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Shuaibo Geng (NCBJ), Investigating the redshift Evolution of Lensing Galaxy Density Slopes via Model-Independent Distance Ratios in the Era of LSST

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Strong lensing systems, soon to be widely detected by LSST, serve as powerful tools for exploring cosmology and galaxy structure. Com- bined with stellar kinematics, the Einstein radius measures the lens's total projected mass and helps constrain lens mass profiles. However, its observed angular size also varies with the cosmological model, specifically through the distance ratio D_ls/D_s, entangling cosmology with galaxy structure. Addressing this, our study uses 161 strong lensing systems to evaluate the power-law (PL) mass distribution slope and its redshift evolution without relying on a specific cosmological model. We employ non-parametric regression via Artificial Neural Networks and Gaussian Processes on data from cosmic chronometers and Type Ia supernovae to reconstruct distance ratios. Our analysis differentiates between the total mass and luminous matter density slopes, revealing that the total mass concentration increases towards the present. While we observe only marginal increases in the density slope of luminous matter as redshift decreasing. The study provides a basis for using strong lensing to constrain cosmological parameters and to understand galaxy evolution, with ongoing potential applications being investigated.

Session Classification : Cosmology