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Strong gravitational lensing applications on cosmology and galactic evolution

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Gravitational lensing, as predicted by Einstein's General Relativity, is the bending of light from distant sources via the gravitational field of massive objects. This phenomenon provides a valuable opportunity for unique studies. In this presentation, I will discuss the applications of strong gravitational lensing in the realms of cosmology and galaxy evolution.

Using the most extensive current sample of early-type galaxies (ETGs) lensing systems, we probe the velocity dispersion function (VDF) and trace its evolution at redshift z ~ 1. Our findings align with the SDSS survey results, revealing a halving of number density and a 20% increase in characteristic velocity dispersion for ETGs at z ~ 1, supporting the Cold Dark Matter (CDM) paradigm. We've used model-independent methods to reconstruct distance ratios and time-delay distances by lensing systems, which help us limit the parameters of various cosmological models. The derived Hubble constant (H0) is in agreement with the SH0ES collaboration findings from the cosmic distance ladder. And the zero spatial curvature is supported by the current observations of time delays due to strong lensing and cosmic chronometers. The forthcoming LSST survey, with its expected larger sample, could enhance the precision of redshift evolution constraints of ETGs by a factor of twenty. Furthermore, it can estimate the matter density parameter Ωm with an accuracy of $\Delta\Omega$~0.015 in the ΛCDM model, offering constraints comparable to Planck 2015's results.

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