Witnessing the rapid growth of the disc galaxies over cosmic time

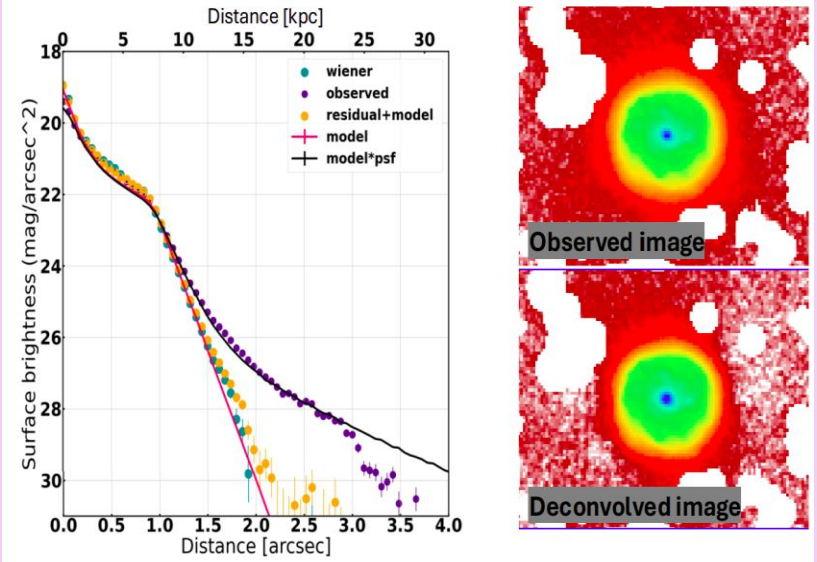
Samane Raji, Mireia Montes, Ignacio Trujillo, Fernando Buitrago
University of Valladolid

Proyecto PID2020-116188GA-I00 financiado por MICIU/AEI/10.13039/501100011033

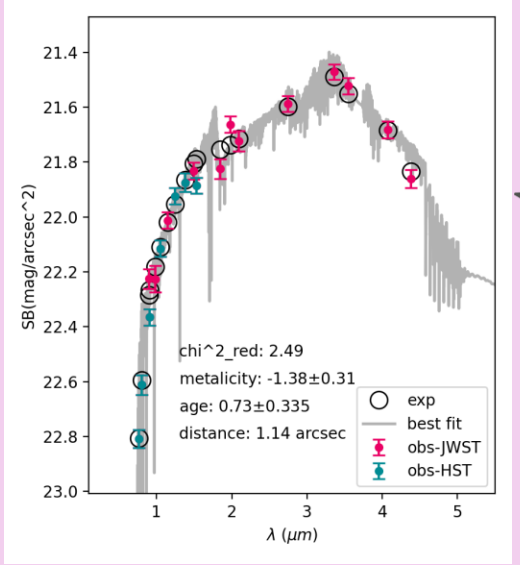
Abstract

Thanks to the superb depth and spatial resolution of the Hubble and James Webb Space Telescopes, we can for the first time study the evolution of the edge of galaxies over the past 8 Gyr. The edge of galaxies, understood here as the farthest radial location where star formation is taking place, has evolved dramatically over time. In this contribution, we present our work on quantifying this evolution and comparing it with theoretical expectations. Using 11 photometric filters based on a combination of JWST and HST data, we have studied a sample of 77 disk galaxies in the EGS CEERS field with confirmed spectroscopic redshifts < 1 and stellar masses > 10^10 M⊙. We find that the radial extent of Milky Way-like galaxies has increased by a factor of 2 since z=1. This enormous transformation of the galactic disk over cosmic time forces us to rethink how and where galaxies like our Milky Way formed their outermost regions

PSF correction: Although the PSF of the JWST and the HST are relatively small, they cannot be ignored in our measurement. Therefore, we must deconvolve the image using the PSF. By employing the Wiener deconvolution method, which provides high-speed deconvolution, we were able to successfully remove the PSF effects from galaxies.



Spectral energy distributions: The extensive range of filters in our data set, covering a broad wavelength range, enabled us to fit single stellar population (SSP) models, exploring the gradients of stellar populations from the centre of the galaxies to the outer parts. The UV-extended E-MILES SSP models from Vazdekis et al. (2016) were employed in this analysis.



Radial profiles of galaxies: Finally, we computed the radial profiles of age and metallicity for each galaxy.