The Addition of deep UV data to the HUDF has revolutionized the way we search for clumpy galaxies at intermediate redshifts (0.5 ≤ z ≤ 1.5). Previous studies of clumpy galaxies have either been in the rest-frame FUV at higher redshifts or in the NUV at intermediate redshifts. With the inclusion of high spatial resolution UV images we present an investigation of 403 clumpy galaxies hosting 506 clumps, with 104 galaxies and 506 clumps at 1 ≤ z ≤ 1.5. Due to the total rest-frame FUV flux of the host galaxy, comprise only a small fraction of the total star formation rate of their host galaxy, and individually contribute an average of ~3% of the host galaxy mass. We search for evidence of clump migration on the outskirts of disks to determine the role they play in galaxy evolution. Our findings show that although clumps at 1.0 ≤ z ≤ 1.5 tend to agree with the mass and size trends of higher redshift studies, clumps at 0.5 ≤ z ≤ 1.0 have lower masses by an order of 2. We also find that clumps contribute an average of 19% of the total rest-frame FUV flux of the host galaxy, comprise only a small fraction of the total star formation rate of their host galaxy, and individually contribute an average of ~3% of the host galaxy mass. We search for evidence of clump migration on the outskirts of disks to determine the role they play in galaxy evolution.

Abstract

The addition of deep UV data to the HUDF has revolutionized the way we search for clumpy galaxies at intermediate redshifts (0.5 ≤ z ≤ 1.5). Previous studies of clumpy galaxies have either been in the rest-frame FUV at higher redshifts or in the NUV at intermediate redshifts. With the addition of 8 ultra-deep UV mosaics in the F225W, F275W, and F336W filters taken with WFC3/UVIS, we are able to study clumpy galaxies in their rest-frame FUV (1500Å), probe light from the young and bright O & B stellar populations. These galaxies are home to kpc sized regions of intense star formation known as clumps. With the inclusion of high spatial resolution UV images we present an investigation of 403 clumpy galaxies hosting 506 clumps, with 104 galaxies and 506 clumps at 1 ≤ z ≤ 1.5. Due to the increased image resolution and deblending of clumps, we are able to determine clump and host galaxy properties including mass, age, and star formation rate. Our findings show that although clumps at 1.0 ≤ z ≤ 1.5 tend to agree with the mass and size trends of higher redshift studies, clumps at 0.5 ≤ z ≤ 1.0 have lower masses by an order of 2. We also find that clumps contribute an average of 19% of the total rest-frame FUV flux of the host galaxy, comprise only a small fraction of the total star formation rate of their host galaxy, and individually contribute an average of ~3% of the host galaxy mass. We search for evidence of clump migration on the outskirts of disks to determine the role they play in galaxy evolution.

Data & Clump Detection

Clump Finding Algorithm:

(I) is galaxy ID 24587 in the optical
(II) shows the UV detection image (for this example F225W) used to search for clumps
(III) shows the UV detection image (for this example F225W) used to search for clumps
(IV) shows segmentation map that is output (IV.) is then used to measure the photometry in the remaining figures

- The flux is then measured at 3σ above the host galaxy in the detection band
- The segmentation map that is output (IV.) is then used to measure the photometry in the remaining figures

Results & Conclusions

- We found evidence for clump mergers & clump migration
- Less clumps at intermediate z than high-z studies
- Single and double clump systems, located in inner regions, contribute more to the galaxy mass fraction than multiple clump galaxies in the outskirts
- Younger higher star-forming clumps in the outskirts in comparison to inner region clumps
- Greater flux ratios in the inner regions for galaxies with less clumps, which correspond to the low-z bin clumps

- Supports the Clump Migration and Bulge Formation Theory


(Right) Image gallery comparing the original HST resolution image to the H-band PSF matched images.