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A new method to determine H_0 from cosmological energy-density measurements

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We introduce a new method for measuring the Hubble parameter from low-redshift large-scale observations that is independent of the comoving sound horizon. The method uses the baryon-to-photon ratio determined by the primordial deuterium abundance, together with Big Bang Nucleosynthesis (BBN) calculations and the present-day CMB temperature to determine the physical baryon density $\Omega_b h^2$. The baryon fraction Ω_b/Ω_m is measured using the relative amplitude of the baryonic signature in galaxy clustering, scaling the physical baryon density to the physical matter density. The physical density $\Omega_m h^2$ is then compared with the geometrical density Ω_m from Alcock-Paczynski measurements from Baryon Acoustic Oscillations (BAO) and voids, to give H_0. Current data is only weakly constraining and therefore consistent with both the distance-ladder and CMB H_0 determinations, but near-future large-scale structure surveys (such as the full DESI and Euclid surveys) will obtain 3–4× tighter constraints. Including type Ia supernovae and uncalibrated BAO, and using the baryon signature in BOSS galaxy clustering, we measure $H_0 = 67.1^{+6.3}_{-5.3}$ km s^{-1} Mpc^{-1}. We find similar results when varying analysis choices, such as measuring the baryon signature from the reconstructed correlation function, or excluding supernovae or voids.

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