A First Look at Galaxy Morphology at High-Redshift Using HST/WFC3 Imaging

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ABSTRACT
We present initial results from a morphological analysis of ~300 BzK selected galaxies in GOODS-S using the Early Release Science (ERS) WFC3 images taken with HST in conjunction with previously obtained ACS images. By studying the morphologies of these high redshift (z~2) in the near-infrared, we are actually probing rest-frame optical at high resolution. We use this rich data set to explore the morphological k-corrections present in this high-redshift sample of massive star-forming galaxies. Finally, we study the relationship between a galaxy’s morphology and its position on the mass-star formation rate plane. In particular, we study the position of galaxies identified as possible mergers. Future work with CANDELS images and Herschel will allow us to study the morphological properties of a larger sample of BzK objects as well as Herschel selected targets across a wide range of luminosities.

Sample
- Subset of Daddi et al. 2007 sample
- BzK selected
- X-ray AGN removed
- WFC3 imaging from ERS/UDF in GOODS-S
- ~300 sources in total

WFC3 Imaging
- Y, J, and H band images of a small portion of GOODS-S were taken as a part of the Early Release Science program on HST with the newly installed Wide-Field Camera 3 in 2009. Additionally, deep WFC3 images were taken of the UDF portion of the GOODS-S field. Here, we look at the morphologies of the BzK sample of Daddi et al. 2007 that fall into either of these two regions.

GOODS-Herschel
- The GOODS-Herschel program has obtained deep FIR observations of both GOODS-N and GOODS-S with PACS at 100 and 160 µm. This data set allows us to determine accurate luminosities for over 1000 objects. The luminosity distribution as a function of redshift is shown to the left for both fields. Combined with the BzK objects in both fields, as well as future WFC3 imaging with CANDELS, we will be able to do a detailed morphological analysis for all of these high redshift objects spanning a large range of LIR.

Future Work
- Use multiple classifiers to determine a robust morphological classification for each object
- Compare visual classifications to quantitative measures
- Analyze galaxies with a morphological change from the optical to near-infrared in more detail
- Study the objects that lie above the SFR-M* relation in more detail. Is there something special about these objects?
- Use Herschel data to derive accurate LIR estimates (see LIR vs. a figure for GOODS-Herschel to the left)
- CANDELS WFC3 imaging for rest of BzK sample as well as Herschel selected targets

Morphological analysis for all of these objects will be able to do a detailed morphological analysis for all of these high redshift objects spanning a large range of LIR.