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TDCOSMO 2025: Cosmological constraints from strong lensing time delays

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Time-delay cosmography with lensed quasars is a one-step method for estimating the Hubble constant in the local Universe independently of the cosmic distance ladder. It does not require any intermediate calibration and relies on measuring the time delays between multiple images of strongly lensed quasars, which are inversely proportional to the Hubble constant.

In this talk, I will present the cosmological constraints from the latest blinded analysis conducted by the TDCOSMO collaboration from eight strongly lensed quasars (hereafter, the TDCOSMO-2025 sample). Building on recent advances, we have improved our modelling of (1) line-of-sight effects, the surface brightness profiles of lens galaxies, (3) the stellar orbital anisotropy, and we also corrected for projection effects in the lens dynamics. Our uncertainties in the deflectors' mass density profiles remain maximally conservative as they incorporate explicitly the effect of the mass-sheet degeneracy, now constrained by new measurements of stellar velocity dispersions from spectra obtained with the James Webb Space Telescope (JWST), the Keck Telescopes, and the Very Large Telescope (VLT), all benefitting from crucial methodology improvements.

Our primary result, $H_0 = 71.6^{+3.9}_{-3.3}$ km/s/Mpc, is derived from the TDCOSMO-2025 sample combined with Ω_m constraints from the Pantheon+ Type Ia supernova (SN) dataset. Importantly, our Hubble constant measurement is robust against the addition of external lens samples (SL2S, SLACS), the prior on Ω_m (Pantheon+, DES Year-5 SN sample or DESI DR2 BAO), and the choice of different cosmological models.

Auteur: TDCOSMO COLLABORATION

Co-auteurs: BIRRER, Simon; SHAJIB, Anowar; MILLON, Martin; GALAN, Aymeric (MPA, TUM)

Orateur: GALAN, Aymeric (MPA, TUM)