boscaleri, P. De Bernardis, P. Ferreira, S. Hanany, V. Hristov, A. Jaffe, *et al.*, “Constraints on cosmological parameters from MAXIMA-1,” *The Astrophysical Journal Letters*, vol. 545, no. 1, p. L1, 2000.
- [78] G. Hinshaw, D. Larson, E. Komatsu, D. N. Spergel, C. Bennett, J. Dunkley, M. Nolte, M. Halpern, R. Hill, N. Odegard, *et al.*, “Nine-year WMAP observations: cosmological parameter results,” *The Astrophysical Journal Supplement Series*, vol. 208, no. 2, p. 19, 2013.
- [79] C. L. Bennett, D. Larson, J. Weiland, N. Jarosik, G. Hinshaw, N. Odegard, K. Smith, R. Hill, B. Gold, M. Halpern, *et al.*, “Nine-year WMAP observations: final maps and results,” *The Astrophysical Journal Supplement Series*, vol. 208, no. 2, p. 20, 2013.
- [80] <http://pla.esac.esa.int/pla/#home>.
- [81] D. L. Clements, “An introduction to the Planck mission,” *Contemporary Physics*, vol. 58, no. 4, p. 331, 2017.
- [82] P. A. Ade, N. Aghanim, M. Alves, C. Armitage-Caplan, M. Arnaud, M. Ashdown, F. Atrio-Barandela, J. Aumont, H. Aussel, C. Baccigalupi, *et al.*, “Planck 2013 results-i: overview of products and scientific results,” *Astronomy & Astrophysics*, vol. 571, p. A1, 2014.
- [83] P. A. Ade, N. Aghanim, C. Armitage-Caplan, M. Arnaud, M. Ashdown, F. Atrio-Barandela, J. Aumont, C. Baccigalupi, A. J. Banday, R. Barreiro, *et al.*, “Planck

- 2013 results-xv: CMB power spectra and likelihood,” *Astronomy & Astrophysics*, vol. 571, p. A15, 2014.
- [84] P. A. Ade, N. Aghanim, C. Armitage-Caplan, M. Arnaud, M. Ashdown, F. Atrio-Barandela, J. Aumont, C. Baccigalupi, A. J. Banday, R. Barreiro, *et al.*, “Planck 2013 results-xvi: cosmological parameters,” *Astronomy & Astrophysics*, vol. 571, p. A16, 2014.
- [85] R. Adam, P. Ade, N. Aghanim, Y. Akrami, M. Alves, F. Argüeso, M. Arnaud, F. Arroja, M. Ashdown, J. Aumont, *et al.*, “Planck 2015 results-i: overview of products and scientific results,” *Astronomy & Astrophysics*, vol. 594, p. A1, 2016.
- [86] N. Aghanim, M. Arnaud, M. Ashdown, J. Aumont, C. Baccigalupi, A. Banday, R. Barreiro, J. Bartlett, N. Bartolo, E. Battaner, *et al.*, “Planck 2015 results-xi: CMB power spectra, likelihoods, and robustness of parameters,” *Astronomy & Astrophysics*, vol. 594, p. A11, 2016.
- [87] Y. Akrami, F. Arroja, M. Ashdown, J. Aumont, C. Baccigalupi, M. Ballardini, A. Banday, R. Barreiro, N. Bartolo, S. Basak, *et al.*, “Planck 2018 results-i: overview and the cosmological legacy of Planck,” *arXiv:1807.06205*, 2018.
- [88] N. Aghanim, Y. Akrami, M. Ashdown, J. Aumont, C. Baccigalupi, M. Ballardini, A. Banday, R. Barreiro, N. Bartolo, S. Basak, *et al.*, “Planck 2018 results-vi: cosmological parameters,” *arXiv:1807.06209*, 2018.
- [89] <https://www.cosmos.esa.int/web/planck/publications>.
- [90] M. Tegmark, D. J. Eisenstein, M. A. Strauss, D. H. Weinberg, M. R. Blanton, J. A. Frieman, M. Fukugita, J. E. Gunn, A. J. Hamilton, G. R. Knapp, *et al.*, “Cosmological constraints from the SDSS luminous red galaxies,” *Physical Review D*, vol. 74, no. 12, p. 123507, 2006.
- [91] D. J. Eisenstein, I. Zehavi, D. W. Hogg, R. Scoccimarro, M. R. Blanton, R. C. Nichol, R. Scranton, H.-J. Seo, M. Tegmark, Z. Zheng, *et al.*, “Detection of the

- baryon acoustic peak in the large-scale correlation function of SDSS luminous red galaxies,” *The Astrophysical Journal*, vol. 633, no. 2, p. 560, 2005.
- [92] F. Beutler, C. Blake, M. Colless, D. H. Jones, L. Staveley-Smith, L. Campbell, Q. Parker, W. Saunders, and F. Watson, “The 6DF galaxy survey: BAO and the local Hubble constant,” *Monthly Notices of the Royal Astronomical Society*, vol. 416, no. 4, p. 3017, 2011.
- [93] A. J. Ross, L. Samushia, C. Howlett, W. J. Percival, A. Burden, and M. Manera, “The clustering of the SDSS data releases main galaxy sample-i: a 4 percent distance measure at $z=0.15$,” *Monthly Notices of the Royal Astronomical Society*, vol. 449, no. 1, p. 835, 2015.
- [94] L. Anderson, E. Aubourg, S. Bailey, F. Beutler, V. Bhardwaj, M. Blanton, A. S. Bolton, J. Brinkmann, J. R. Brownstein, A. Burden, *et al.*, “The clustering of galaxies in the SDSS-III BOSS: BAO in the data releases 10 and 11 galaxy samples,” *Monthly Notices of the Royal Astronomical Society*, vol. 441, no. 1, p. 24, 2014.
- [95] A. G. Riess, L. Macri, S. Casertano, H. Lampeitl, H. C. Ferguson, A. V. Filippenko, S. W. Jha, W. Li, and R. Chornock, “A 3% solution: determination of the Hubble constant with the HST and WFC-3,” *The Astrophysical Journal*, vol. 730, no. 2, p. 119, 2011.
- [96] A. G. Riess, S. Casertano, W. Yuan, L. Macri, J. Anderson, J. W. MacKenty, J. B. Bowers, K. I. Clubb, A. V. Filippenko, D. O. Jones, *et al.*, “New parallaxes of galactic Cepheids from spatially scanning the HST: implications for the Hubble constant,” *The Astrophysical Journal*, vol. 855, no. 2, p. 136, 2018.
- [97] <http://sci.esa.int/planck/60504-measurements-of-the-hubble-constant/>.
- [98] R. A. Sunyaev and Y. B. Zeldovich, “Small-scale fluctuations of relic radiation,” *Astrophysics and Space Science*, vol. 7, no. 1, p. 3, 1970.

- [99] M. Hasselfield, M. Hilton, T. A. Marriage, G. E. Addison, L. F. Barrientos, N. Battaglia, E. S. Battistelli, J. R. Bond, D. Crichton, S. Das, *et al.*, “The ACT: Sunyaev-Zel’dovich selected galaxy clusters at 148 GHz from three seasons of data,” *Journal of Cosmology and Astroparticle Physics*, vol. 2013, no. 07, p. 008, 2013.
- [100] A. Saro, J. Liu, J. Mohr, K. Aird, M. Ashby, M. Bayliss, B. Benson, L. Bleem, S. Bocquet, M. Brodwin, *et al.*, “Constraints on the CMB temperature evolution using multiband measurements of the Sunyaev-Zel’dovich effect with the SPT,” *Monthly Notices of the Royal Astronomical Society*, vol. 440, no. 3, p. 2610, 2014.
- [101] T. Abbott, F. Abdalla, A. Alarcon, J. Aleksić, S. Allam, S. Allen, A. Amara, J. Annis, J. Asorey, S. Avila, *et al.*, “Dark Energy Survey year 1 results: cosmological constraints from galaxy clustering and weak lensing,” *Physical Review D*, vol. 98, no. 4, p. 043526, 2018.
- [102] M. A. Troxel, N. MacCrann, J. Zuntz, T. Eifler, E. Krause, S. Dodelson, D. Gruen, J. Blazek, O. Friedrich, S. Samuroff, *et al.*, “Dark Energy Survey year 1 results: cosmological constraints from cosmic shear,” *Physical Review D*, vol. 98, no. 4, p. 043528, 2018.
- [103] A. Gelman, D. B. Rubin, *et al.*, “Inference from iterative simulation using multiple sequences,” *Statistical science*, vol. 7, no. 4, p. 457, 1992.
- [104] S. Kumar, R. C. Nunes, and S. K. Yadav, “Cosmological bounds on dark matter-photon coupling,” *Physical Review D*, vol. 98, no. 4, p. 043521, 2018.
- [105] S. K. Yadav, “Constraints on dark matter-photon coupling in the presence of time-varying dark energy,” *Modern Physics Letters A*, vol. 35, no. 04, p. 1950358, 2020.
- [106] A. Ibarra, D. Tran, and C. Weniger, “Indirect searches for decaying dark matter,” *International Journal of Modern Physics A*, vol. 28, no. 27, p. 1330040, 2013.

- [107] A. Esmaili and P. D. Serpico, “Are icecube neutrinos unveiling pev-scale decaying dark matter?,” *Journal of Cosmology and Astroparticle Physics*, vol. 2013, no. 11, p. 054, 2013.
- [108] J. Lesgourgues, G. Marques-Tavares, and M. Schmaltz, “Evidence for dark matter interactions in cosmological precision data?,” *Journal of Cosmology and Astroparticle Physics*, vol. 2016, no. 02, p. 037, 2016.
- [109] N. F. Bell, A. J. Galea, and K. Petraki, “Lifetime constraints for late dark matter decay,” *Physical Review D*, vol. 82, no. 2, p. 023514, 2010.
- [110] N. F. Bell, A. J. Galea, and R. R. Volkas, “Model for late dark matter decay,” *Physical Review D*, vol. 83, no. 6, p. 063504, 2011.
- [111] K. Enqvist, S. Nadathur, T. Sekiguchi, and T. Takahashi, “Decaying dark matter and the tension in σ_8 ,” *Journal of Cosmology and Astroparticle Physics*, vol. 2015, no. 09, p. 067, 2015.
- [112] Z. Berezhiani, A. Dolgov, and I. Tkachev, “Reconciling Planck results with low redshift astronomical measurements,” *Physical Review D*, vol. 92, no. 6, p. 061303, 2015.
- [113] V. Poulin, P. D. Serpico, and J. Lesgourgues, “A fresh look at linear cosmological constraints on a decaying dark matter component,” *Journal of Cosmology and Astroparticle Physics*, vol. 2016, no. 08, p. 036, 2016.
- [114] P. Ko and Y. Tang, “Light dark photon and fermionic dark radiation for the Hubble constant and the structure formation,” *Physics Letters B*, vol. 762, p. 462, 2016.
- [115] M. A. Buen-Abad, M. Schmaltz, J. Lesgourgues, and T. Brinckmann, “Interacting dark sector and precision Cosmology,” *Journal of Cosmology and Astroparticle Physics*, vol. 2018, no. 01, p. 008, 2018.

- [116] S. D. L. Amigo, W. M.-Y. Cheung, Z. Huang, and S.-P. Ng, “Cosmological constraints on decaying dark matter,” *Journal of Cosmology and Astroparticle Physics*, vol. 2009, no. 06, p. 005, 2009.
- [117] I. M. Oldengott, D. Boriero, and D. J. Schwarz, “Reionization and dark matter decay,” *Journal of Cosmology and Astroparticle Physics*, vol. 2016, no. 08, p. 054, 2016.
- [118] C. El Aisati, M. Gustafsson, T. Hambye, and T. Scarna, “Dark matter decay to a photon and a neutrino: the double monochromatic smoking gun scenario,” *Physical Review D*, vol. 93, no. 4, p. 043535, 2016.
- [119] M. Gustafsson, T. Hambye, and T. Scarnà, “Effective theory of dark matter decay into monochromatic photons and its implications: constraints from associated cosmic-ray emission,” *Physics Letters B*, vol. 724, no. 4-5, p. 288, 2013.
- [120] H. Yüksel and M. D. Kistler, “Circumscribing late dark matter decays model-independently,” *Physical Review D*, vol. 78, no. 2, p. 023502, 2008.
- [121] C. Boehm, A. Riazuelo, S. H. Hansen, and R. Schaeffer, “Interacting dark matter disguised as warm dark matter,” *Physical Review D*, vol. 66, no. 8, p. 083505, 2002.
- [122] J. Stadler and C. Boehm, “Constraints on γ -cdm interactions matching the Planck data precision,” *Journal of Cosmology and Astroparticle Physics*, vol. 2018, no. 10, p. 009, 2018.
- [123] R. J. Wilkinson, J. Lesgourgues, *et al.*, “Using the CMB angular power spectrum to study dark matter-photon interactions,” *Journal of Cosmology and Astroparticle Physics*, vol. 2014, no. 04, p. 026, 2014.
- [124] R. J. Wilkinson, C. Boehm, and J. Lesgourgues, “Constraining dark matter-neutrino interactions using the CMB and large-scale structure,” *Journal of Cosmology and Astroparticle Physics*, vol. 2014, no. 05, p. 011, 2014.

- [125] S. Kumar and R. C. Nunes, “Observational constraints on dark matter–dark energy scattering cross section,” *The European Physical Journal C*, vol. 77, no. 11, p. 734, 2017.
- [126] M. Rigault, G. Aldering, M. Kowalski, Y. Copin, P. Antilogus, C. Aragon, S. Bailey, C. Baltay, D. Baugh, S. Bongard, *et al.*, “Confirmation of a star formation bias in type Ia supernova distances and its effect on the measurement of the Hubble constant,” *The Astrophysical Journal*, vol. 802, no. 1, p. 20, 2015.
- [127] S. Dhawan, S. W. Jha, and B. Leibundgut, “Measuring the Hubble constant with type Ia supernovae as near-infrared standard candles,” *Astronomy & Astrophysics*, vol. 609, p. A72, 2018.
- [128] L. Ackerman, M. R. Buckley, S. M. Carroll, and M. Kamionkowski, “Dark matter and dark radiation,” *Physical Review D*, vol. 79, no. 2, p. 023519, 2009.
- [129] W. Yang and L. Xu, “Cosmological constraints on interacting dark energy with redshift-space distortion after Planck data,” *Physical Review D*, vol. 89, no. 8, p. 083517, 2014.
- [130] J. Lima and I. Baranov, “Gravitationally induced particle production: Thermodynamics and kinetic theory,” *Physical Review D*, vol. 90, no. 4, p. 043515, 2014.
- [131] J. Chluba and R. Sunyaev, “The evolution of CMB spectral distortions in the early Universe,” *Monthly Notices of the Royal Astronomical Society*, vol. 419, no. 2, p. 1294, 2011.
- [132] J. Chluba, “Tests of the CMB temperature-redshift relation, CMB spectral distortions and why adiabatic photon production is hard,” *Monthly Notices of the Royal Astronomical Society*, vol. 443, no. 3, p. 1881, 2014.
- [133] J. Lima, A. Silva, and S. Viegas, “Is the radiation temperature-redshift relation of the standard Cosmology in accordance with the data?,” *Monthly Notices of the Royal Astronomical Society*, vol. 312, no. 4, p. 747, 2000.

- [134] S. Räsänen, J. Väliviita, and V. Kosonen, “Testing distance duality with CMB anisotropies,” *Journal of Cosmology and Astroparticle Physics*, vol. 2016, no. 04, p. 050, 2016.
- [135] N. Komatsu and S. Kimura, “Cosmic microwave background radiation temperature in a dissipative Universe,” *Physical Review D*, vol. 92, no. 4, p. 043507, 2015.
- [136] R. C. Nunes, “Connecting inflation with late cosmic acceleration by particle production,” *International Journal of Modern Physics D*, vol. 25, no. 06, p. 1650067, 2016.
- [137] Y. Ali-Haïmoud, J. Chluba, and M. Kamionkowski, “Constraints on dark matter interactions with standard model particles from cosmic microwave background spectral distortions,” *Physical Review Letters*, vol. 115, no. 7, p. 071304, 2015.
- [138] W. Lin and M. Ishak, “Cosmological discordances-II: Hubble constant, Planck and LSS data sets,” *Physical Review D*, vol. 96, no. 8, p. 083532, 2017.
- [139] E. Di Valentino, E. V. Linder, and A. Melchiorri, “Vacuum phase transition solves the H_0 tension,” *Physical Review D*, vol. 97, no. 4, p. 043528, 2018.
- [140] M. Benetti, L. L. Graef, and J. S. Alcaniz, “The H_0 and σ_8 tensions and the scale invariant spectrum,” *Journal of Cosmology and Astroparticle Physics*, vol. 2018, no. 07, p. 066, 2018.
- [141] S. Kumar and R. C. Nunes, “Probing the interaction between dark matter and dark energy in the presence of massive neutrinos,” *Physical Review D*, vol. 94, no. 12, p. 123511, 2016.
- [142] S. Kumar and R. C. Nunes, “Echo of interactions in the dark sector,” *Physical Review D*, vol. 96, no. 10, p. 103511, 2017.
- [143] E. Di Valentino, A. Melchiorri, and O. Mena, “Can interacting dark energy solve the H_0 tension?,” *Physical Review D*, vol. 96, no. 4, p. 043503, 2017.

- [144] V. Poulin, K. K. Boddy, S. Bird, and M. Kamionkowski, “Implications of an extended dark energy Cosmology with massive neutrinos for cosmological tensions,” *Physical Review D*, vol. 97, no. 12, p. 123504, 2018.
- [145] E. Di Valentino, C. Bøehm, E. Hivon, and F. R. Bouchet, “Reducing the H_0 and σ_8 tensions with dark matter-neutrino interactions,” *Physical Review D*, vol. 97, no. 4, p. 043513, 2018.
- [146] P. Ade, N. Aghanim, M. Arnaud, F. Arroja, M. Ashdown, J. Aumont, C. Baccigalupi, M. Ballardini, A. Banday, R. Barreiro, *et al.*, “Planck 2015 results-xx: constraints on inflation,” *Astronomy & Astrophysics*, vol. 594, p. A20, 2016.
- [147] A. Heavens, R. Jimenez, and L. Verde, “Standard rulers, candles, and clocks from the low-redshift Universe,” *Physical Review Letters*, vol. 113, no. 24, p. 241302, 2014.
- [148] L. Verde, J. L. Bernal, A. F. Heavens, and R. Jimenez, “The length of the low-redshift standard ruler,” *Monthly Notices of the Royal Astronomical Society*, vol. 467, no. 1, p. 731, 2017.
- [149] M. Chevallier and D. Polarski, “Accelerating Universes with scaling dark matter,” *International Journal of Modern Physics D*, vol. 10, no. 02, p. 213, 2001.
- [150] E. V. Linder, “Exploring the expansion history of the Universe,” *Physical Review Letters*, vol. 90, no. 9, p. 091301, 2003.
- [151] S. Kumar, “Probing the matter and dark energy sources in a viable Big Rip model of the Universe,” *Modern Physics Letters A*, vol. 29, no. 25, p. 1450119, 2014.
- [152] S. Kumar and L. Xu, “Observational constraints on variable equation of state parameters of dark matter and dark energy after Planck,” *Physics Letters B*, vol. 737, p. 244, 2014.

- [153] S. Kumar, R. C. Nunes, and S. K. Yadav, “Testing the warmness of dark matter,” *Monthly Notices of the Royal Astronomical Society*, vol. 490, no. 1, p. 1406, 2019.
- [154] S. K. Yadav, “Observational constraints on variable equation of state of dark matter and dark energy,” (*Communicated*), 2020.
- [155] M. J. Jee, H. Hoekstra, A. Mahdavi, and A. Babul, “Hubble space telescope/advanced camera for surveys confirmation of the dark substructure in A520,” *The Astrophysical Journal*, vol. 783, no. 2, p. 78, 2014.
- [156] E. Papastergis, R. Giovanelli, M. P. Haynes, and F. Shankar, “Is there a “too big to fail” problem in the field?,” *Astronomy & Astrophysics*, vol. 574, p. A113, 2015.
- [157] H. De Vega and N. Sanchez, “Warm dark matter in the galaxies: theoretical and observational progresses. highlights and conclusions of the chalonge meudon workshop 2011,” *arXiv:1109.3187*, 2011.
- [158] C. M. Müller, “Cosmological bounds on the equation of state of dark matter,” *Physical Review D*, vol. 71, no. 4, p. 047302, 2005.
- [159] T. Faber and M. Visser, “Combining rotation curves and gravitational lensing: how to measure the equation of state of dark matter in the galactic halo,” *Monthly Notices of the Royal Astronomical Society*, vol. 372, no. 1, p. 136, 2006.
- [160] A. L. Serra and M. J. L. D. Romero, “Measuring the dark matter equation of state,” *Monthly Notices of the Royal Astronomical Society: Letters*, vol. 415, no. 1, p. L74, 2011.
- [161] A. Avelino, N. Cruz, and U. Nucamendi, “Testing the EOS of dark matter with cosmological observations,” *arXiv:1211.4633*, 2012.
- [162] N. Cruz, G. Palma, D. Zambrano, and A. Avelino, “Interacting warm dark matter,” *Journal of Cosmology and Astroparticle Physics*, vol. 2013, no. 05, p. 034, 2013.

-
- [163] H. Wei, Z.-C. Chen, and J. Liu, “Cosmological constraints on variable warm dark matter,” *Physics Letters B*, vol. 720, no. 4-5, p. 271, 2013.
- [164] E. Calabrese, M. Migliaccio, L. Pagano, G. De Troia, A. Melchiorri, and P. Natoli, “Cosmological constraints on the matter equation of state,” *Physical Review D*, vol. 80, no. 6, p. 063539, 2009.
- [165] L. Xu and Y. Chang, “Equation of state of dark matter after Planck data,” *Physical Review D*, vol. 88, no. 12, p. 127301, 2013.
- [166] W. Hu, “Structure formation with generalized dark matter,” *The Astrophysical Journal*, vol. 506, no. 2, p. 485, 1998.
- [167] M. Kopp, C. Skordis, and D. B. Thomas, “Extensive investigation of the generalized dark matter model,” *Physical Review D*, vol. 94, no. 4, p. 043512, 2016.
- [168] D. B. Thomas, M. Kopp, and C. Skordis, “Constraining the properties of dark matter with observations of the cosmic microwave background,” *The Astrophysical Journal*, vol. 830, no. 2, p. 155, 2016.
- [169] M. Kunz, S. Nesseris, and I. Sawicki, “Constraints on dark-matter properties from large-scale structure,” *Physical Review D*, vol. 94, no. 2, p. 023510, 2016.
- [170] I. Tutusaus, B. Lamine, and A. Blanchard, “Generalized dark matter model with the Euclid satellite,” *arXiv:1805.06202*, 2018.
- [171] M. Kopp, C. Skordis, D. B. Thomas, and S. Ilić, “Dark matter equation of state through cosmic history,” *Physical Review Letters*, vol. 120, no. 22, p. 221102, 2018.
- [172] R. De Putter, D. Huterer, and E. V. Linder, “Measuring the speed of dark: detecting dark energy perturbations,” *Physical Review D*, vol. 81, no. 10, p. 103513, 2010.
- [173] E. M. Barboza Jr, R. C. Nunes, E. M. Abreu, and J. A. Neto, “Thermodynamic aspects of dark energy fluids,” *Physical Review D*, vol. 92, no. 8, p. 083526, 2015.

- [174] P. A. Ade, N. Aghanim, C. Armitage-Caplan, M. Arnaud, M. Ashdown, F. Atrio-Barandela, J. Aumont, C. Baccigalupi, A. Banday, R. Barreiro, *et al.*, “Planck 2013 results-XX: cosmology from Sunyaev-Zeld’ovich cluster counts,” *Astronomy & Astrophysics*, vol. 571, p. A20, 2014.
- [175] C. Armendariz-Picon and J. T. Neelakanta, “How cold is cold dark matter?,” *Journal of Cosmology and Astroparticle Physics*, vol. 2014, no. 03, p. 049, 2014.
- [176] P. Bode, J. P. Ostriker, and N. Turok, “Halo formation in warm dark matter models,” *The Astrophysical Journal*, vol. 556, no. 1, p. 93, 2001.
- [177] M. Viel, J. Lesgourgues, M. G. Haehnelt, S. Matarrese, and A. Riotto, “Constraining warm dark matter candidates including sterile neutrinos and light gravitinos with WMAP and the Lyman- α forest,” *Physical Review D*, vol. 71, no. 6, p. 063534, 2005.
- [178] S. Tremaine and J. E. Gunn, “Dynamical role of light neutral leptons in Cosmology,” *Physical Review Letters*, vol. 42, no. 6, p. 407, 1979.
- [179] V. K. Narayanan, D. N. Spergel, R. Davé, and C.-P. Ma, “Constraints on the mass of warm dark matter particles and the shape of the linear power spectrum from the Ly α forest,” *The Astrophysical Journal: letters*, vol. 543, no. 2, p. L103, 2000.
- [180] S. Colombi, S. Dodelson, and L. M. Widrow, “Large scale structure tests of warm dark matter,” *arXiv: astro-ph/9505029*, 1995.
- [181] J. C. Fabris, I. L. Shapiro, and A. Velasquez-Toribio, “Testing dark matter warmness and quantity via the reduced relativistic gas model,” *Physical Review D*, vol. 85, no. 2, p. 023506, 2012.
- [182] K. T. Inoue, R. Takahashi, T. Takahashi, and T. Ishiyama, “Constraints on warm dark matter from weak lensing in anomalous quadruple lenses,” *Monthly Notices of the Royal Astronomical Society*, vol. 448, no. 3, p. 2704, 2015.

- [183] S. Gariazzo, M. Escudero, R. Diamanti, and O. Mena, “Cosmological searches for a noncold dark matter component,” *Physical Review D*, vol. 96, no. 4, p. 043501, 2017.
- [184] R. Murgia, A. Merle, M. Viel, M. Totzauer, and A. Schneider, “Non-cold dark matter at small scales: a general approach,” *arXiv: 1704.07838*, 2017.
- [185] L. Lopez-Honorez, O. Mena, S. Palomares-Ruiz, and P. Villanueva-Domingo, “Warm dark matter and the ionization history of the Universe,” *Physical Review D*, vol. 96, no. 10, p. 103539, 2017.
- [186] A. Schneider, “Constraining noncold dark matter models with the global 21-cm signal,” *Physical Review D*, vol. 98, no. 6, p. 063021, 2018.
- [187] W. S. Hipólito-Ricaldi, R. vom Marttens, J. Fabris, I. Shapiro, and L. Casarini, “On general features of warm dark matter with reduced relativistic gas,” *Eur. Phys. J. C*, vol. 78, no. 5, p. 365, 2018.
- [188] J. S. Martins, R. Rosenfeld, and F. Sobreira, “Forecasts for warm dark matter from photometric galaxy surveys,” *Monthly Notices of the Royal Astronomical Society*, vol. 481, no. 1, p. 1290, 2018.
- [189] S. Kumar, R. C. Nunes, and S. K. Yadav, “Dark sector interaction: a remedy of the tensions between CMB and LSS data,” *European Physical Journal C*, vol. 79, p. 576, 2019.
- [190] H. Lampeitl, R. Nichol, H.-J. Seo, T. Giannantonio, C. Shapiro, B. Bassett, W. Percival, T. M. Davis, B. Dilday, J. Frieman, *et al.*, “First-year sloan digital sky survey-ii supernova results: consistency and constraints with other intermediate-redshift data sets,” *Monthly Notices of the Royal Astronomical Society*, vol. 401, no. 4, p. 2331, 2010.
- [191] A. G. Riess, L. Macri, S. Casertano, M. Sosey, H. Lampeitl, H. C. Ferguson, A. V. Filippenko, S. W. Jha, W. Li, R. Chornock, *et al.*, “A redetermination of the Hubble

- constant with the Hubble space telescope from a differential distance ladder,” *The Astrophysical Journal*, vol. 699, no. 1, p. 539, 2009.
- [192] V. Salvatelli, N. Said, M. Bruni, A. Melchiorri, and D. Wands, “Indications of a late-time interaction in the dark sector,” *Physical Review Letters*, vol. 113, no. 18, p. 181301, 2014.
- [193] V. Salvatelli, A. Marchini, L. Lopez-Honorez, and O. Mena, “New constraints on coupled dark energy from the Planck satellite experiment,” *Physical Review D*, vol. 88, no. 2, p. 023531, 2013.
- [194] W. Yang, A. Mukherjee, E. Di Valentino, and S. Pan, “Interacting dark energy with time varying equation of state and the H_0 tension,” *Physical Review D*, vol. 98, no. 12, p. 123527, 2018.
- [195] W. Yang, S. Pan, R. Herrera, and S. Chakraborty, “Large-scale (in) stability analysis of an exactly solved coupled dark-energy model,” *Physical Review D*, vol. 98, no. 4, p. 043517, 2018.
- [196] W. Yang, S. Pan, and A. Paliathanasis, “Cosmological constraints on an exponential interaction in the dark sector,” *Monthly Notices of the Royal Astronomical Society*, vol. 482, no. 1, p. 1007, 2018.
- [197] S. Pan, A. Mukherjee, and N. Banerjee, “Astronomical bounds on a cosmological model allowing a general interaction in the dark sector,” *Monthly Notices of the Royal Astronomical Society*, vol. 477, no. 1, p. 1189, 2018.
- [198] R. C. Nunes and E. M. Barboza, “Dark matter-dark energy interaction for a time-dependent equation of state parameter,” *General Relativity and Gravitation*, vol. 46, no. 11, p. 1820, 2014.
- [199] R. C. Nunes, S. Pan, and E. N. Saridakis, “New constraints on interacting dark energy from cosmic chronometers,” *Physical Review D*, vol. 94, no. 2, p. 023508, 2016.

-
- [200] M. D. Marsh, “Exacerbating the cosmological constant problem with interacting dark energy models,” *Physical Review Letters*, vol. 118, no. 1, p. 011302, 2017.
- [201] J. Mifsud and C. van de Bruck, “An interacting dark sector and the first gravitational-wave standard siren detection,” *arXiv:1901.09218*, 2019.
- [202] C. Van De Bruck and J. Mifsud, “Searching for dark matter-dark energy interactions: going beyond the conformal case,” *Physical Review D*, vol. 97, no. 2, p. 023506, 2018.
- [203] C. van de Bruck, J. Mifsud, and J. Morrice, “Testing coupled dark energy models with their cosmological background evolution,” *Physical Review D*, vol. 95, no. 4, p. 043513, 2017.
- [204] M. Asghari, J. B. Jiménez, S. Khosravi, and D. F. Mota, “On structure formation from a small-scales-interacting dark sector,” *Journal of Cosmology and Astroparticle Physics*, vol. 2019, no. 04, p. 042, 2019.
- [205] W. Yang, S. Vagnozzi, E. Di Valentino, R. C. Nunes, S. Pan, and D. F. Mota, “Listening to the sound of dark sector interactions with gravitational wave standard sirens,” *arXiv:1905.08286*, 2019.
- [206] B. Wang, E. Abdalla, F. Atrio-Barandela, and D. Pavon, “Dark matter and dark energy interactions: theoretical challenges, cosmological implications and observational signatures,” *Reports on Progress in Physics*, vol. 79, no. 9, p. 096901, 2016.
- [207] J.-H. He and B. Wang, “Effects of the interaction between dark energy and dark matter on cosmological parameters,” *Journal of Cosmology and Astroparticle Physics*, vol. 2008, no. 06, p. 010, 2008.
- [208] H.-L. Li, L. Feng, J.-F. Zhang, and X. Zhang, “Models of vacuum energy interacting with cold dark matter: constraints and comparison,” *Science China Physics, Mechanics & Astronomy*, vol. 62, no. 12, p. 120411, 2019.

- [209] J. Väliiviita, E. Majerotto, and R. Maartens, “Large-scale instability in interacting dark energy and dark matter fluids,” *Journal of Cosmology and Astroparticle Physics*, vol. 2008, no. 07, p. 020, 2008.
- [210] J.-H. He, B. Wang, and E. Abdalla, “Stability of the curvature perturbation in dark sectors’ mutual interacting models,” *Physics Letters B*, vol. 671, no. 1, p. 139, 2009.
- [211] D. Wands, J. De-Santiago, and Y. Wang, “Inhomogeneous vacuum energy,” *Classical and Quantum Gravity*, vol. 29, no. 14, p. 145017, 2012.
- [212] Y. Wang, D. Wands, L. Xu, J. De-Santiago, and A. Hojjati, “Cosmological constraints on a decomposed chaplygin gas,” *Physical Review D*, vol. 87, no. 8, p. 083503, 2013.
- [213] M. Martinelli, N. B. Hogg, S. Peirone, M. Bruni, and D. Wands, “Constraints on the interacting vacuum-geodesic CDM scenario,” *arXiv:1902.10694*, 2019.