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Measurements of galaxy kinematics using slitless spectroscopy
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Slitless spectroscopy has usually been considered as a niche and complicated technique. However, since the era of the Hubble Space Telescope (HST) instruments which offer a low background and fine spatial resolution, slitless spectroscopy has become an adopted survey tool to study galaxy evolution. In this paper we will present its application to single object studies. The method presented here aims to extract kinematic parameters of galaxies from slitless spectroscopy images such as the maximal velocity of rotation curves (RCs) v0(km/s) and the turn-over radius r0(arcsec-kpc) which characterize the transition region in the RC. We describe our approach based on a forward model of the 2D slitless spectrum of a galaxy, described by its density profile (constrained by broadband photometry), its mean spectrum and its velocity field (for now a purely rotating cold disk). We adopt the «separability assumption» i.e. the galaxy spectrum is constant over its whole extent. We will detail in which way this model is an efficient approach to reduce self- and cross-confusion effects which are the primary drawbacks in slitless spectroscopy. We apply this method to 3D-HST and GLASS observations. The main limitation encountered to extract v0 and r0 is the spectral resolution of the available instruments (~46 A/px). Thus, we first attempt to estimate the steepness of the RCs by measuring its slope dv(0) / dr (km/s/arcsec); some measurements of this parameter are presented. To conclude, there are promising applications to the future slitless spectroscopy surveys (JWST, EUCLID and WFIRST) which will possess a better spectral resolution (~ 10A /px) and a greater number of spectroscopic data (> 10-50 millions of galaxies).