

# Deep Field Observations with the LBC

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Outline:

Classic Legacy Deep Field: GOODS-North

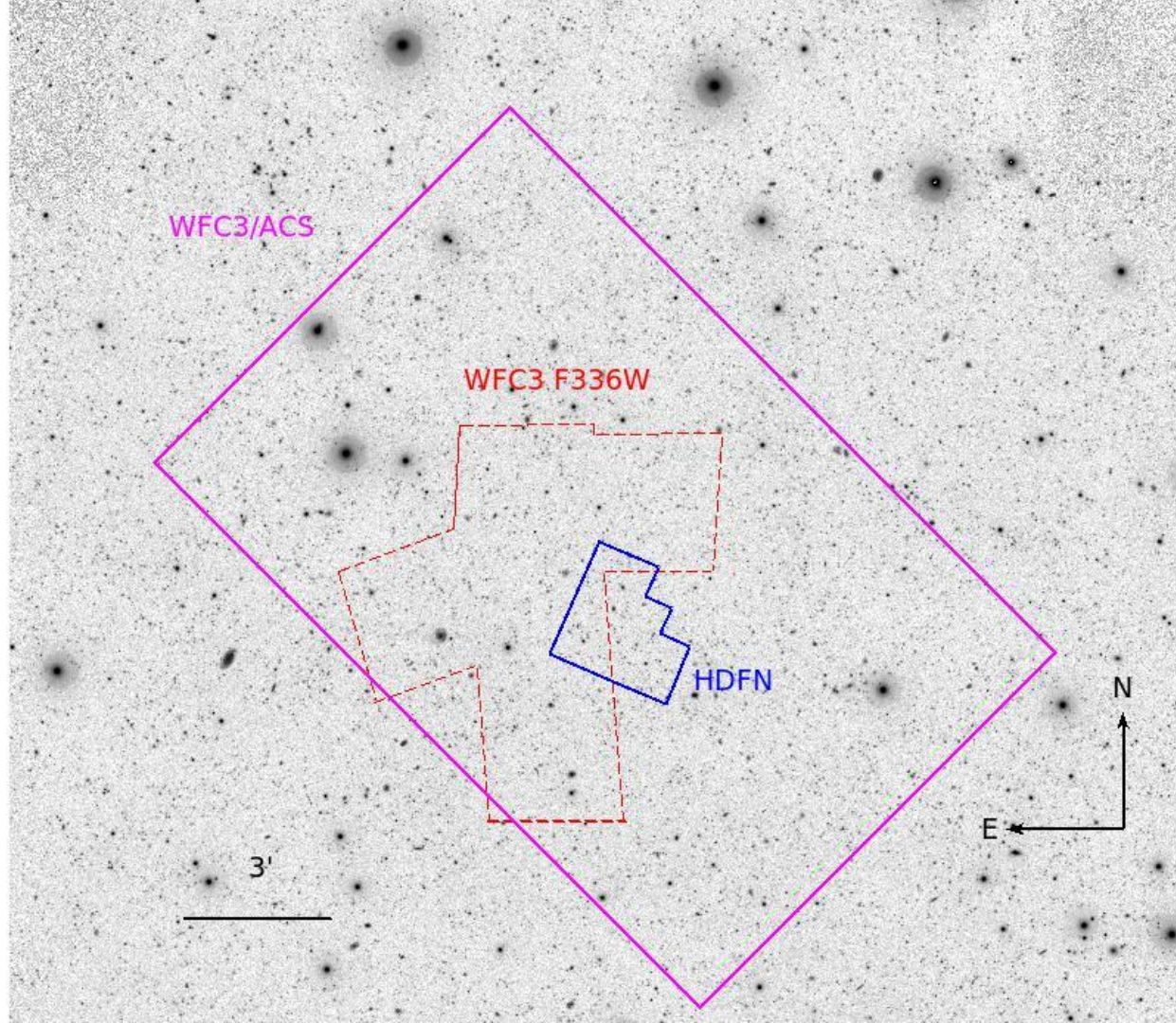
New Legacy Deep Field: JWST North Ecliptic Pole (NEP) Time-Domain Field (TDF)

Collaboration of several member partners (Az, OSURC, INAF) to observe the CANDELS deep fields in the U-band

## GOODS-North Field

- Entire field fits in FOV of LBC
- Over 32 hours of LBCB Uspec time and 335 exposures

# GOODS-North Field

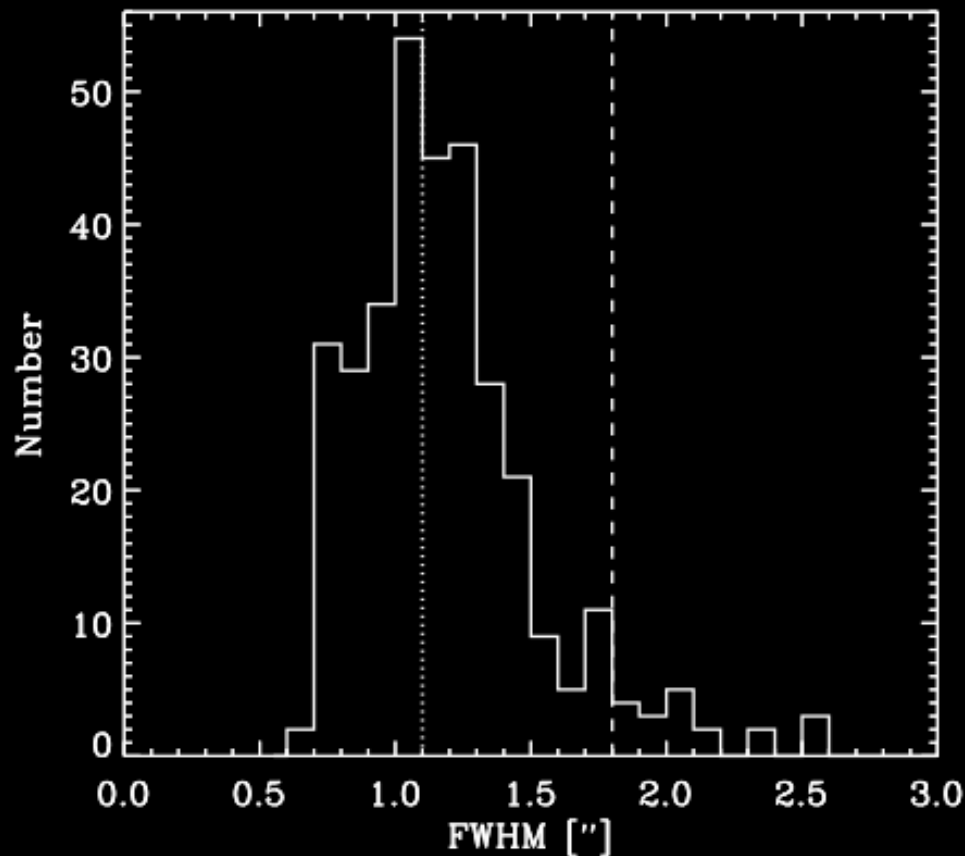


## Histogram of FWHM for each image

Dashed line is the cut-off for  
usable images  $1.8''$   
(optimized depth)

Dotted line is the median  
FWHM of  $1.1''$

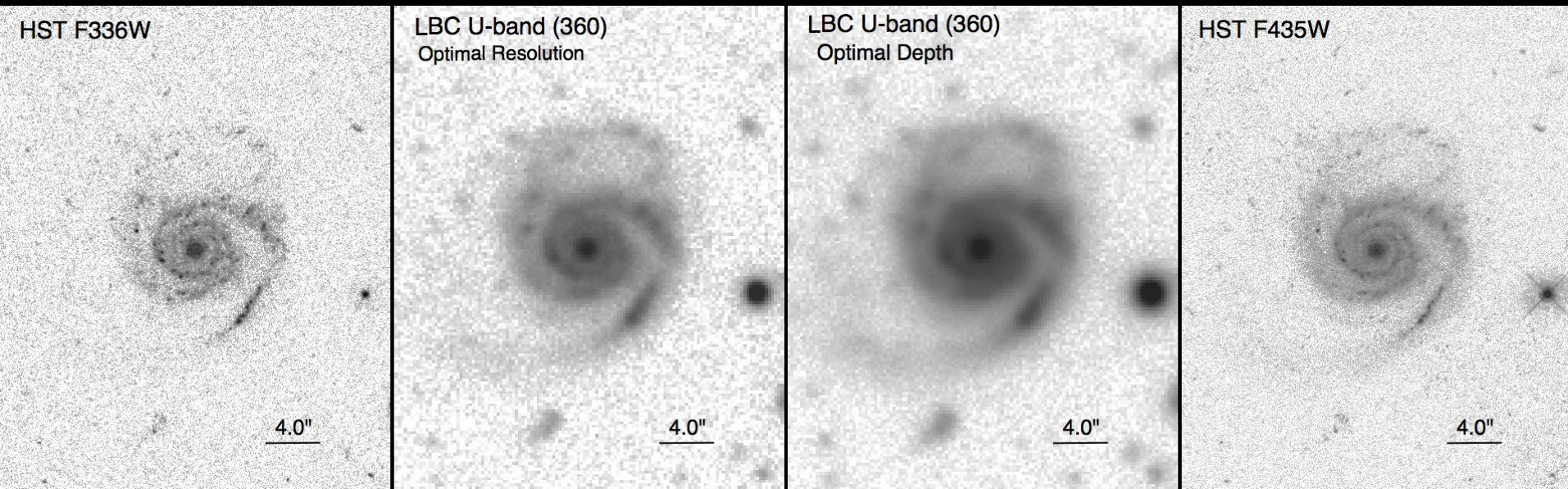
Optimized Resolution:  $<0.8''$





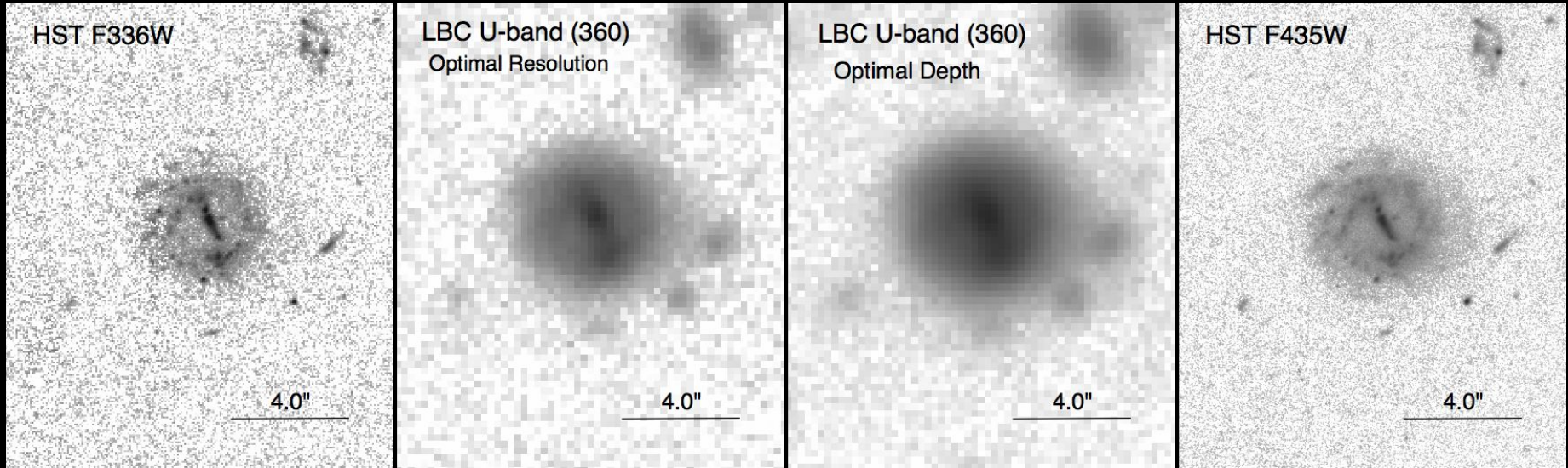
# Comparison of LBC images to HST

$m_{AB} \sim 18.0$  mag



# Comparison of LBC images to HST

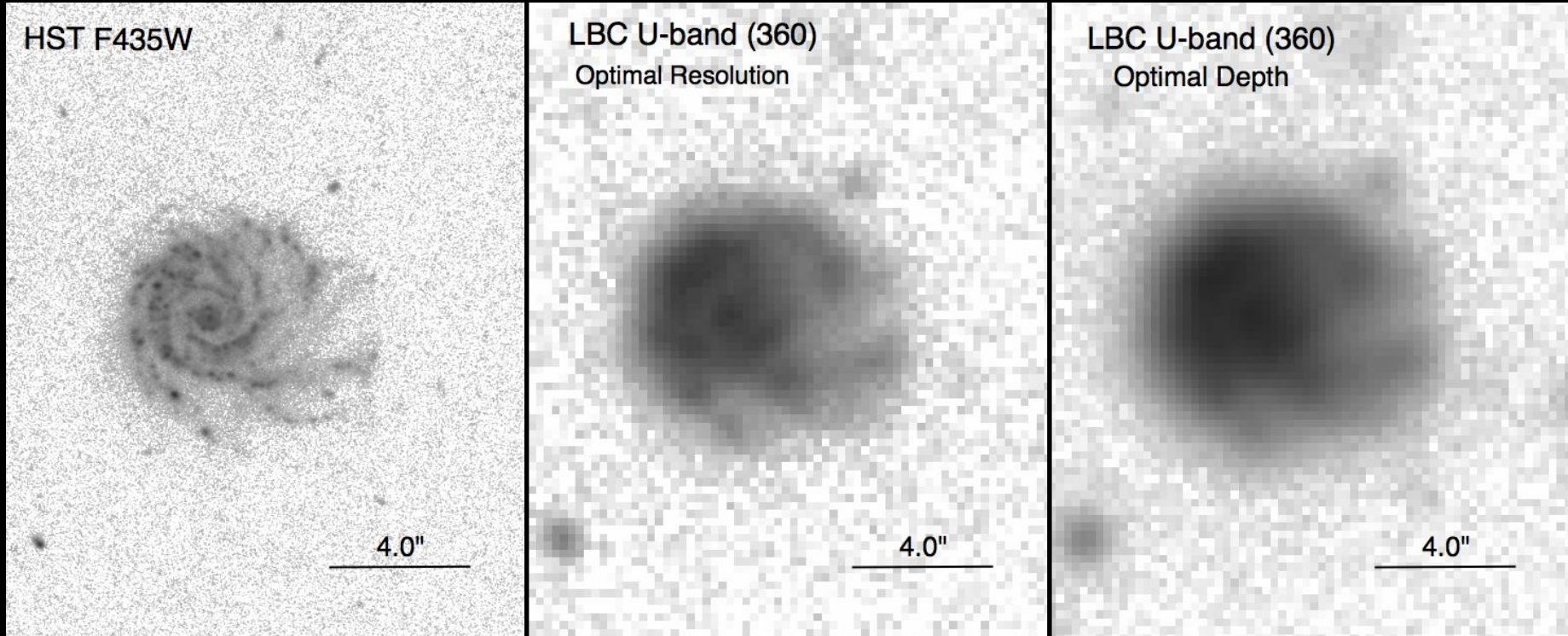
$m_{AB} \sim 20.8$  mag





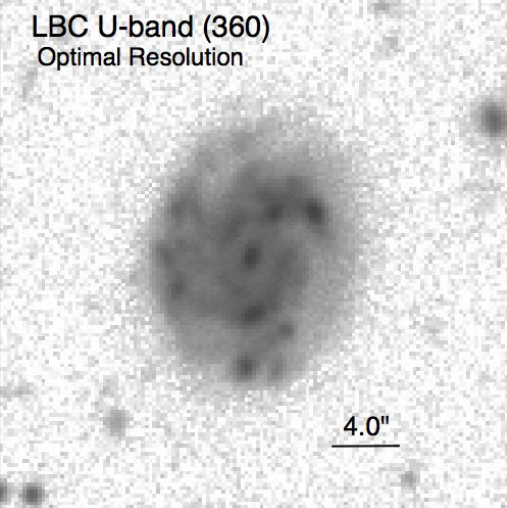
# Comparison of LBC images to HST

$m_{AB} \sim 19.9$  mag

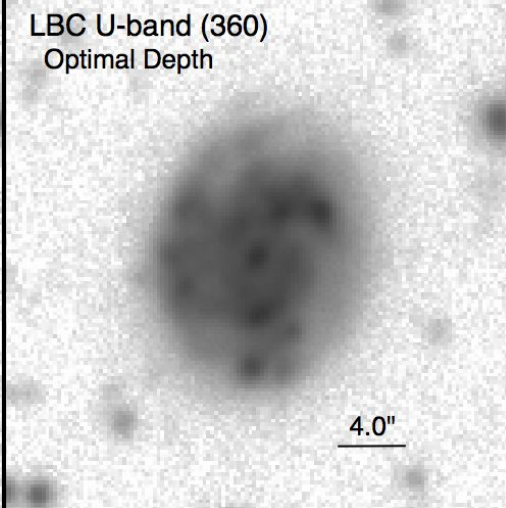




LBC U-band (360)  
Optimal Resolution



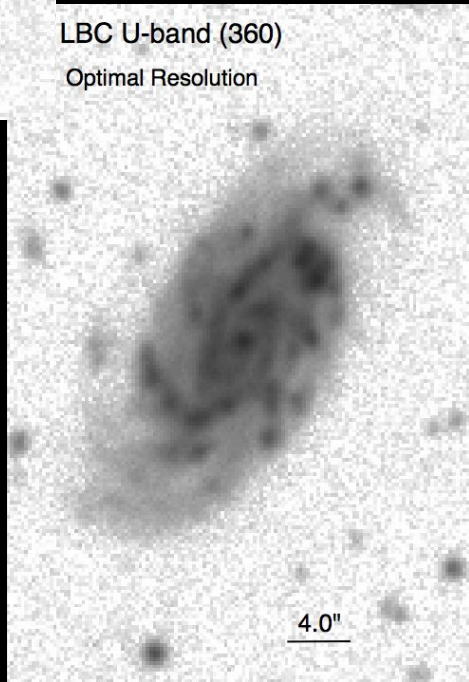
LBC U-band (360)  
Optimal Depth



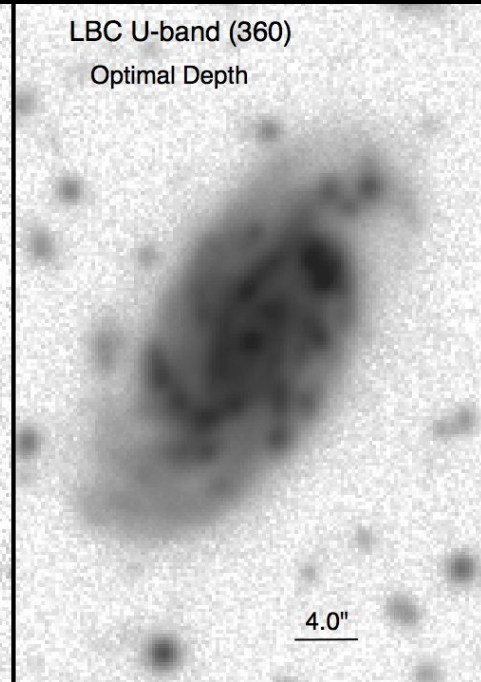
$m_{AB} \sim 18.3 \text{ mag}$

$m_{AB} \sim 19.2 \text{ mag}$

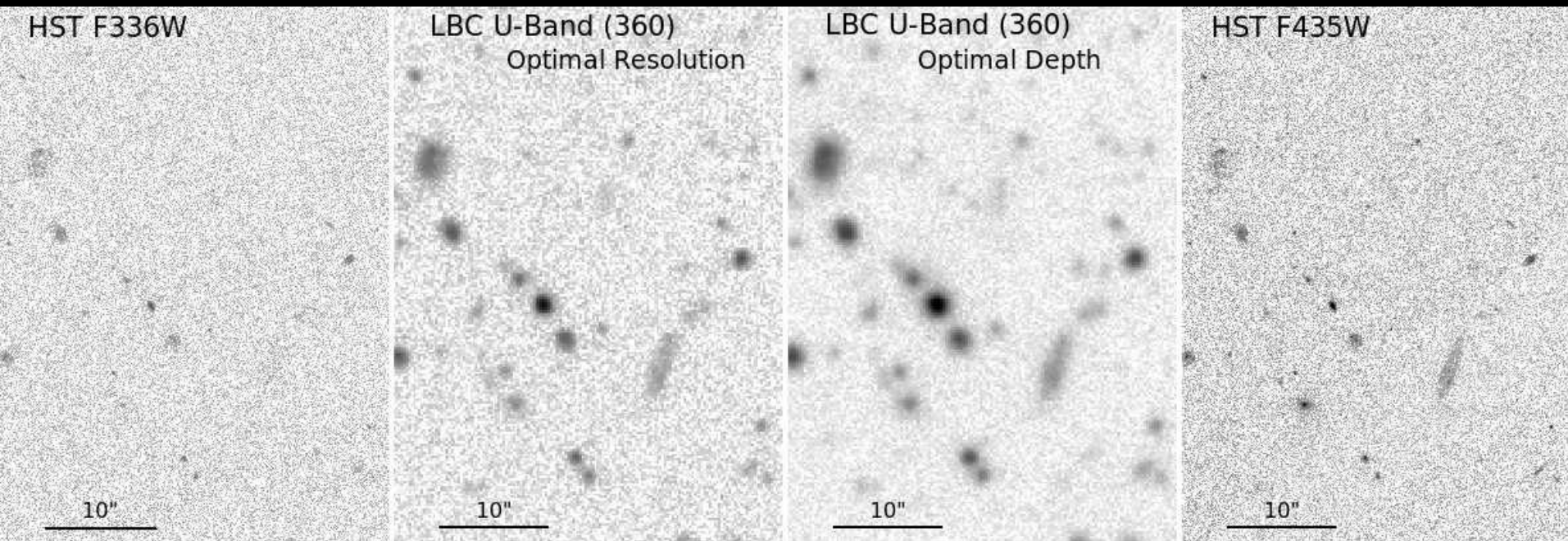
LBC U-band (360)  
Optimal Resolution



LBC U-band (360)  
Optimal Depth



# Comparison of LBC images to HST

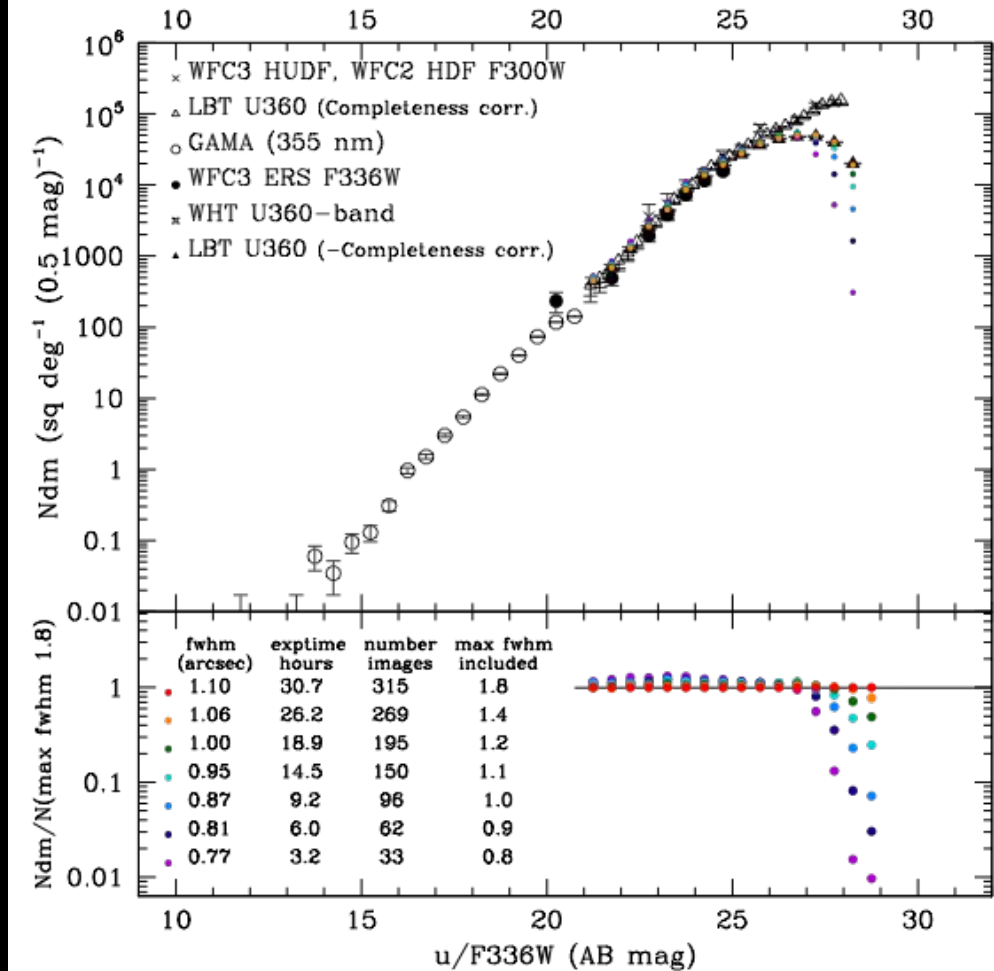


Photometric zero-points were determined by matching our SExtractor catalogs to the KPNO HDF-N U-band catalog.

Over 100 stars were used

Number of Stacked Images	Exposure Time (Hours)	FWHM (arcsec)	Depth ( $m_{AB}$ mag)
33	3.2	0.77	27
62	6	0.81	27.4
96	9.1	0.87	27.6
150	14.2	0.96	27.8
195	18.8	1	28
241	23.2	1.03	28.1
269	26	1.06	28.2
290	28.1	1.08	28.2
315	30.4	1.1	28.3

# Differential number counts for different mosaics compared to other U-band surveys



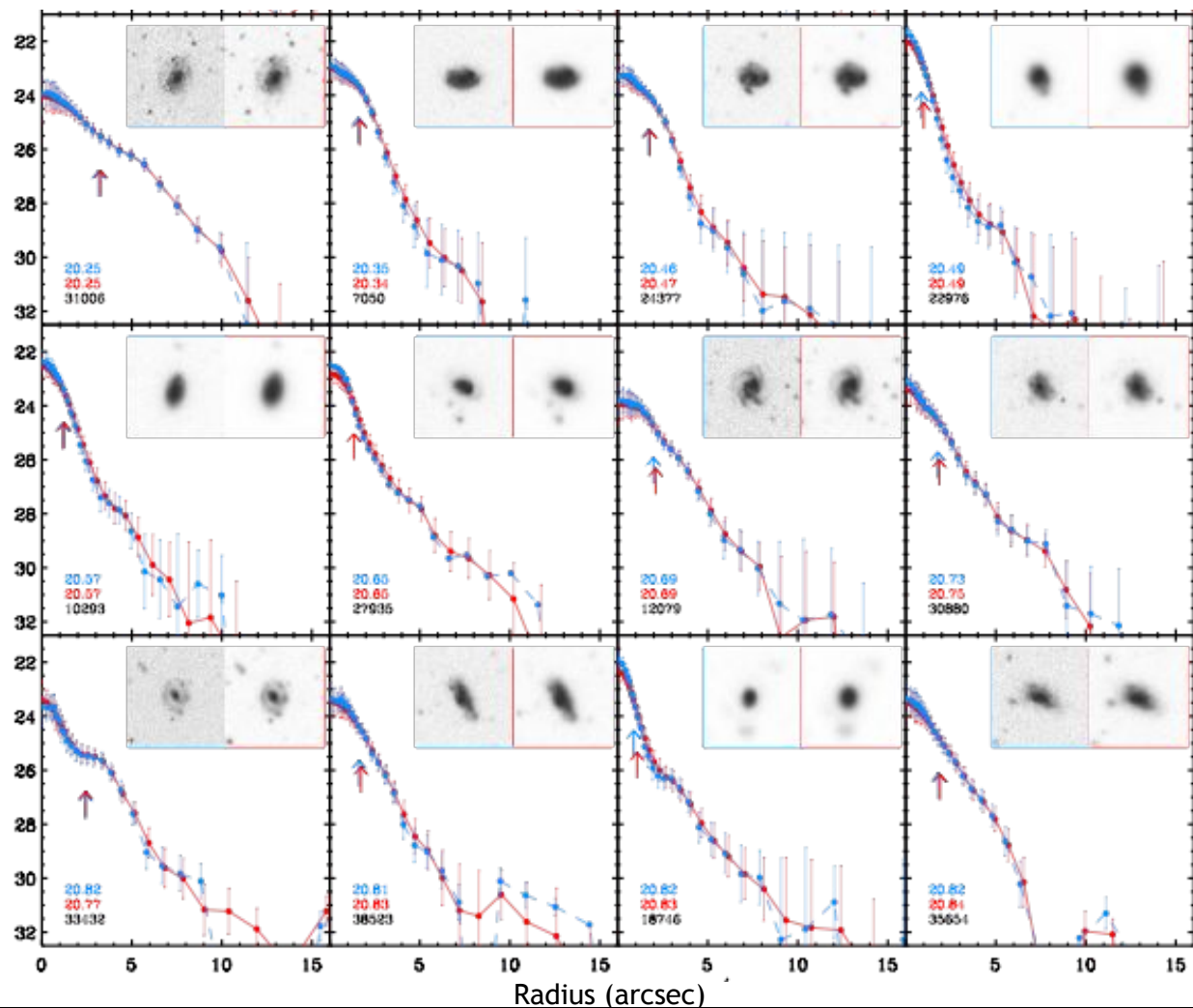


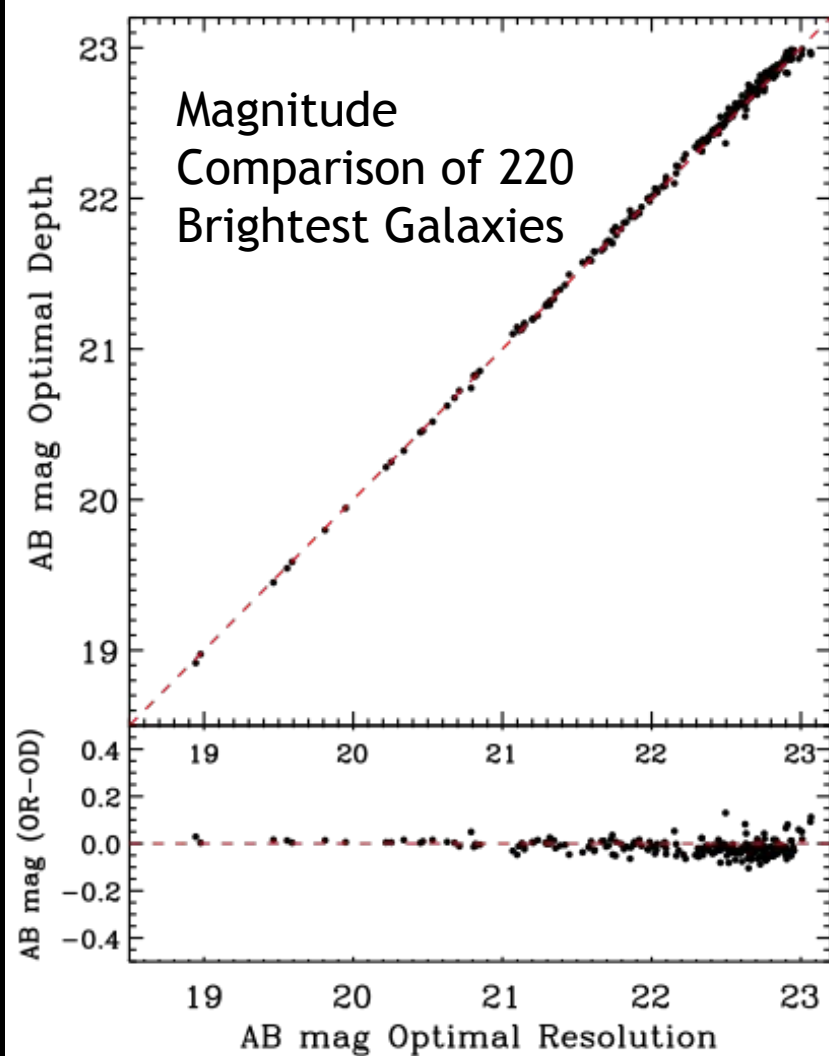
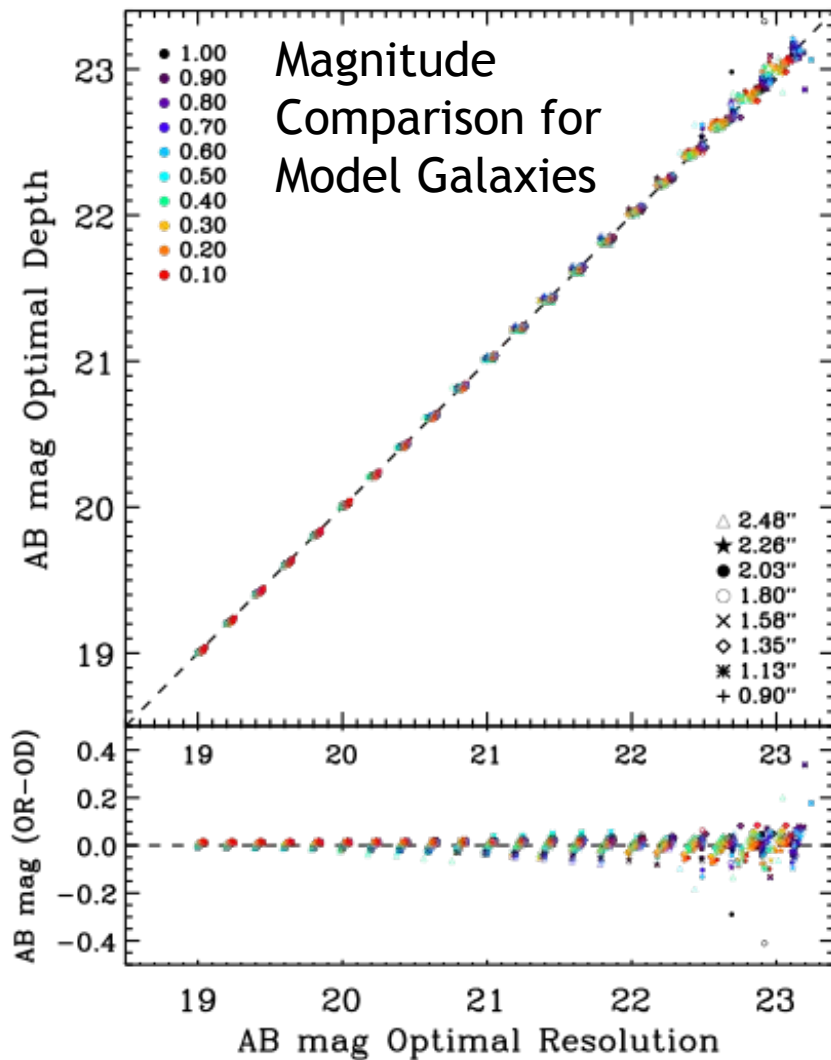
Surface Brightness  
Profiles measured for  
the 220 brightest  
galaxies in field  
 $m_{AB} < 23$  mag

Red: Optimized Depth  
Image

Blue: Optimized  
Resolution Image

Optimized Depth  
image:  $\sim 31 \text{ mag/arcsec}^2$





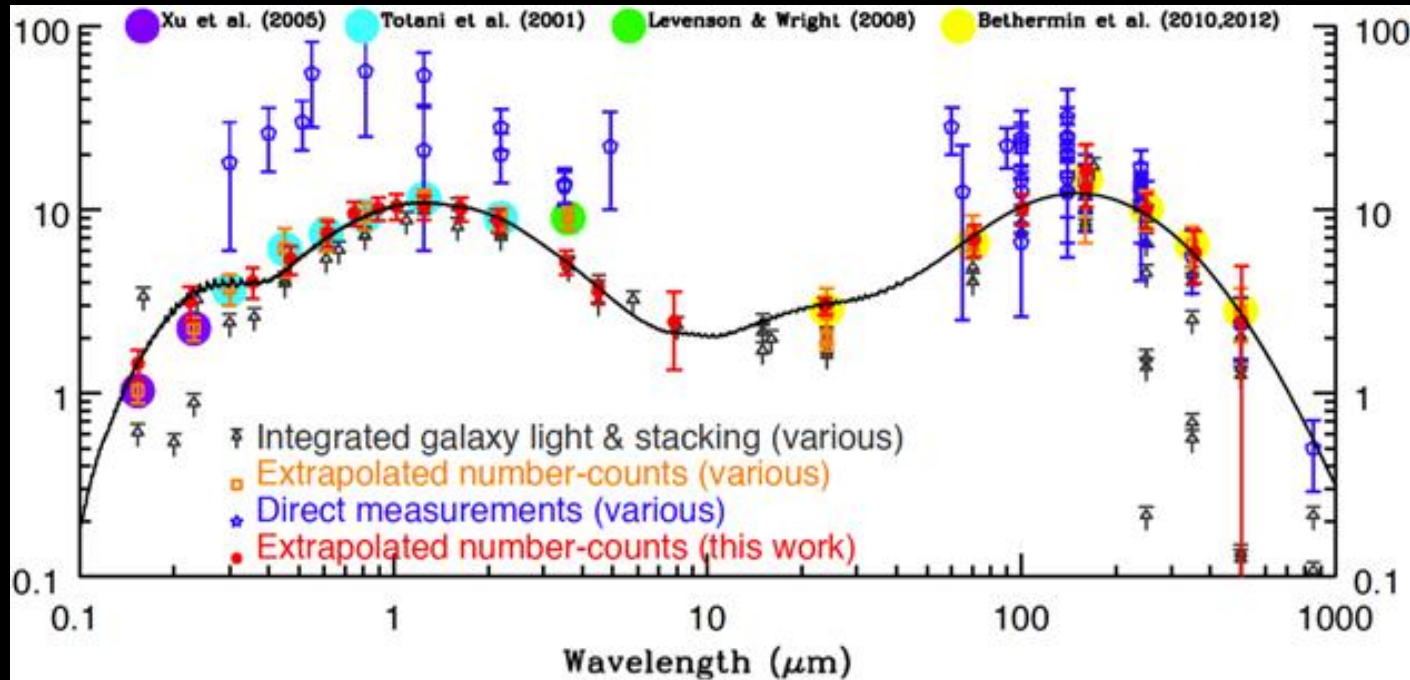
# Implications for Extragalactic Background Light (EBL)

EBL is the integrated flux received today from an area of the extragalactic sky

Two types of detection: direct measurements and integrated galaxy counts

Methods disagree in the UV/Optical with direct measurements being a factor of  $\sim 5$  higher

# Implications for Extragalactic Background Light (EBL)





# Implications for Extragalactic Background Light (EBL)

Could there be diffuse flux in outskirts of galaxies that is being missed in the galaxy counts method?

Not that we found in the U band!

We found no significant extra flux in the outskirts of these 220 galaxies to make up for the EBL measurement differences.

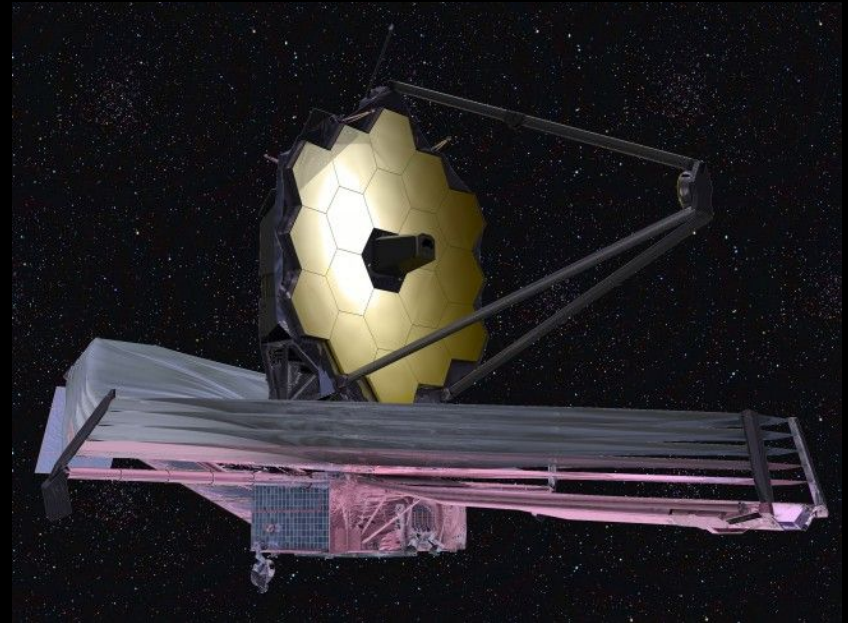
# Conclusions

Comparing to best resolution to best depth light-profiles shows that no more than 10-20% of total galaxy U-band light is missing in outskirts of galaxies down to 31 mag/arcsec<sup>2</sup>.

This is very important for EBL studies: It suggests that the direct EBL measurements may have overestimated the total light in galaxies by a factor of several

... Or the direct measurements are seeing a truly diffuse EBL component, which you would not see, since it could get sky-subtracted out in your images --- but there are other arguments against such a large truly diffuse EBL component (see Driver et. al 2016).

# JWST North Ecliptic Pole (NEP) Time-Domain Field (TDF) in the northern continuous viewing area of James Webb Space Telescope



# LBT NEP Data

- Images were taken in July 6, 2016 in U, Sloan g, Sloan r, Sloan z
- 3 hours total time on sky
- Depth in each filter  $AB < 26$  mag
- Still need Sloan i, and more time in Sloan z

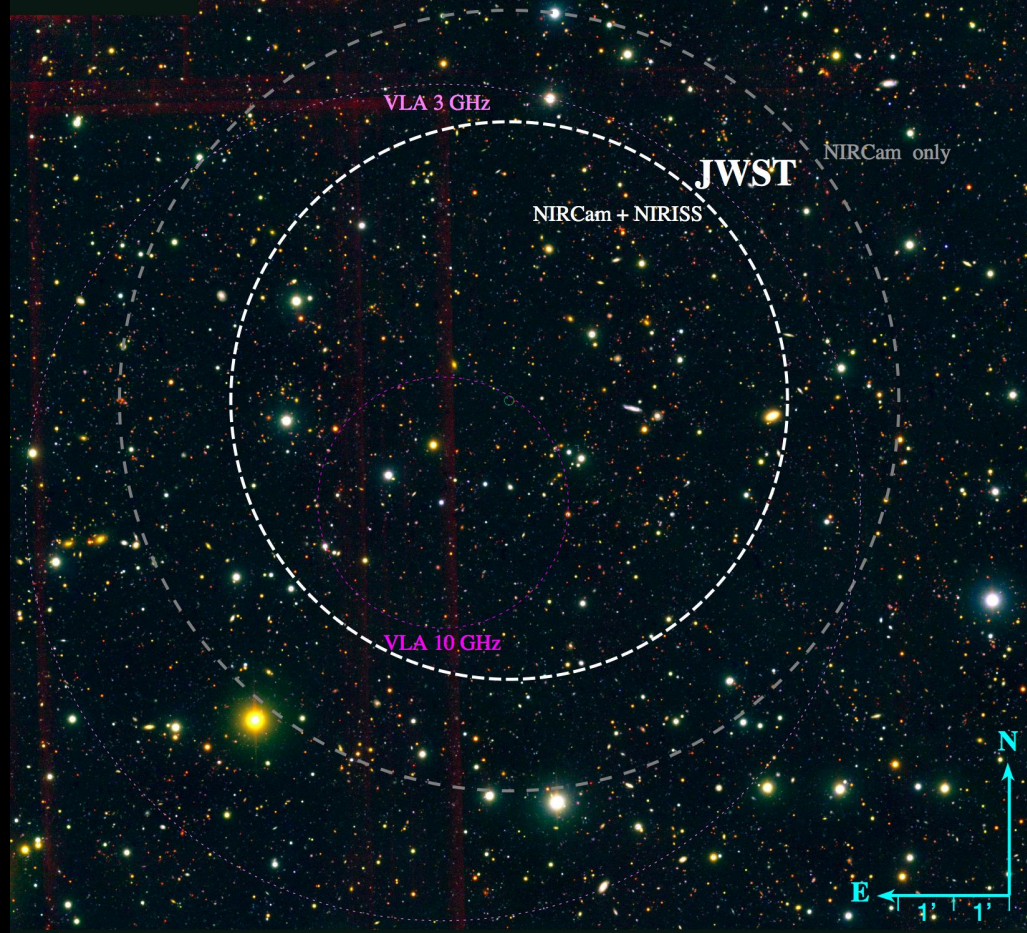


*Sloan z*  
*Sloan r*  
*U + Sloan g*

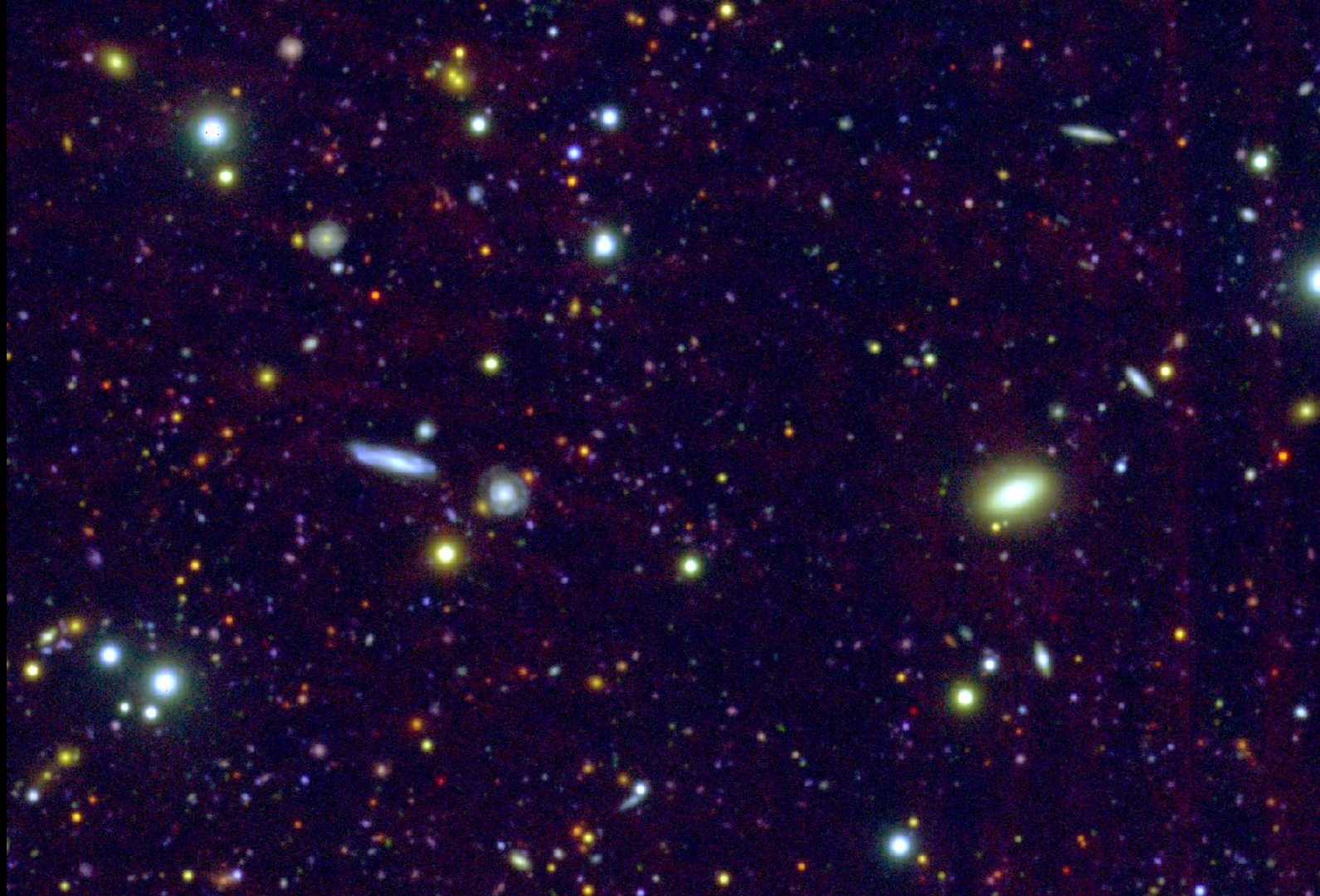
JWST/VLA NEP survey field

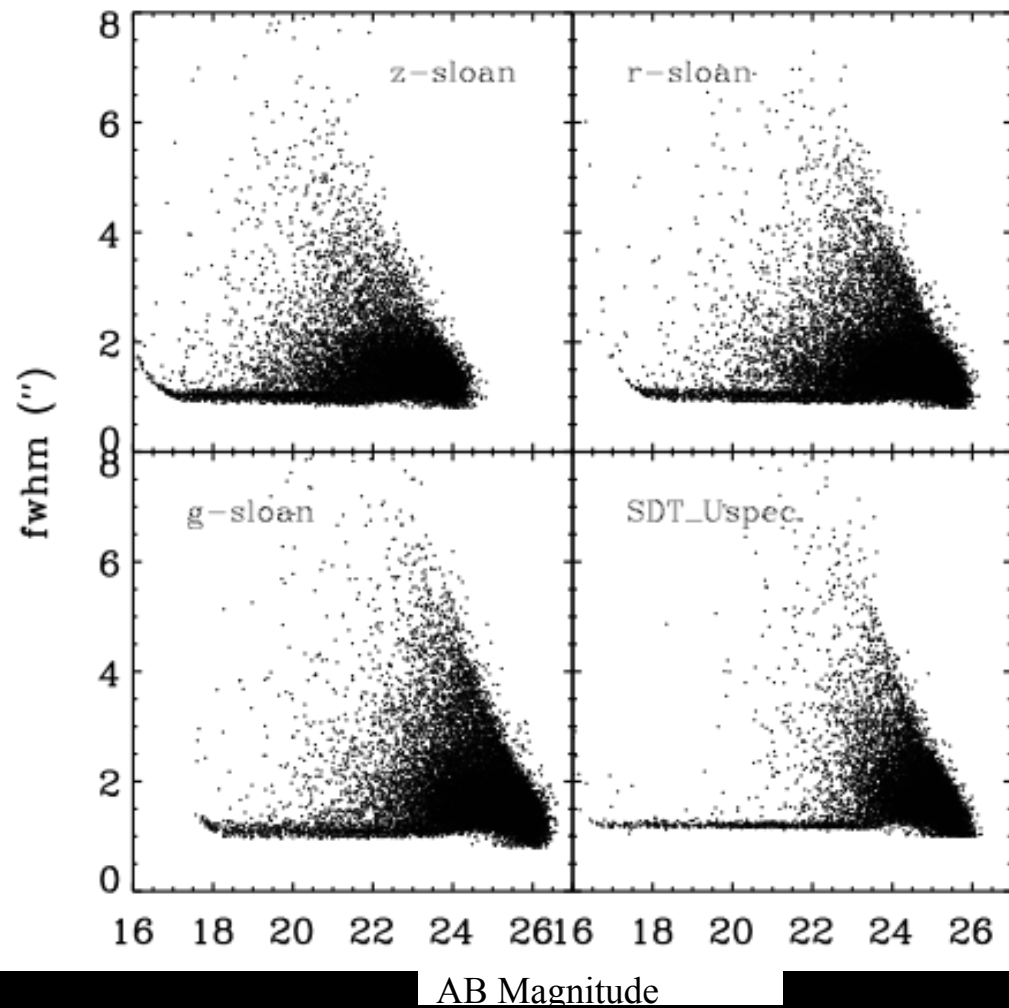
LBT/LBC, Jul 6 2016

Jansen & Ashcraft









# Summary

We present one of the deepest ever ground-based U-band image (GOODS-N field), and surface photometry of well-resolved galaxies to  $\sim 31$  mag/arcsec<sup>2</sup> [Ashcraft et al. 2017, PASP (submitted)].

LBT/LBC can deliver exquisite 0.35--0.95 micron images and source photometry needed to complement deep JWST/NIRCam 0.9--4.8 micron observations.