Multi-Object Spectroscopy in the Next Decade: Big Questions, Large Surveys and Wide Fields
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BaLROG - The influence of bars on the dynamical structure and stellar populations in 3D

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Abstract

Studies of barred galaxies have provided powerful constraints on their formation and evolution. While spectroscopic measurements in 2D have mainly focused on the interstellar component, two dimensional studies of the stellar counterpart have only become possible with the advent of integral-field spectroscopic surveys. Here we present new results from the BaLROG project (Bars in Low Redshift Optical galaxies), using the integral field spectrograph SAURON. Our 2D maps, combining several SAURON pointings per galaxy, allow us to probe radial dependencies within and past the bar into the start of the disk, while providing the highest spatial resolution possible. We develop a new method to measure bar strength based on radial and tangential velocities derived from our kinematic maps and find a good agreement with the torque found via the photometry of Spitzer images. A comparison with N-body simulations using the two distinct torque measurements shows that early-type bars might originate from distinct dark matter (DM) halos. Using the bar strength as a leveling staff, we detect subtle, but noticeable influence of the bar on the stellar kinematics such as humps in the rotation curve and stellar angular momentum profiles. Stronger bars also seem to strengthen these features found between resonance points, but also depend on the bulge properties (prominence, concentration). Nonetheless, we confirm that bars do not change remarkably the global rotation or dispersion patterns. We also compute line-strength indices to derive SSP-equivalent ages and metallicities and find slightly enhanced iron features likely associated to bar-driven resonances. We conclude that high spatial resolution is key to detect the subtle influence of the bars as they do not seem to influence global galaxy properties. However, they still have a non-negligible effect on the secular evolution of a galaxy, possibly increasing in importance.