

HST MORPHOLOGIES OF LOCAL LYMAN BREAK GALAXY ANALOGS I: EVIDENCE FOR STARBURSTS TRIGGERED BY MERGING

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ABSTRACT

Heckman et al. (2005) used the Galaxy Evolution Explorer (GALEX) UV imaging survey to show that there exists a rare population of nearby compact UV-luminous galaxies (UVLGs) that closely resembles high redshift Lyman break galaxies (LBGs). We present HST images in the UV, optical, and H α , and resimulate them at the depth and resolution of the GOODS/UDF fields to show that the morphologies of UVLGs are also similar to those of LBGs. Our sample of 8 LBG analogs thus provides detailed insight into the connection between star formation and LBG morphology. Tidal features or companions can be seen in all of the undegraded, rest-frame optical images, suggesting that the starbursts are always the result of a merger or interaction. The UV/optical light is dominated by unresolved (~ 100 -300 pc) super starburst regions (SSBs). The structural features revealed by the new HST images occur on very small physical scales and are thus not detectable in images of high redshift LBGs, except in a few cases where they are magnified by gravitational lensing. We propose, therefore, that LBGs are mergers of gas-rich, relatively low-mass ($M_* \sim 10^{10} M_\odot$) systems, and that the mergers trigger the formation of SSBs. If galaxies at high redshifts are dominated by SSBs, then the faint end slope of the luminosity function is predicted to have slope $\alpha \sim 2$. Our results are the most direct confirmation to date of models that predict that the main mode of star formation in the early universe was highly collisional.

Subject headings: cosmology: observations – early universe – galaxies: high-redshift – galaxies: starburst

1. INTRODUCTION

How did galaxies form? Ultimately, this simple question captures most, if not all, of the most widely pursued

mation. The most luminous of these, the Lyman break galaxies (LBGs), are easily detected at $z = 2 - 6$ in deep pencil beam surveys from the ground and with the *Hub-*





New evidence for a merger-driven formation of LBGs

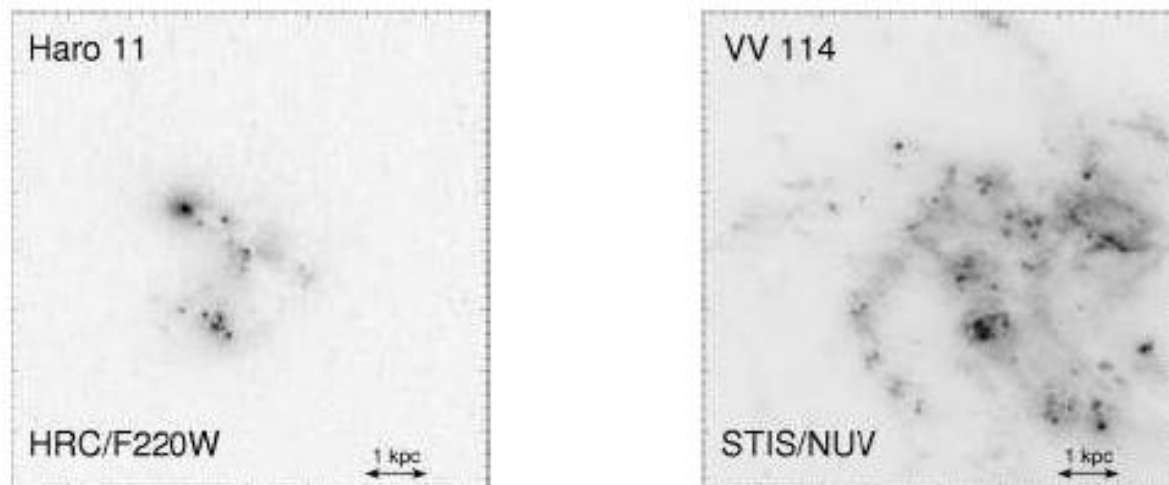


FIG. 2.— NUV archival images of the local starburst galaxies Haro 11 and VV 114, both at $z = 0.02$. The image of Haro 11 was taken with the ACS/HRC (Program 10575, PI: Göran Östlin). The VV 114 observations were taken using STIS (Program 8201, PI: Gerh Meurer). See Sect. [2.4.1](#) for details.

