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Implications for cosmological expansion models from the final Dark Energy Survey BAO and SN data

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The Dark Energy Survey (DES) recently released the final results of its two main probes of the expansion history: Type Ia Supernovae (SN) and Baryonic Acoustic Oscillations (BAO). In this work, we explore the cosmological implications of these data in combination with external Cosmic Microwave Background (CMB), Big Bang Nucleosynthesis (BBN), and age-of-the-Universe information. The BAO measurement, which is $\sim 2\sigma$ away from {\tt Planck-2018}'s ΛCDM predictions, pushes for low values of Ω_m compared to {\tt Planck-2018}, in contrast to SN which prefers a higher value than {\tt Planck-2018}. We identify several tensions among datasets in the ΛCDM model and try to solve them by including curvature or evolving dark energy. For DES BAO and SN in combination with {\tt Planck-2018}, we find a 3.2σ deviation from ΛCDM when assuming $w_0 w_a$CDM. For the combination of all the background cosmological probes considered (including $\theta_\star$ from {\tt Planck-2018}), we still find a deviation of 2.8σ in the $w_0 - w_a$ plane. This work provides further evidence for non-ΛCDM physics or systematics, which is consistent with recent claims in support of evolving dark energy.

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