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Luminous and dark matter in early-type lens galaxies

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In the past few years gravitational lensing has allowed astrophysicists to make great progress in the understanding of the internal structure of early-type galaxies. By taking advantage of accurate photometric and spectroscopic measurements, the luminous and dark matter content of lens galaxies can in principle be disentangled (e.g., Grillo *et al.* 2008, 2009). SDSS J1538+5817 is an extraordinary strong lensing system composed of an elliptical galaxy and two equally-distant sources located, respectively, at redshifts 0.143 and 0.531 (Grillo *et al.*, submitted to ApJ). The sources are lensed into two and four images with an almost complete Einstein ring, covering a rather large region on the lens plane. By using HST/ACS and WFPC2 imaging and NOT/ALFOSC spectroscopy, we have investigated the lens total mass distribution within one effective radius. Then, we have fitted the SDSS multicolor photometry of the galaxy with composite stellar population models to obtain its luminous mass. By combining lensing and photometric measurements, we have estimated the lens mass in terms of luminous and dark matter components and studied the global properties of the dark matter halo. The exceptional lensing configuration of this system has allowed us to conclude that the galaxy dark matter density distribution is shallower and more diffused than the luminous one and the former starts exceeding the latter at a distance of approximately 1.5 times the effective radius. Extending these results to a larger number of lenses would help us to decipher the processes that rule galaxy formation and evolution in the LCDM scenario.

References

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