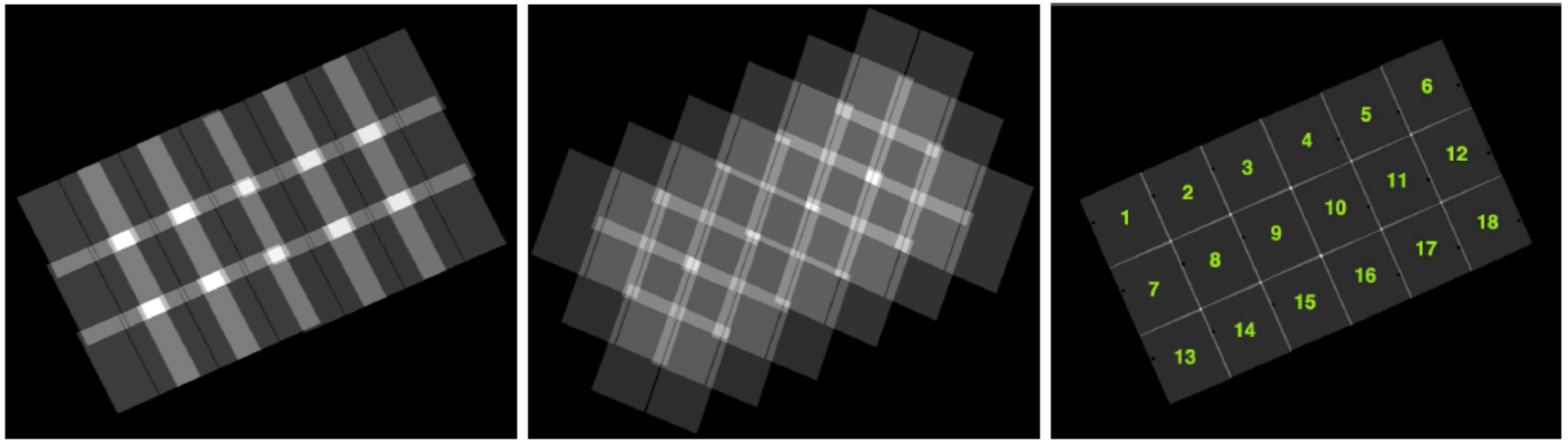
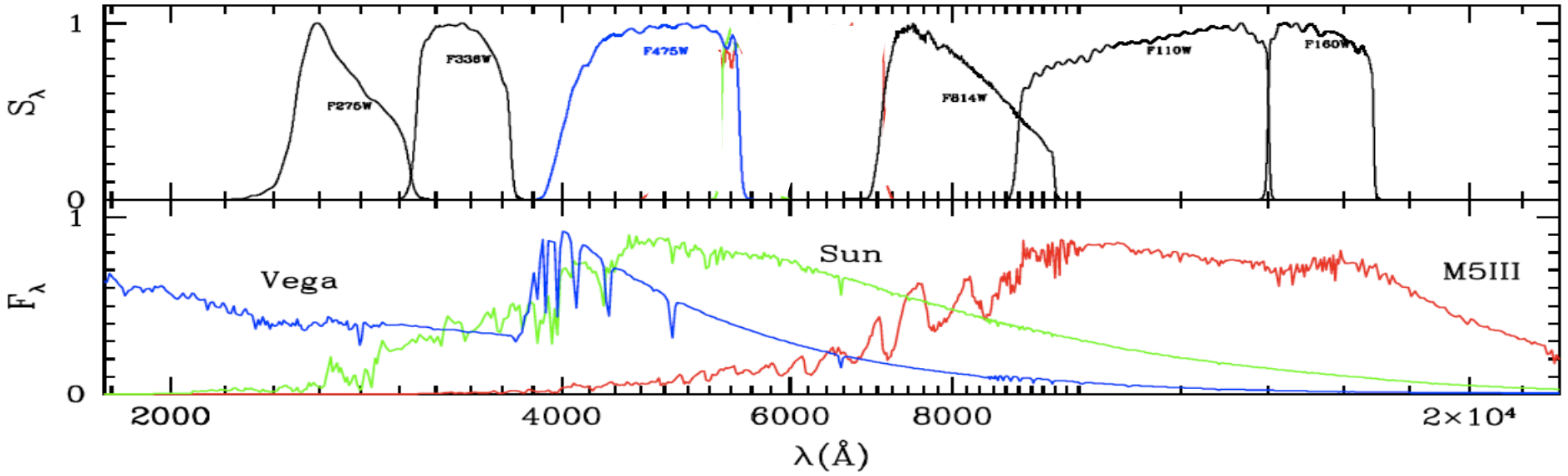
The Panchromatic Hubble Andromeda Treasury

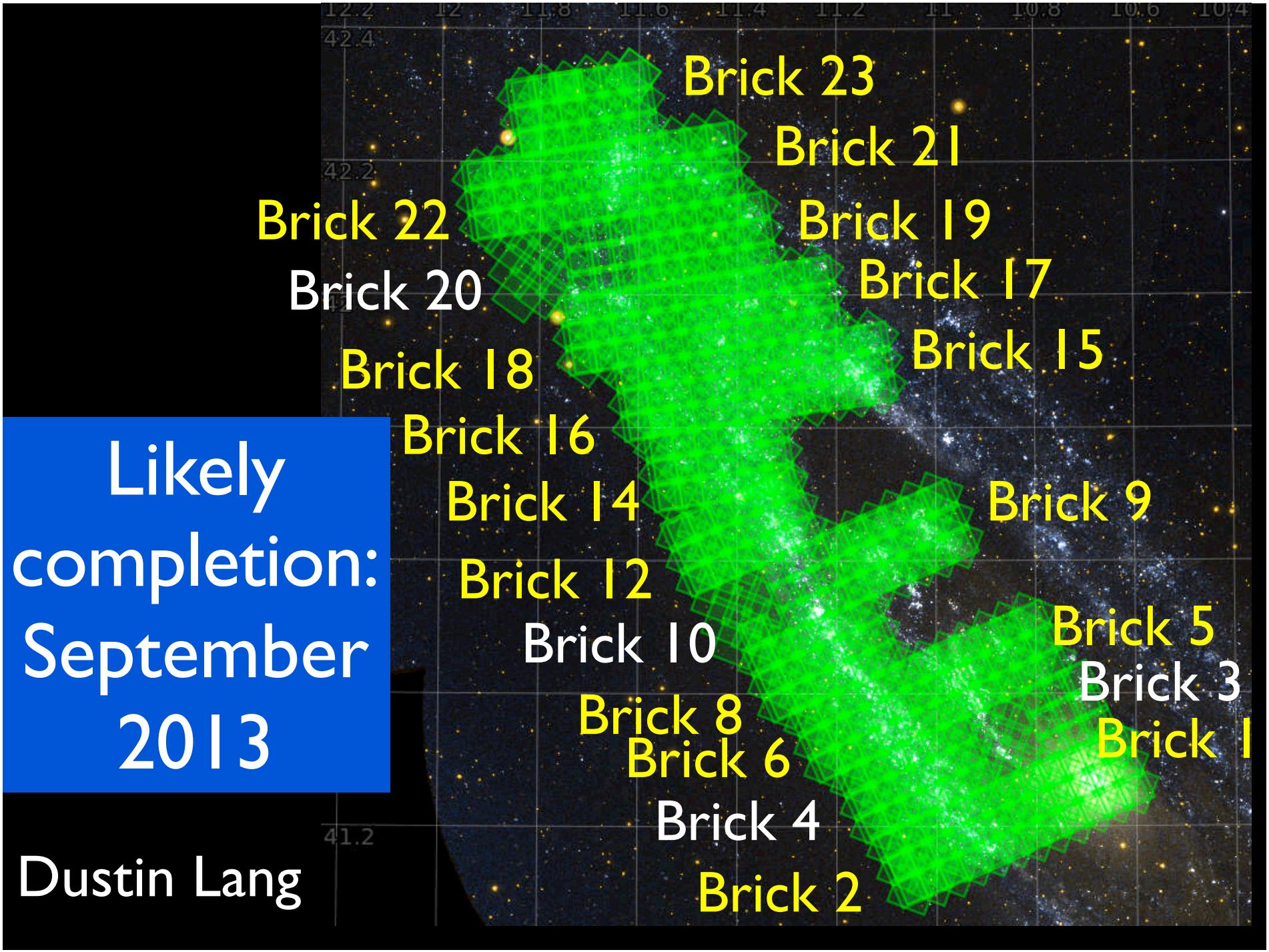
STUC Update November 2012

Observing Strategy



F275W F336W F475W F814W F110W F160W





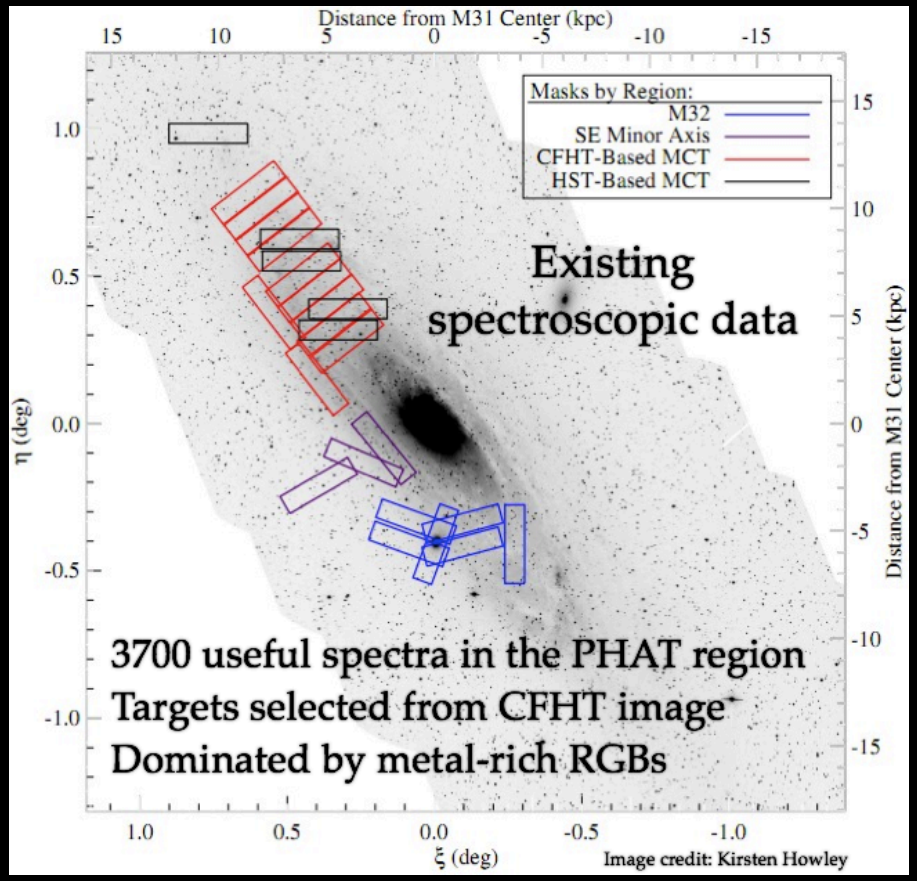
Likely completion: September 2013

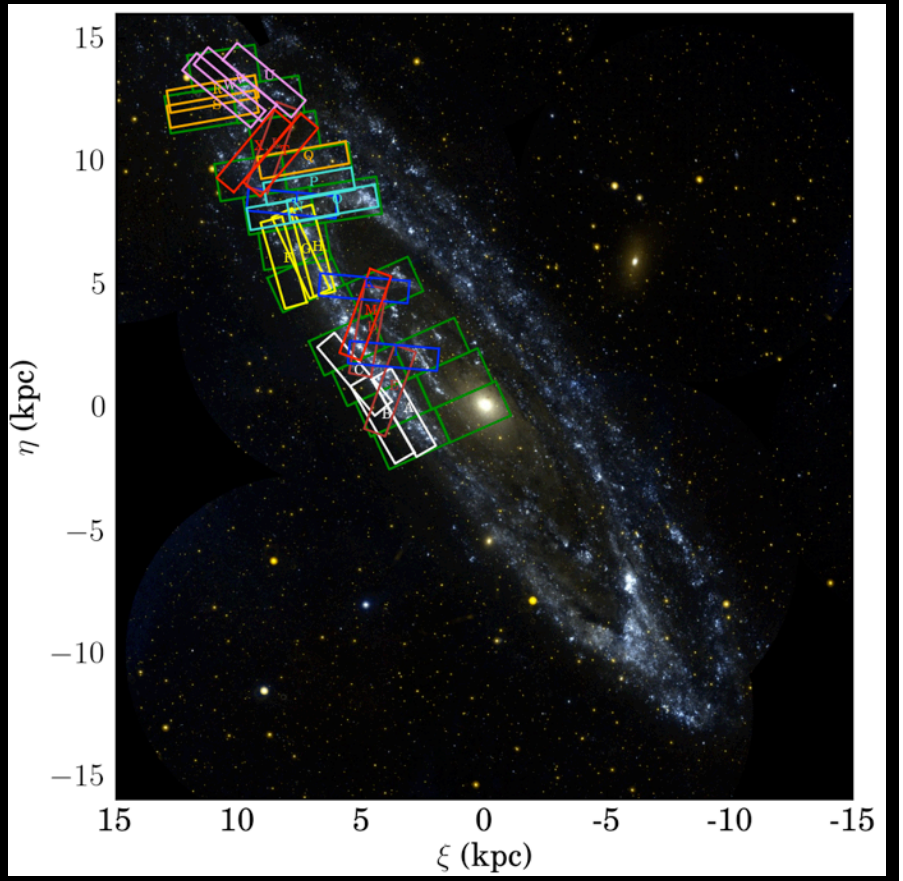
Dustin Lang

Major Spectroscopic Campaigns

- Keck DEIMOS (stellar kinematics & spectral typing: Guhathakurta, Dorman, Kalirai, & Howley)
- MMT Hectospec (clusters, PNe: Caldwell)
- Palomar/MMT (HII regions: Skillman, Berg, Kirby)
- Keck MOSFIRE (metal-rich bulge giants: Kirby)
- LBT MODS (hot stars: Collins, Rix, Weisz)

DEIMOS Campaign

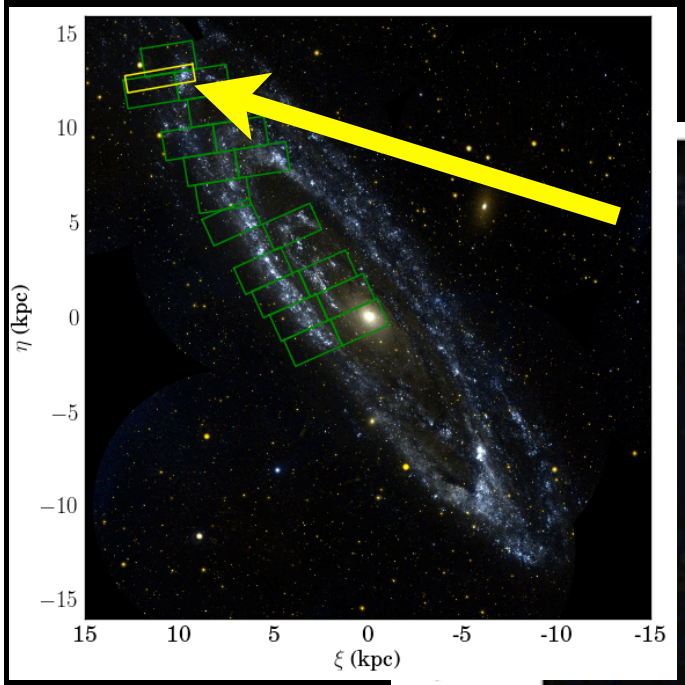


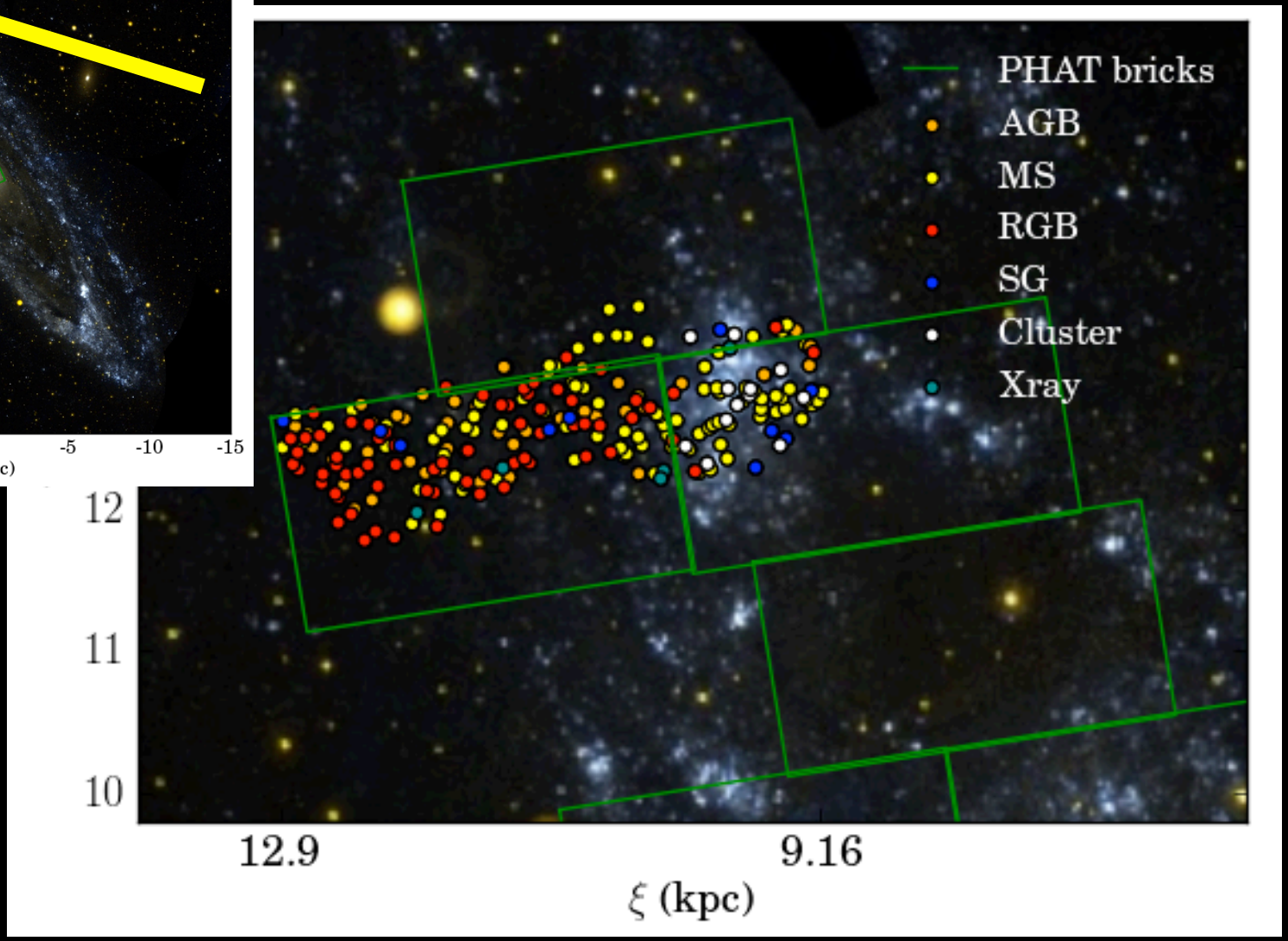


Oct 2010
Selected from CFHT data
RGB dominated

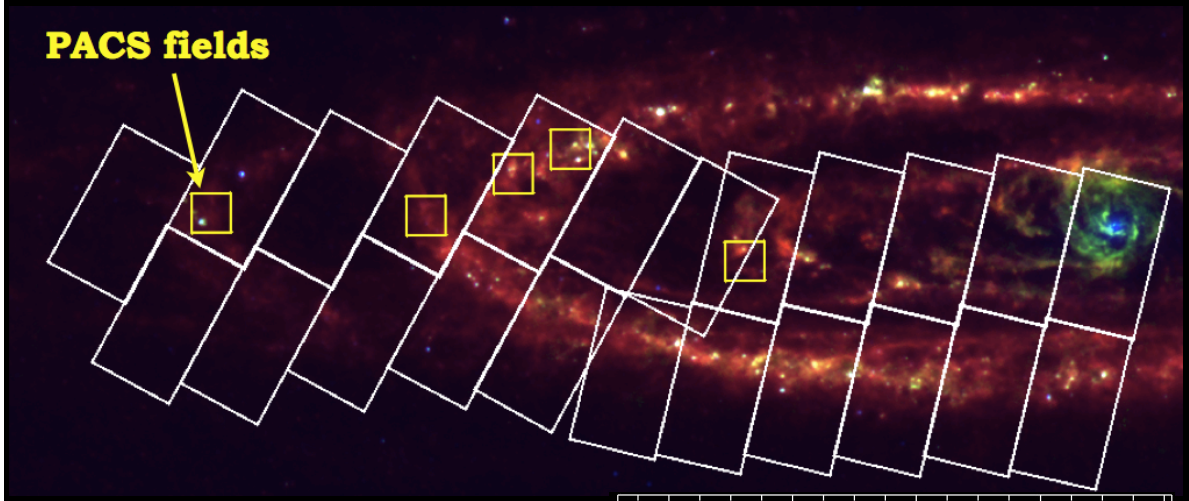
Sept 2012
Selected from HST data
All spectral types

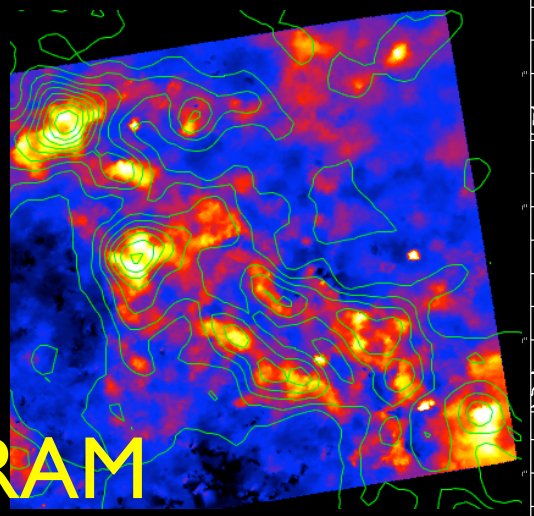
An Example

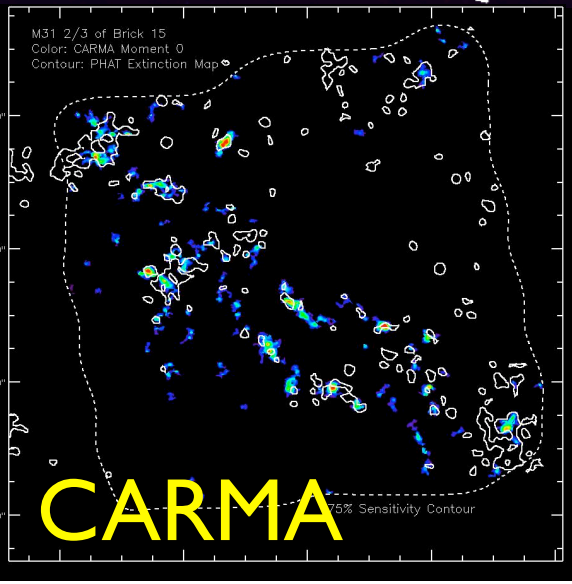

15
10
5
0
−5
−10
−15
η (kpc)
15
10
5
0
-5
-10
-15
ξ (kpc)


PHAT bricks
AGB
MS
RGB
SG
Cluster
Xray
12
11
10
12.9
9.16
ξ (kpc)

Major Multi-Wavelength Campaigns

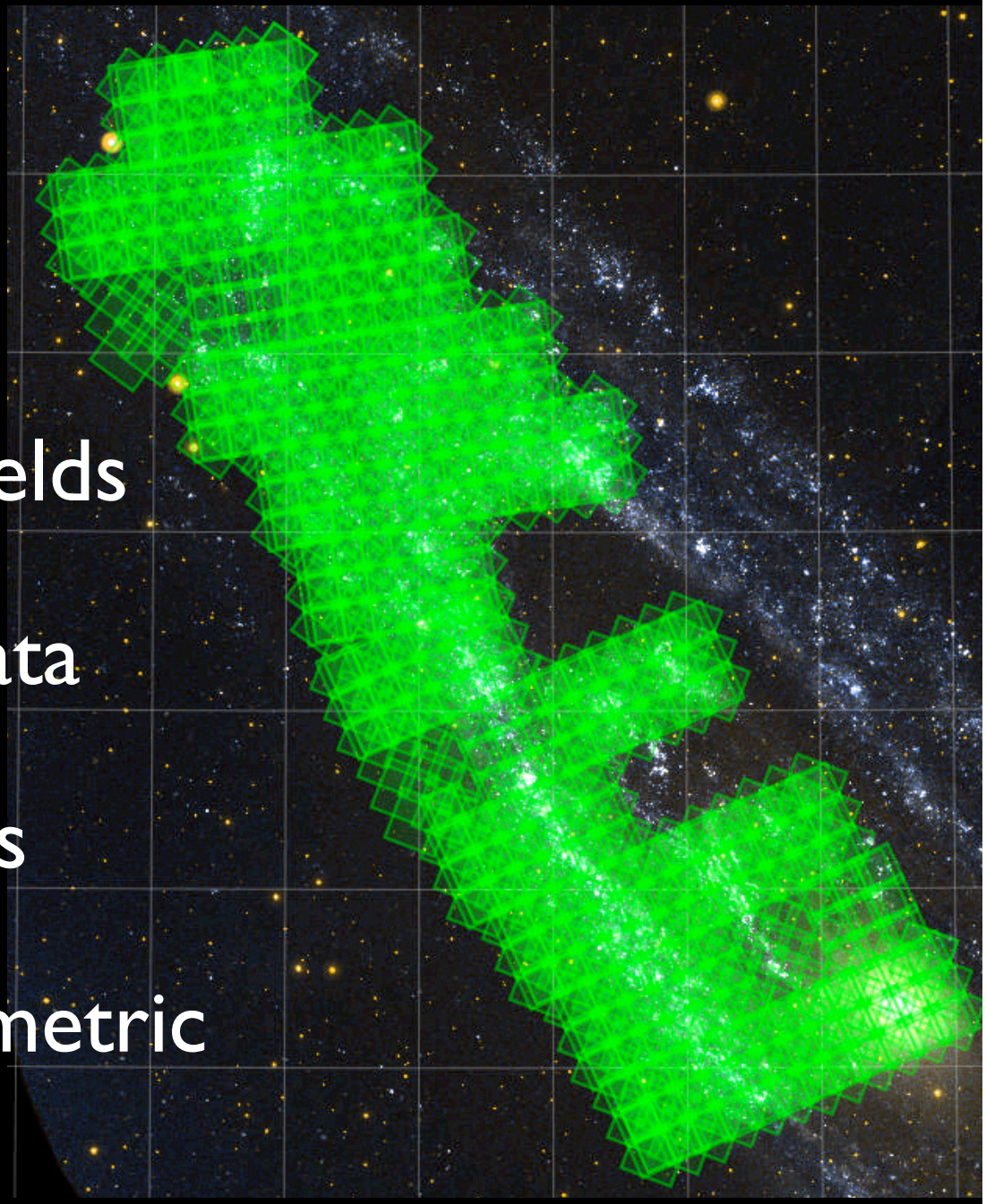






- EVLA (radio continuum & 21 cm: A. Leroy, D. Weisz)
- Herschel (complete imaging + targeted spectroscopy: MPIA, K. Sandstrom)
- CARMA (CO J=0-1: A. Leroy, A. Schruba)

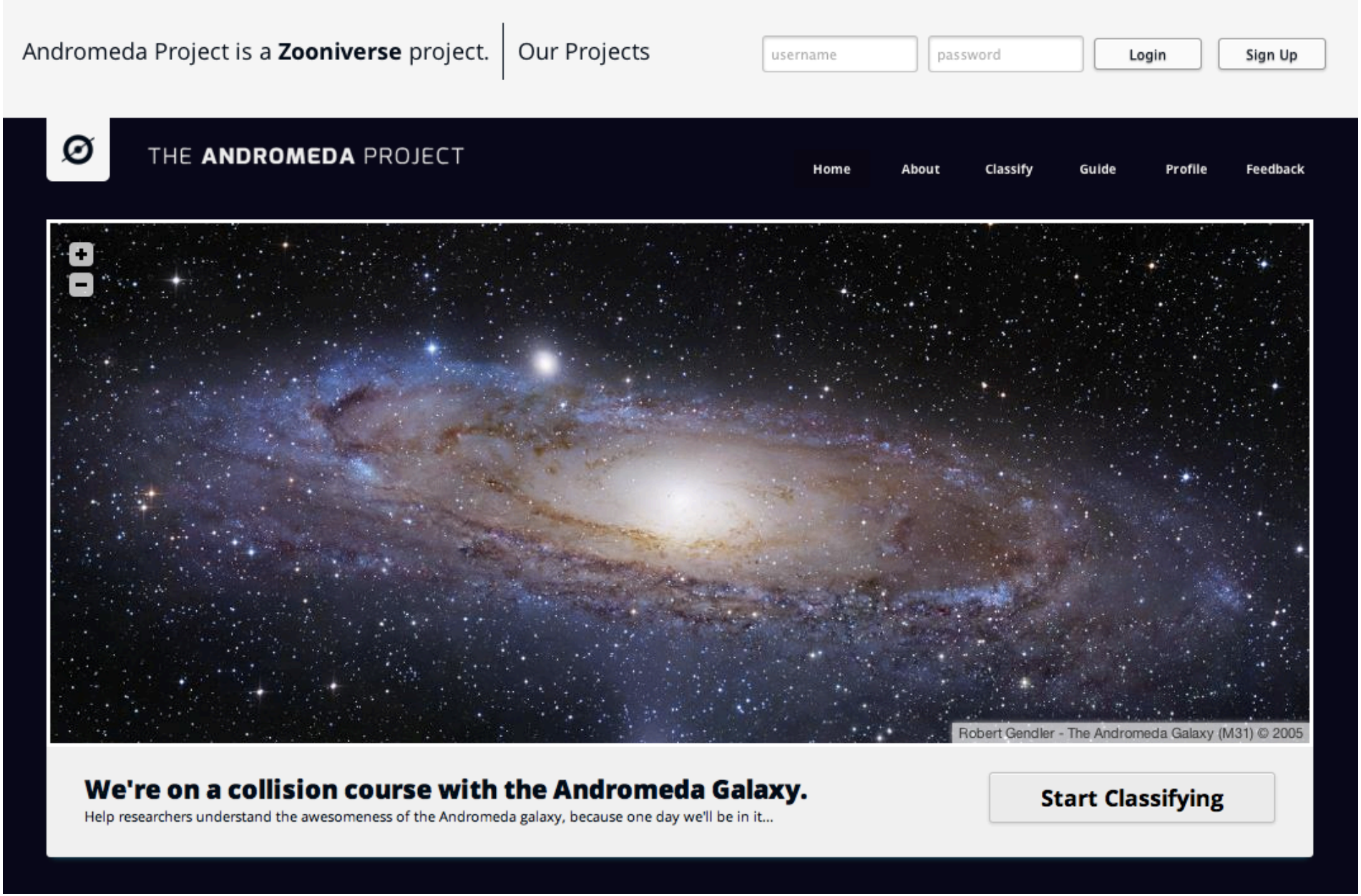
Stats:



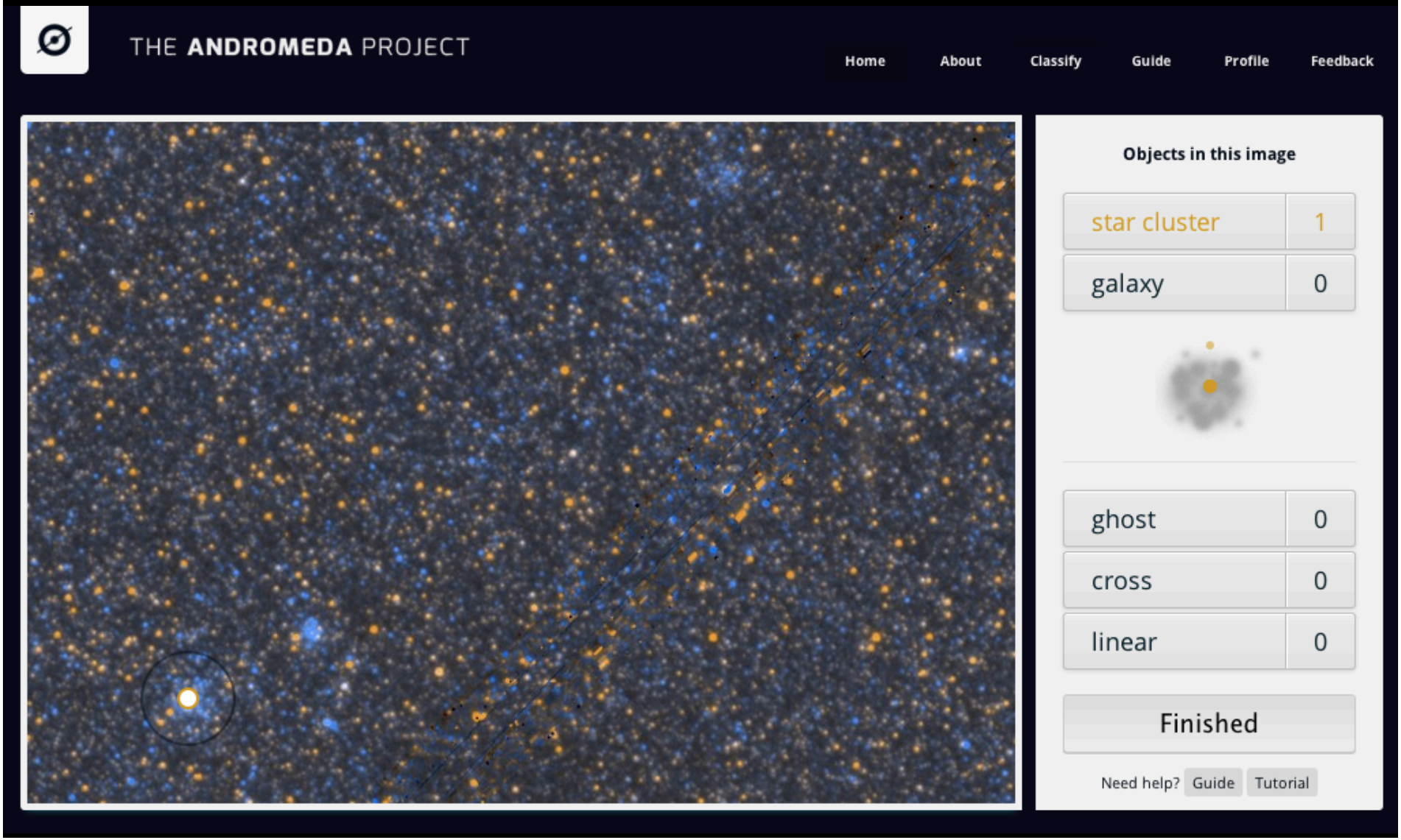
- 336 out of 414 fields
- 850 Gb of raw data
- >100 million stars
- 0.7 billion photometric measurements


Brick 15

Citizen Science



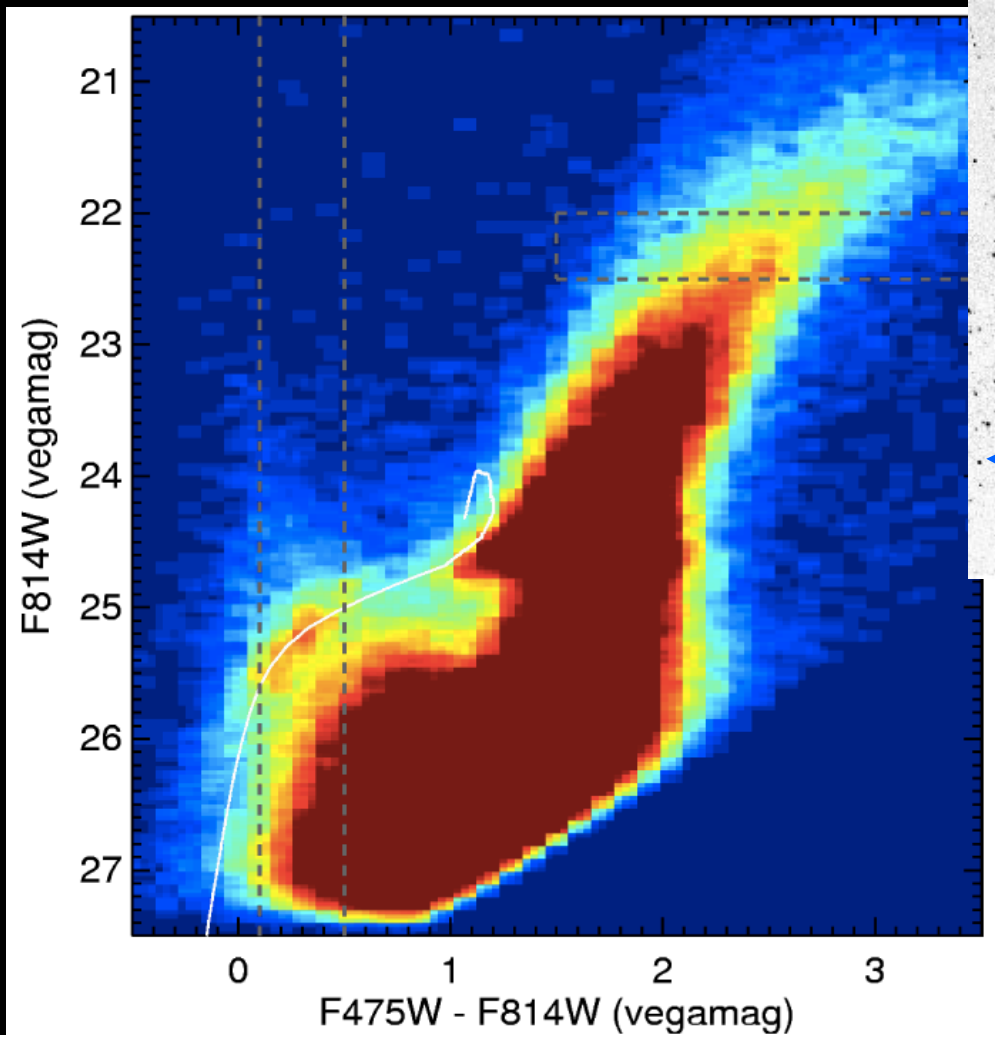
http://www.andromedaproject.org/beta/

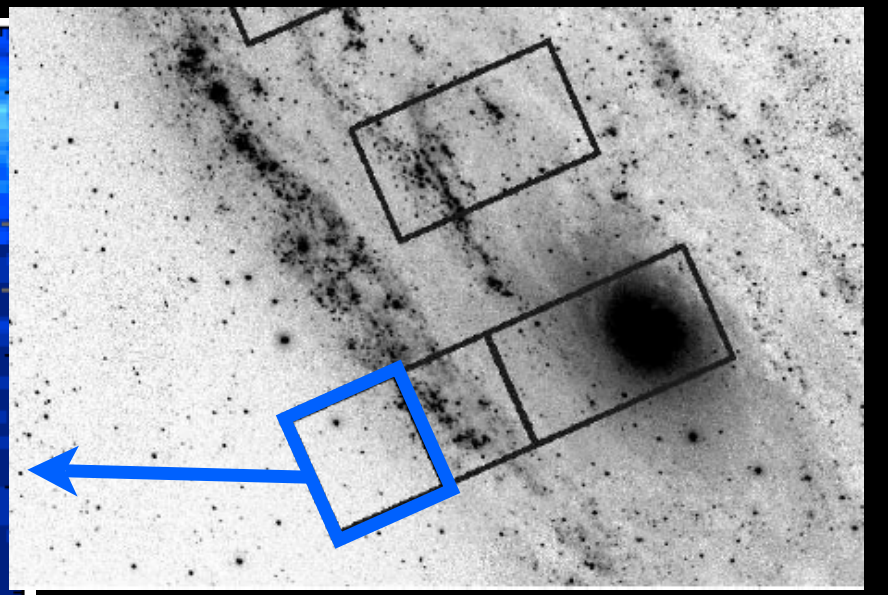


Science Highlights

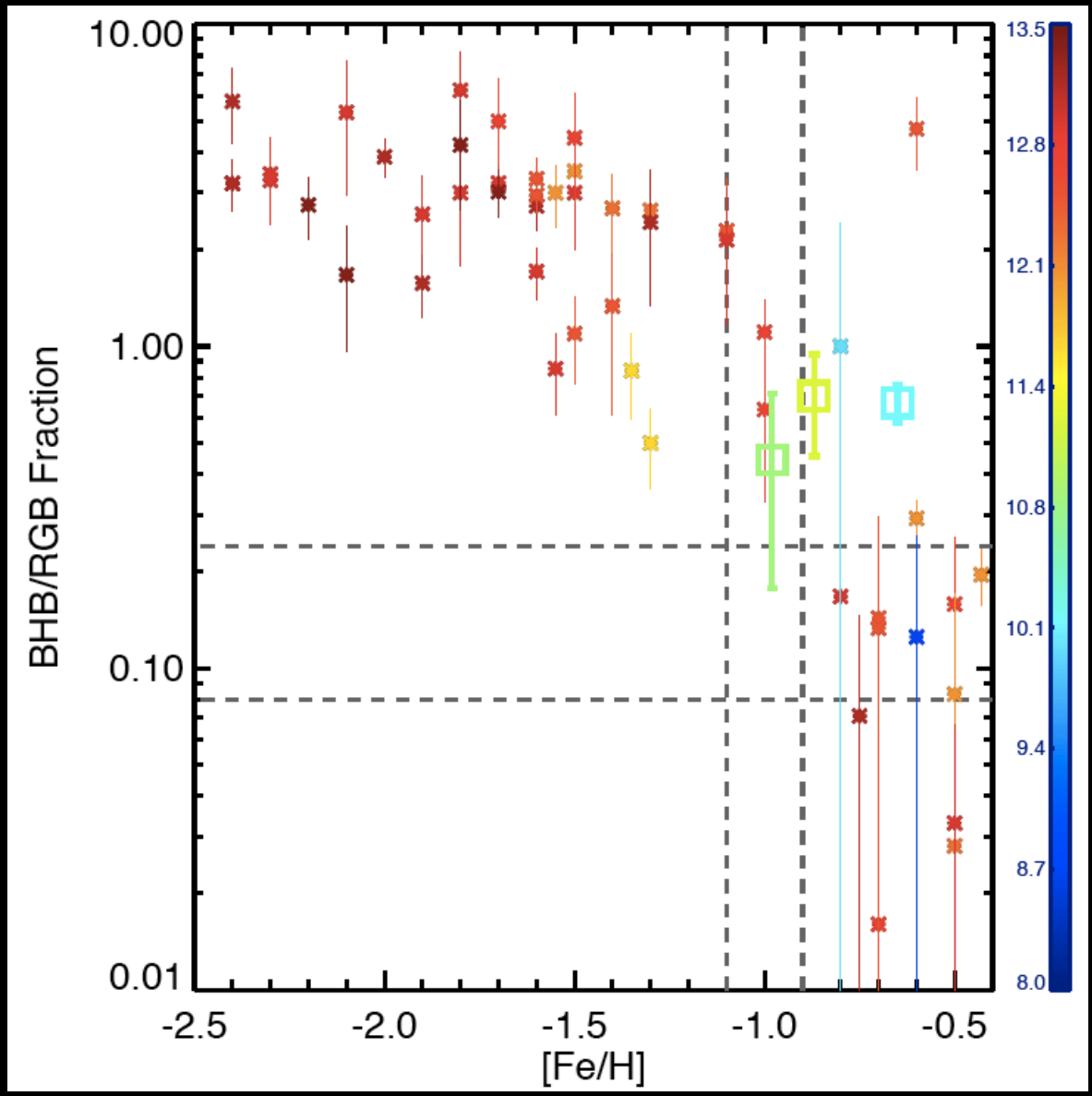
- Survey paper (Dalcanton et al 2012)
- First cluster catalog paper (Johnson et al 2012)
- UV stars in bulge (Rosenfield et al 2012)
- Kinematics of the inner halo (Dorman et al 2012)
- Halo profile traced by blue HB stars (Williams et al 2012)
- Techniques for age dating semi-resolved clusters (Beerman et al 2012)
- Techniques for IMF fitting (Weisz et al 2012)
- SNR progenitor masses (Jennings et al 2012)

Blue Horizontal Branch Stars as a Halo Tracer





BHB are a low metallicity tracer

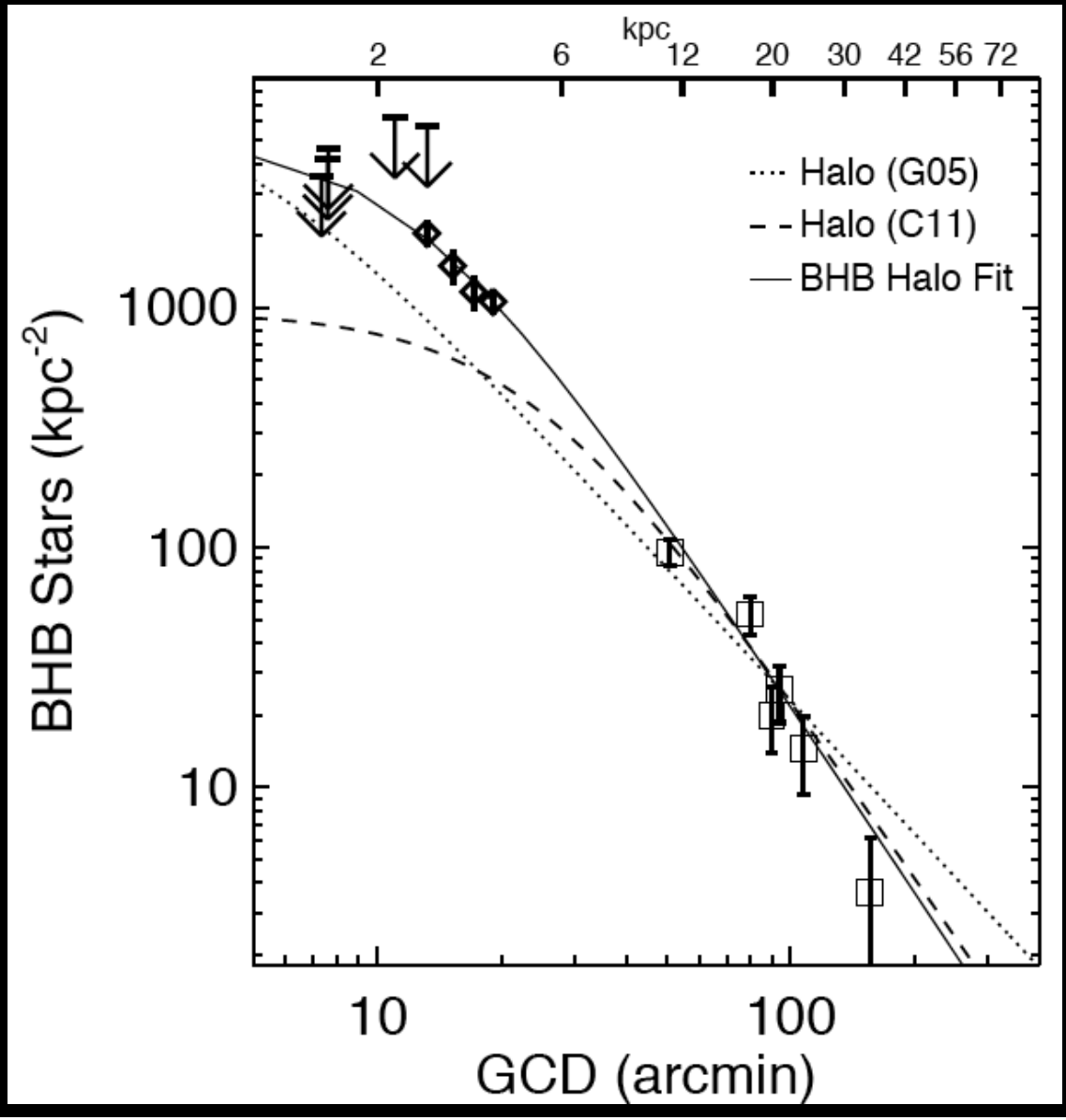


GC's from Dotter et al 2010

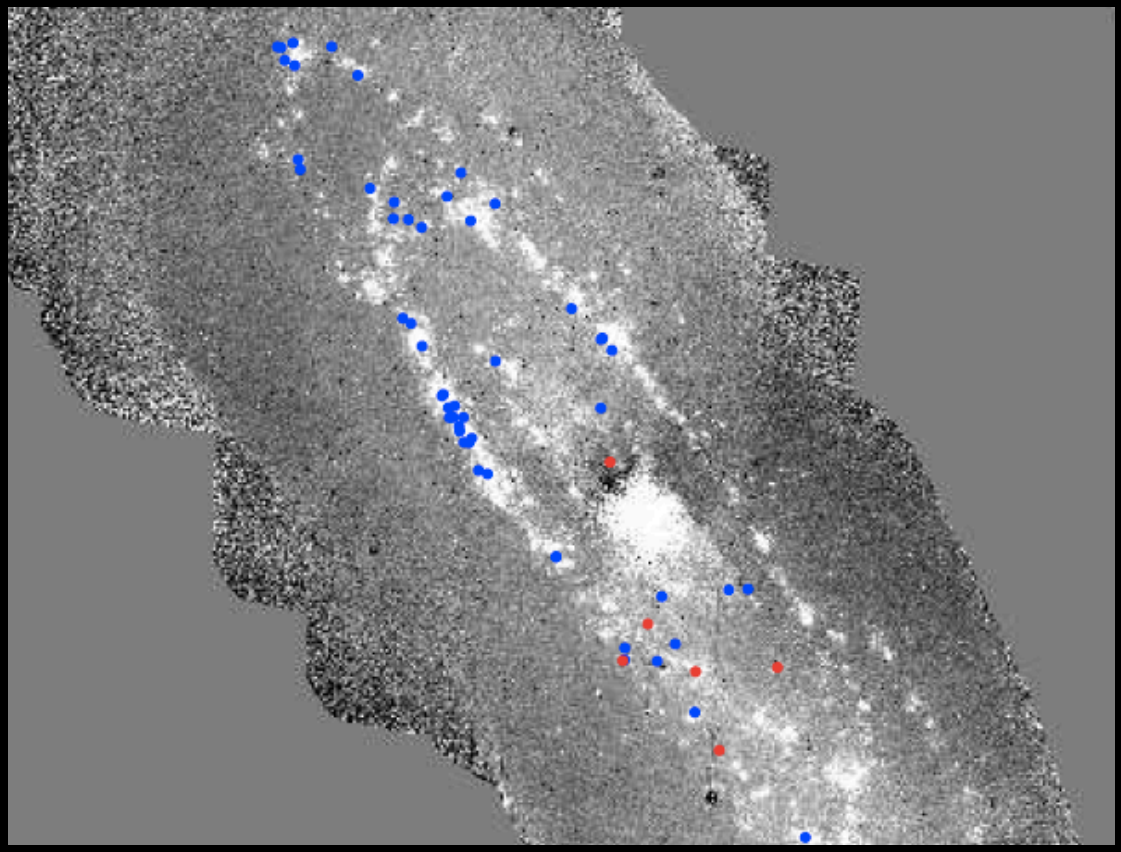
BHB's detected to within 3 kpc of center

Halo Mass:
~2×10^9 $M_\odot$

Requires profile break

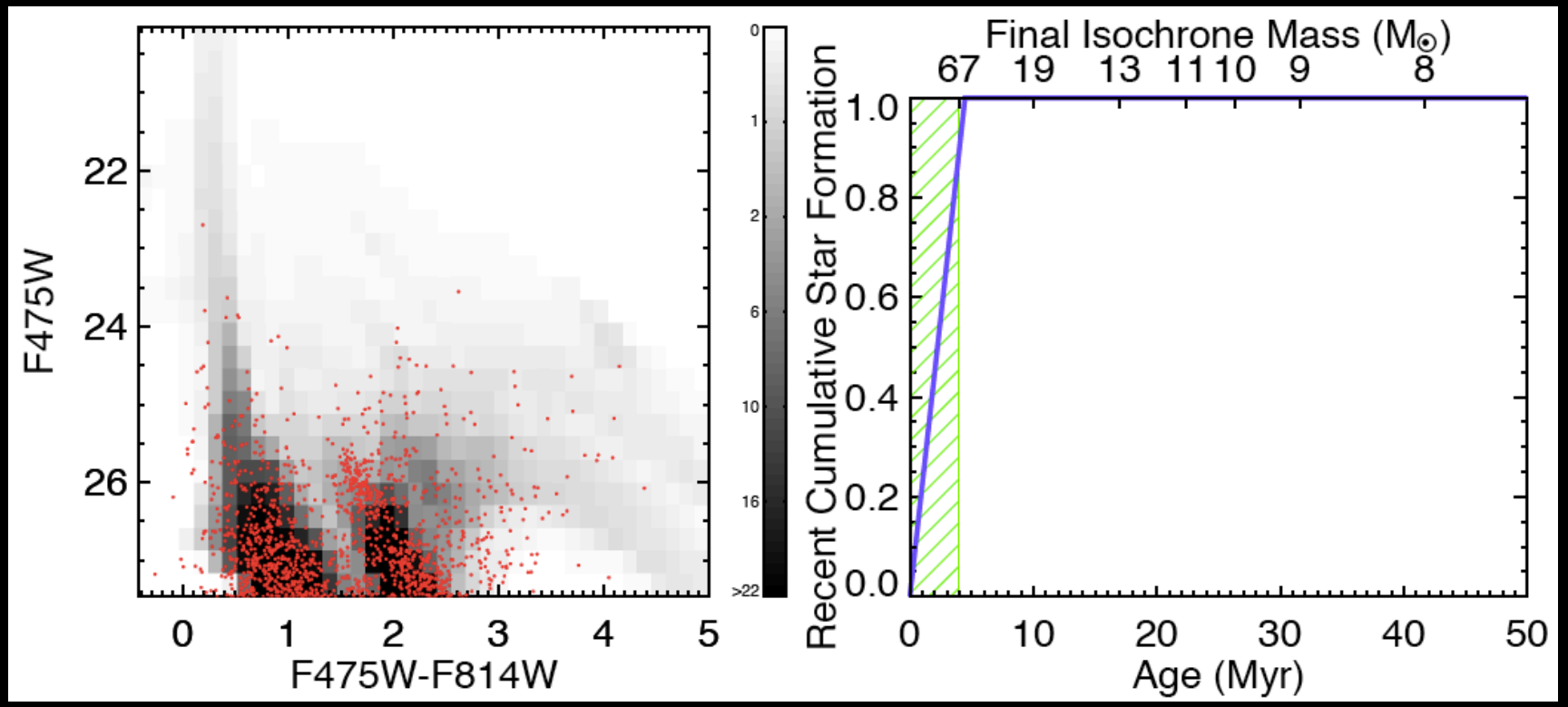


Masses of SNR progenitors



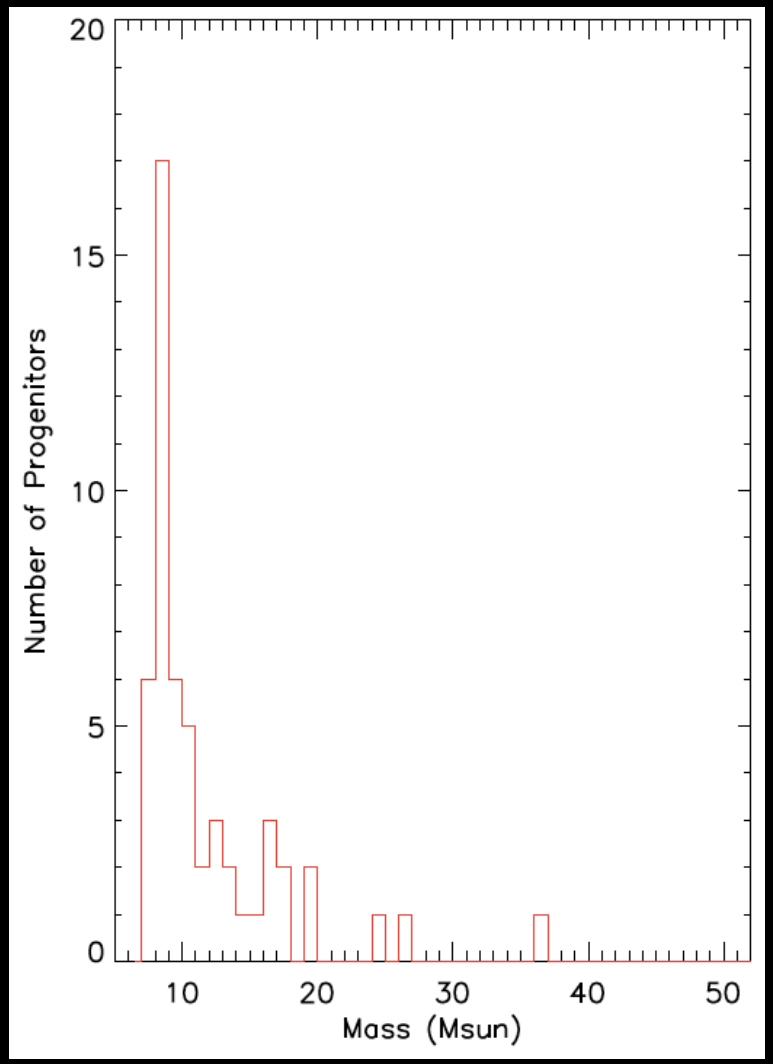
59 SNR in M31 with HST coverage (most from PHAT)

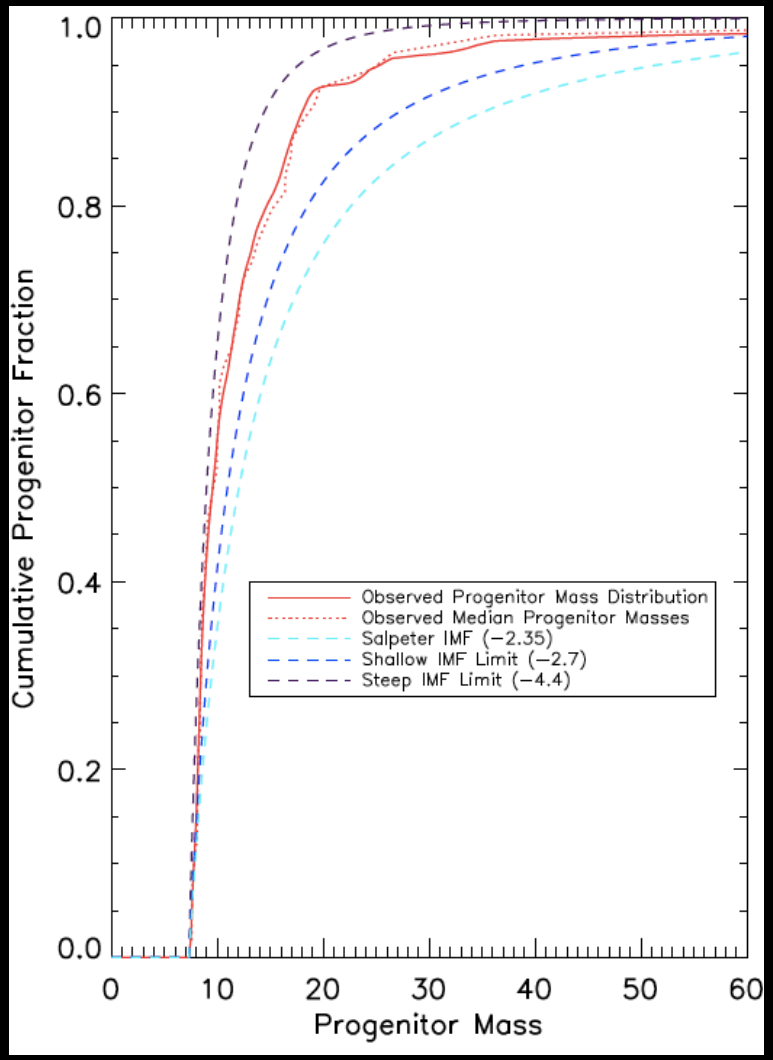
Age of stars near SNR tell mass of evolving star



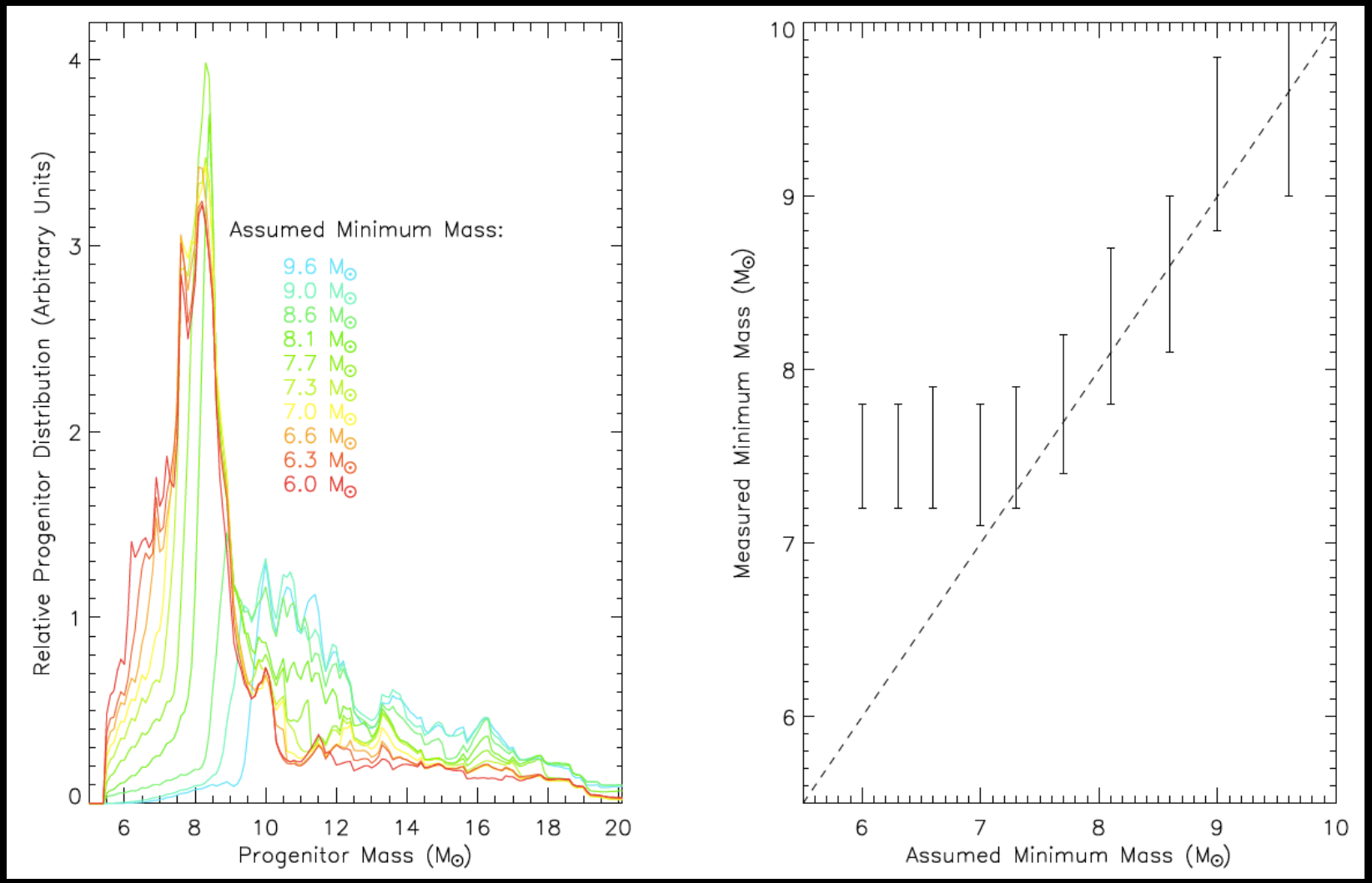
Red: Data Grey: Model Star Formation History

Mass distribution steeper than Salpeter IMF





Constrains minimum explosion mass as well



Primary Data Products

- Photometric catalogs for field-by-field photometry, with <0.005" relative astrometry.
- Multidrizzled reference images for each field.
- Multidrizzled brick-wide mosaics.
- Delivered ~9 months after observations complete (6 month intervals between releases)

Data Releases

Fall 2011
4 Bricks
25M stars
170M measurements

Spring 2012
1 Brick
5M stars
35M measurements

Fall 2012
9 Bricks
40M stars
280M measurements

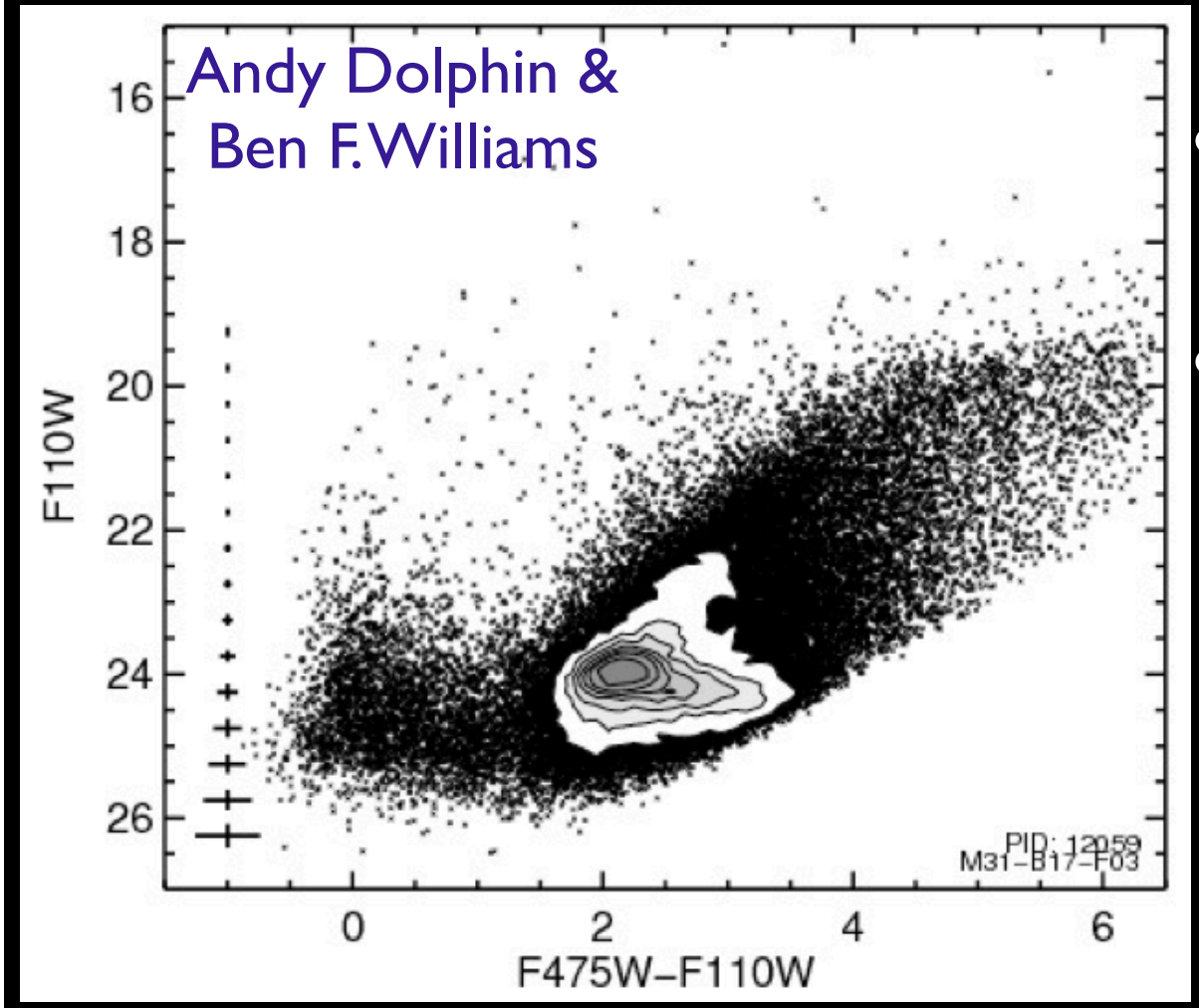
← In progress:
Photometry complete
UV + optical ready, but
NIR distortion issues

3 more complete bricks to be released in Spring 2013

Technical challenges

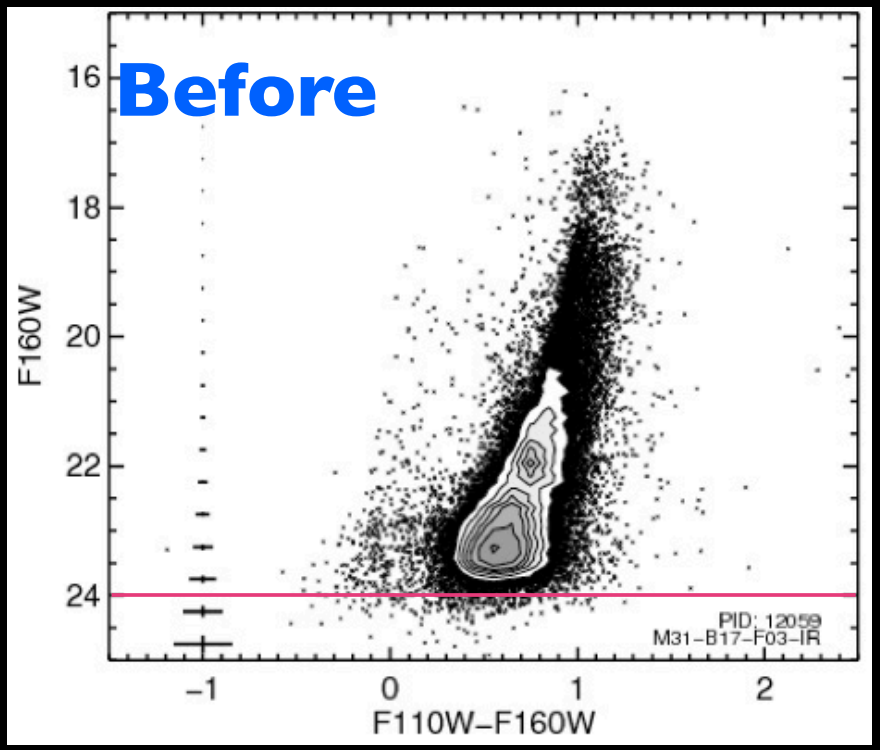
- Switch to AstroDrizzle
- Implementation of 6 filter photometry

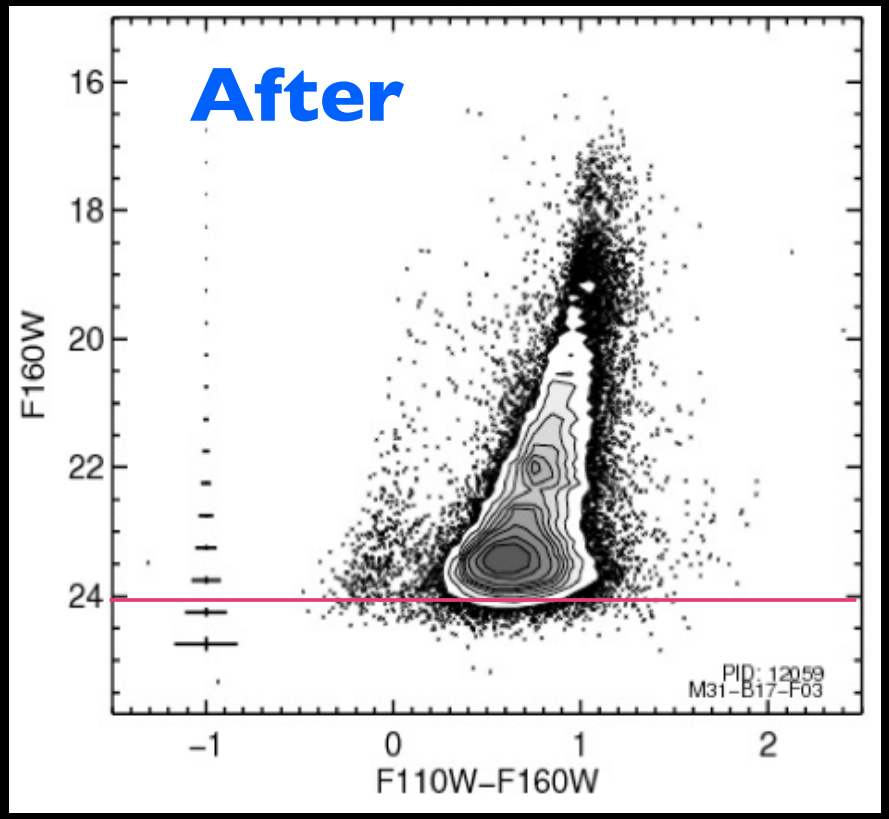
Simultaneous 6-filter photometry



- Uses full depth in overlaps.
- Star positions constrained by higher resolution and/or deeper data

Many more stars detected in NIR





Some improvement in UV as well

6 Filters = Memory Hog

- 237 chips from 163 exposures overlap each WFC3/IR pointing
- Needs 50 GB of memory to execute!

Technical challenges

- Switch to AstroDrizzle
- Implementation of 6 filter photometry
- Data Volume

Data Volume

- Will have ~1 Billion photometric measurements.
- Data management is a time sink
- Data access is challenging
- Data processing is expensive
- Optimization saves money but costs time

Impact of Budget Descopes?

- Won't know until we optimize data processing
- Pursuing cost offsets (XSEDE, Teragrid, Amazon)

Even before de-scope

9/12 9/13 9/14

Data Acquisition Complete

50% of one research scientist

Risk: Insufficient time to do science with full data set

STScI Support

- **Databases!!!!**
  - UVIS CTE correction
  - New TinyTim PSF models (still desperately needed for WFC3!)
  - Higher priority to F475W calibration